

Unclassified

TAD/CA/APM/WP(2011)4/FINAL

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

19-Apr-2011

English - Or. English

**TRADE AND AGRICULTURE DIRECTORATE
COMMITTEE FOR AGRICULTURE**

Working Party on Agricultural Policies and Markets

SYNTHESIS REPORT ON RISK MANAGEMENT IN AGRICULTURE

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JT03300416

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Note by the Secretariat

During the 2007-08 PWB the OECD developed a holistic framework for the analysis of risk management policies in agriculture (OECD 2009). This report synthesizes recent work on risk management in agriculture that has focused on the application of this framework in empirical policy studies. It is the final stage of the project “Optimal risk management policies in agriculture” (output area 3 of the 2009-10 PWB) as described in [TAD/CA/APM/WP(2010)3].

The first component of this work is a thematic review on risk management in agriculture that included five country studies analyzing the whole set of risk management policies and interactions. All country studies were based on the same methodology and followed the same process of preparation. The key inputs to these reports are: responses by governments to a detailed questionnaire prepared by the Secretariat; a background report drafted by a national expert; a Secretariat visit to the country with participation of national and international experts, and discussions with all relevant stakeholders, institutions and government units; and a report on the country visit by an international expert. The participating countries are: Australia [TAD/CA/APM/WP(2010)15/FINAL], New Zealand [TAD/CA/APM/WP(2010)16/FINAL], Spain [TAD/CA/APM/WP(2010)17/FINAL], The Netherlands [TAD/CA/APM/WP(2010)30/FINAL] and Canada [TAD/CA/APM/WP(2010)29/FINAL].

The second component was the development of a micro model for the analysis of risk management decisions and policies at the farm level (OECD, 2010). Micro data from nine countries was used for this work (Australia, Canada, Estonia, Germany, Italy, the Netherlands, New Zealand, Spain and United Kingdom). Analytical work using this model and data was included in some of the country studies in the thematic review. The third component of this work consists of an aggregate analysis of price volatility using the partial stochastic simulation in the AGLINK-COSIMO model ([TAD/CA/APM/WP(2010)31/REV1]).

All findings of this work were discussed and shared with more than a hundred experts from academia, government and international organizations at the OECD Workshop on Risk Management in Agriculture that took place in Paris in November 2010 ([Workshop on Risk Management in Agriculture, Paris, 22-23 November 2010](#)). The discussions at this workshop are an integral part of the work that is synthesized in this paper.

This document was declassified by the APM on 11 April 2011 under the written procedure.

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EXECUTIVE SUMMARY

Risk management principles and guidelines for policy design

An efficient and effective policy approach to risk management in agriculture will pay attention to the interactions and trade-offs among different risks, strategies and policies. The interactions to be considered are multiple: the prices of inputs and outputs sometimes move in the same direction reducing their combined impact on net returns; production risks can partially offset price risk; farmers routinely adjust their production activities and financial decisions as part of a normal risk management strategy; government payments, as well as production and price-linked policies, affect farmer risk exposure and influence risk management strategies. These interactions are significant and suggest strongly that the approach to risk management needs to be holistic and not be limited to a single source of risk, a single strategy or a single policy instrument.

Management of risk and uncertainty requires efficient use of scarce information about relevant risks. An effective risk management system should be guided by farmers' risk exposure and their preferences, and farmers strategies should not be displaced or constrained by the policies in place. Farmers possess the most complete information about their individual risk environments and risk preferences. A core policy role is to ensure relevant information and tools are available to enable farmers to manage their own risks, i.e. *empowering farmers*. A particular emphasis on information, training, and education is warranted.

National systems of agricultural risk management reflect the specificity of risks, policies and institutions that are in place. In most OECD countries efforts are focused on the management of farm income risk, but in developing and emerging economies food security is higher on the risk management agenda. There is no optimum set of risk management policies that fit all countries. However, a "risk layering" approach that clearly defines the responsibility of farmers, governments and private markets would contribute to more effective risk management strategies in many countries.

There are different *layers of risks* which require differentiated responses. Normal variations in production and prices generally do not require any policy response and should be directly managed by farmers as part of normal business strategy. Infrequent catastrophic events are, by definition, beyond the capacity of farmers or markets and therefore require government involvement. In between the normal and the catastrophic risk layer lies an intermediate risk level that can be handled through market tools, such as insurance and futures markets or through cooperative arrangements among farmers. The role of government should be to encourage the development of these markets.

The boundaries between the three risk layers depend on the specific risk profile and the institutional and policy frame that prevails in individual countries and regions. Case studies on five OECD countries found that boundaries are seldom well-defined and that the following policy principles are relevant in improving risk management policy design.

- All farm support policies influence the risk management decisions made by farmers. Often they will offset what would otherwise have been a pro-active risk management strategy by the farmer. For example, many forms of support discourage diversification of production and income sources.

Among all the policy instruments used by governments, those that address normal business risks (such as price support, income stabilization or counter-cyclical payments) have the strongest *crowding-out* effects. Fixed payments not linked to production decisions interfere less with farmers own risk management strategies and so do not have significant crowding-out effects.

- To address the problem of farm *price volatility* a broad risk management policy approach is more efficient than a focus on stabilizing market prices. First, many farmers benefit from natural production-price hedging and their income variance could actually increase if policies stabilize prices. Second, minimum price policies are effective in stabilising farm income only at very low levels of intervention prices because higher guaranteed prices induce more risky behaviour. Third, efficient markets will generate the high prices caused by supply shocks and the lower prices that follow a strong supply response; it is neither possible nor desirable to isolate producers from these signals.
- Because of the recognized drawbacks associated with attempts to stabilise prices, governments have given considerable thought to policy instruments that aim to stabilise farm income. Income stabilization and countercyclical programmes are often socially acceptable ways to *support farm income*, but they are not efficient risk management tools. This is because they interfere with normal farm risk management decisions, can displace market responses and blur the boundaries between catastrophic, marketable and normal risk layers. Income stabilisation can be an inefficient or even counter-productive risk management tool also due to information asymmetries – it is hard for governments to get timely and accurate information about farm income – and moral hazard which induces farmers to engage in more risky behaviour. Adjustments to the income tax and social security provisions are feasible and preferable ways to help farmers to manage normal risk, as are incentives for saving that allow farmers to smooth income flows from year to year. The income tax system is the most powerful instrument that OECD countries have to overcome asymmetries in income information.
- Market instruments to manage price risk include *futures contracts*, but farmers make only limited direct use of them in most countries. However, farmers benefit indirectly from futures as a price discovery instrument. Farmers also use different kinds of production and marketing contracts with downstream cooperatives and companies, which often offer forward price arrangements to farmers and then transfer their own risk through futures and options markets. Government can contribute to the development of futures markets and improve the efficiency of these hedging and price discovery functions by means of an appropriate financial regulatory framework.
- *Insurance subsidies* should gradually shift away from non-catastrophic insurable risks that could be covered by unsubsidized market-based tools or by farmers' business strategies. Better use should be made of the databases and information created by existing systems and information sharing arrangement, particularly in order to create more competitive markets. This could enhance the incentives for efficiency in the insurance industry and open up possibilities for public-private partnerships. If the insurance system is not able to differentiate appropriately between disaster assistance on the one hand and market enhancement on the other, insurance can become just another mechanism of farm support rather than a risk management tool.
- *Catastrophic risks* are more likely to require government assistance. When a disaster occurs, government faces serious information problems in identifying the scale of the event and the resulting damage. Such events receive widespread coverage in the media and lead to political pressure on the government to take some action. A set of procedures and a clear delineation of the responsibility between government and producers, defined as part of a contingency plan, is needed for the governance of disasters. This *ex ante* policy framework should also include explicit triggering

criteria and a definition of the types and levels of assistance. Getting the balance right between rules and discretionary *ex post* decisions is important and necessary in order to avoid hasty recourse to *ad hoc* decisions that undermine the contingency plans or create moral hazard. Such *ex ante* frameworks exist in different forms for plant and animal diseases in all OECD countries and could also be developed for natural disasters.

- Public support for *crop insurance* is used in some countries as a device to assist in catastrophes. It has the advantage of a formal contract with the financial participation of farmers, expert evaluation of damage, and relatively quick payment of indemnities. To improve its role in disaster assistance crop insurance has to be able to replace *ad hoc* assistance and to be part of the same *ex ante* framework that delineates the boundary of catastrophic risks. Index insurance and other innovative products could potentially reduce the cost of insurance.

Three topics related to risk management in agriculture require specific analysis. First, developing and emerging economies would benefit from more in-depth analysis given the priority they place on food security and poverty alleviation. Secondly, climate change has introduced new uncertainties which may require the adaptation of management tools, and, finally, the externalities that arise from animal disease risks also deserve greater attention.

SYNTHESIS REPORT ON RISK MANAGEMENT IN AGRICULTURE

1. Applying the holistic framework

1. Risk management has become a major *policy* issue of on-going agriculture policy reforms in OECD and non-OECD *countries*. The OECD Committee for Agriculture has been working on this issue since the early 2000s, with the first OECD workshop on income risk management in agriculture taking place in 2000 (OECD, 2001). This report synthesizes recent work that has focused on applying the holistic framework for the analysis of risk management policies in agriculture (OECD 2009) to empirical policy analysis.

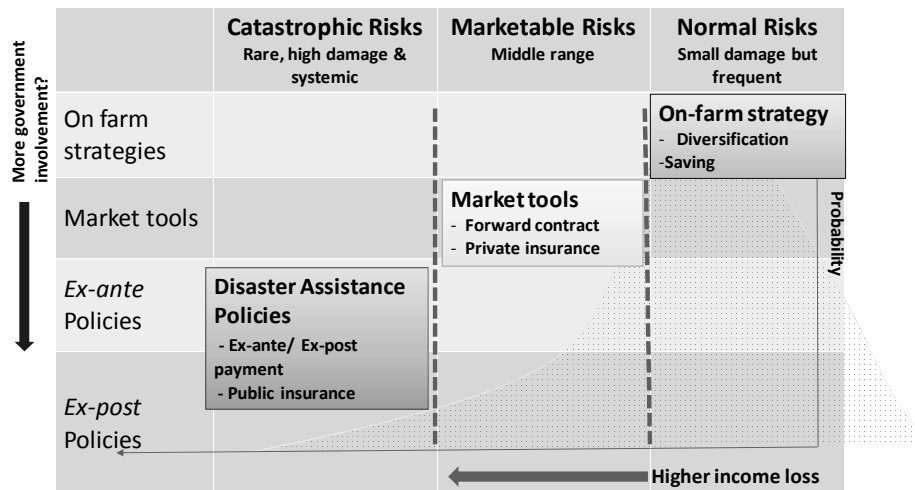
2. Two important policy considerations have emerged from this holistic framework. First, policy design must give attention to the interactions and trade-offs among all risks, strategies and policies, and avoid a narrow focus on single risks or risk management tools as there is evidence of significant interaction between risks and responses. Output price movements can partially offset changes in production quantities due to weather events; input price movements sometimes follow output prices and reduce their impact in net returns; it can also occur that an animal disease outbreak simultaneously reduces output and prices and have strong impact on returns; any of these events will imply adjustments in farmers decisions such as borrowing or diversifying production; government compensation of the impacts of some of these risks will imply that farmers change their production patterns or techniques to improve their returns in a less risky environment; they will also reduce their demand for market tools such as insurance; this adjustment in farmers strategies typically limits the effectiveness of policy in reducing farming risk. To ignore these interactions can lead to inefficient government policies and farmer's risk management strategies.

3. The second important policy consideration is the growing consensus on the need for a policy approach with differentiated responses to different types of risk. Not all risks require the same policy, and some may not require a policy response at all. Efficient policies for normal, marketable and catastrophic risk layers will typically differ. Normal risk is frequent but not too damaging and is typically managed at the farm or household level. For example, small variations in price or yields can be managed through normal on-farm business decisions. General tax, health and social systems may also help to manage such risks. Potentially insurable or marketable risks, such as hail damage, have intermediate levels of frequency and magnitude of losses. Market instruments such as futures and insurance are available to manage some of these risks. Catastrophic risks are infrequent, but cause great damage for many farmers: flooding, drought or disease outbreaks, for instance. The significant uncertainties associated with these events and the possibility of substantial losses makes it difficult to find market solutions, and there is a good chance of market failure. The literature, such as Newbery and Stiglitz (1981), identifies this market failure as the rationale for government policies to cover catastrophic risks.

4. This paper begins with the analysis of risks that affect agriculture (section 2) before analyzing the policy lessons and challenges for each layer of risk. Risks can be represented through a distribution of income loss with three risk layers: high frequency / low damage normal risk; low frequency / high damage catastrophic risks; and marketable risks with intermediate levels of frequency and damage. These layers are represented in the horizontal axis of Figure 1, while four categories of risk management responses are represented in the vertical axis. The locus of most efficient responses is the "good governance" diagonal.

There will always be “normal” risks that should remain the responsibility of a farmer and that need no policy response (section 3). There are also risks that can potentially be managed through market tools, such as insurance or futures markets, and for which the policy challenge is to create the conditions for the development of these markets (section 4). Finally, there are catastrophic risks to which market responses may fail and governments will be asked to respond to social demands for assistance. In this case, good policy governance is required (section 5). The final section 6 focuses on government policies oriented to income stabilization, typically covering normal risks that should not require support from the government.

Figure 1. Optimal pattern of risk management strategies and policies Good governance diagonal is missing



5. This report synthesizes the evidence from the application of this policy framework to empirical analysis in several countries, in particular Australia [TAD/CA/APM/WP(2010)15/FINAL], New Zealand [TAD/CA/APM/WP(2010)16/FINAL], Spain [TAD/CA/APM/WP(2010)17/FINAL], The Netherlands [TAD/CA/APM/WP(2010)30/FINAL] and Canada [TAD/CA/APM/WP(2010)29/FINAL]. Annexes 2 to 6 provide a summary of some of the results of these studies. The policy implications of these country reports and two reports on micro data analysis (OECD, 2010) and on aggregate analysis of price volatility ([TAD/CA/APM/WP(2010)31/REV1]) are discussed under the different sections of this paper. The core of the work so far has been on OECD countries in which the main policy focus is on managing farm income risk. The challenge of applying this frame to developing countries or emerging economies has not yet been tackled in this work. These countries can have risk specificities and, more importantly, governments may have other risk management policy priorities such as food security or poverty alleviation. They may also face more constraints in the development of insurance and financial markets, and different local arrangement may emerge to govern agricultural risks.

2. Understanding farming risks

6. Risk management decisions and the policy debate about farming risks are not always well informed and yet good information is a prerequisite for the design of efficient strategies. This concerns price risk at market and farm level, but also other sources of exposure to risk at the individual farm level.

Market price volatility

7. Market price volatility is an important source of risk for farming, in particular when prices are low. It has become a major policy concern in recent years due to the evolution of global commodity markets: price spikes have been accompanied by high price volatility, even if not significantly higher than in the 1970's [TAD/CA/APM/WP(2010)33]. Although production variability is usually determined by

exogenous risks (related to weather, diseases or other factors), market prices and their variability are determined by supply and demand forces and market adjustment processes, including the potential dynamics of incorrect expectations (OECD 2009, Newbery and Stiglitz 1981). Individual farmers cannot influence price risk at this aggregate level, but they still need to manage it. The policy question is the extent to which the main policy focus should be on making markets work better, or on enhancing farmers' capacity to manage risks, including price risks. The OECD project on risk management has found arguments in favour of placing the main focus on the latter.

Box 1. Exogenous market shocks in AGLINK/COSIMO can replicate historically observed volatility

A series of simulations were implemented using the AGLINK-COSIMO model to estimate the extent to which exogenous shocks can explain the historically observed market price variability of crops for the period 1976-2009 ([TAD/CA/APM/WP(2010)31/FINAL]). Several caveats apply to this analysis: it does not cover all sources of uncertainties that might underlie benchmark projections; it focuses on exogenous uncertainties linked to climate and macroeconomic evolution (excluding exchange rates movements); it does not deal with the endogenous uncertainty on the functioning of agricultural markets nor with the empirical uncertainty on the estimation of the parameters used in the modelling framework; finally, there is no representation of futures markets and there is scope for improving the representation of the distribution of exogenous sources of uncertainties in future work in this area. Despite these limitations, the results are instructive.

Simulations show that exogenous yield variability across different commodities and regions has a strong effect on price variability and is likely to be able to explain more than half of the total. The price of inputs (oil and fertilisers) and the macroeconomic variables rarely contribute to more than a third of the simulated price variability. For maize, the partial stochastic analysis presents a distribution of simulated results that is not far from the levels of historical variability with a median of 15% as compared with a historical of 19%, and with historical minima and maxima closely matched by the 10th and 90th percentiles of the simulations. In contrast, the exogenous shocks for rice in the model are able to explain only a third of the variability and the major peaks of maximum volatility are not in the 90th percentile. This is likely due to the importance of other sources of variability in this market, including policy responses such as export restrictions.

The simulations also indicate that a combination of several factors can be an important element that generates high levels of volatility. Exogenous shocks can generate exceptionally high volatility if they occur in specific patterns, even if this is unlikely to happen. For example, specific episodes of high variability of yields and oil prices, if combined with a positive correlation among yields for different commodities and a negative correlation between oil prices and yields can generate exceptionally high commodity price volatility.

8. Exogenous shocks in agricultural markets were simulated using the AGLINK/COSIMO model. This analysis is subject to the limitations listed in Box 1. Despite the limited number of sources of variability considered in the simulations, shocks on the main exogenous variables in the model are able to explain a significant share of historical price variability in some commodities such as maize. This does not mean that the efficiency of markets cannot be improved, but it implies that even if markets respond efficiently to real shocks, levels of volatility like those observed in the recent past are likely to happen from time to time. It makes sense, therefore; to design risk management tools that enhance the capacity of farmers to manage them.

Individual farmer risk exposure

9. The risks that farmers face and manage occur at the farm level and their relative importance for an individual farmer may differ from that at the aggregate level as shown by the microeconomic analysis undertaken in OECD (2010). This analysis of farm level data from a sample of arable crop farms in nine OECD countries has proved to be very insightful and it could be interesting to do similar analysis with livestock farms. The crop farms analysis shows that the individual risk environment can significantly differ from sectoral or aggregate risk. Most often, aggregate data show that price variability from markets is larger than production variability from weather risks. However aggregate variability of production

disguises higher risk at the farm level. The sample data from all countries show that at the individual level, yield variability is larger than at the aggregate level. It is also found that in four out of six country samples, most farms experience higher yield risk than price risk (Table 1). Only the samples from Canada and the United Kingdom show the opposite. These results do not need to be representative for each country¹, but policy priorities should take into account that this is a reality for many farmers and avoid focusing farm risk management policies on price volatility, which is only one, and often not the highest, risk faced by farmers. Each farmer is exposed to a different combination of risks, and policy should respond to this diversity of circumstances.

Table 1. Characteristics of risk at the crop farm level 1999-2008¹

	Percentage of farms with		
	Higher yield variability than aggregate mean	Higher yield risk than price risk	Price and yield move in opposite directions
United Kingdom	98	11	75
Italy	96	72	36
Estonia	96	68	32
Spain	78	91	25
Australia	84	51	72
Canada	74	7	55

1. The sample dates differ among countries. See OECD (2010a) for details of farm samples used for each country.

10. Price risk correlates with other risks. This is true for aggregate price and production risks whose negative correlation reflects, to a great extent, supply curve shifts along a relatively more stable demand curve. The magnitude of this correlation depends on the market structure, and is likely to be less pronounced for markets that are open to international trade. There is evidence that price risk is more systemic than yield risk because the former impacts all farmers in a similar way. However, there can be cases when yield variations are highly systemic due to systemic climatic events, such as droughts in Australia and Spain. The negative price yield correlation is weaker at the individual level, except in cases of a very systemic production risk. However, the farm-level analysis also shows that in three out of six countries the majority of crop farms there is a negative price-yield correlation in a quarter and more of farms in all countries. This means that many farmers benefit from offsetting movements of price and yield, and stabilizing prices in this case is likely to be an inefficient risk management strategy. A good risk management policy should allow farmers to benefit from natural hedging and to decide which instruments best fit their needs.

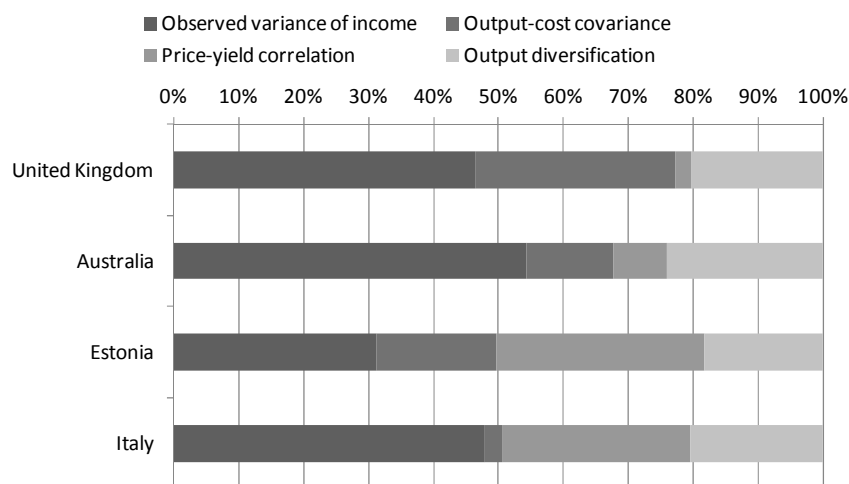
11. This applies to other sources of risk that are correlated with prices and production, such as input costs. The best way to integrate all farming risk into a single frame is to analyze the income variability that reflects the net effect of the conjunction of all risks. The variability of farm income is determined by the variability of all its components put together: prices, output, costs and policy transfers. But these risks are not additive: co-variations and pooling of different risks typically cushion the overall income variability. The analysis of individual farm income variability has proved to be a precious tool to understand the interactions between different risks and strategies.

12. The statistical analysis of the farm-level data provides evidence that diversification in production and revenue-cost covariance play a significant role in reducing farm income risk. In the United Kingdom,

1. For example, the sample from Canada is drawn from a semi-arid region where yield risk is likely to be higher than the national average.

Australia, Estonia and Italy, output diversification is estimated to reduce income variance of arable farms by around 20% (Figure 2) and by 25% of pastoral farms in New Zealand. The significance of negative price-yield correlations is estimated to be large in countries such as Estonia or Italy, while output-costs covariance can also largely reduce income variance (United Kingdom). Moreover, the contribution of these factors varies across countries and specific risk environments. Altogether, according to the sample data of these four countries, in the absence of correlations and diversification, the variance of income would be as high as double the observed variance (Figure 2).

Figure 2. Decomposition of the variance of income (arable crop farms)



The total of 100% represents the calculated variance in the counterfactual case of zero correlations, covariances and diversification. For details on the methodology, see OECD (2010a)

13. These statistical results on farmers' risk environment have implications for defining policy priorities and approaches. Different farmers in different countries are exposed to different risk environments. The details of the risk environment in terms of the sources of variability and correlations that affect farm income are important and will determine the optimal risk management strategy at the farm level. Each farmer has better information on the nature of his own risk environment than do researchers or governments. Government policies should not select the risks to be mitigated nor design the risk management tools on behalf of the farmers; they need to empower farmers to take their own risk management decisions, and to have access to a diversity of instruments and strategies, so that each farmer can develop his own risk management portfolio.

Farmers' risk perceptions

14. The perceptions farmers have about risk are as important as the observed risks faced at the farm level. These perceptions are not only based on observed risks, but also on common knowledge and all kinds of good and not so good information. Decisions by farmers and their risk management strategies respond to these perceived risks.

15. Variations in prices, weather conditions, and disease feature constantly at the top of farmers' risk perceptions across all studies. In the countries with sectors that are highly dependent on world markets as sources for inputs and outlets for agricultural products (e.g. Australia, Canada, New Zealand, and the Netherlands), exchange rate variations represent a prominent source of price risks. The perception of weather risks tends to be stronger in crop farming. While in some countries weather risk is dominated by a particular peril (e.g. drought in Australia and Spain), in others weather risks are perceived as diverse (less systemic) (e.g. the Netherlands and Canada). Weather risks may also be perceived as strong in pastoral

agriculture, such as in New Zealand, due to the impact of weather on pasture condition. The high level of concern accorded to disease risks among livestock farmers is connected with the prevalence of intensive production systems and potentially devastating effects on the whole sector that may occur due to disease outbreaks. Risks of highly contagious diseases are invariably associated with high economic damage, particularly in exporting countries, due to the disruptions these may cause to trade. Human risks, related to accidents and health represent another important source of risk. Where comparisons can be made across time, these show that the perception and awareness about risks has generally increased, i.e. farmers tend to give higher importance to the same risks than previously.

16. In many countries, uncertainty about laws and regulations has increased in farmers' perception in recent years. In EU countries, such as Spain and the Netherlands, this is related to the on-going debate about the future of the CAP, as well as the increasing requirements on consumer safety, animal welfare and environmental protection. Strengthening society's environmental awareness has been a driving force in New Zealand and has led to rapid changes in its environmental policies. However, farmers in this country are uncertain about the exact nature of the new environmental regulations and the costs that will be incurred. Changing government policies and programmes also feature among the key risks in the perceptions of Canadian farmers. All of this suggests that changes in government policies, even responding to legitimate concerns, may represent an important source of uncertainty perceived by farmers.

17. Price variability typically implies costs for risk averse producers and consumers. However some recent research has focused on a "positive" side of farmer risk perceptions (Shadbolt, 2010). Most risks represent both a threat and an opportunity, and farmers may perceive them as one or the other. The dividing line between the two is likely to be the ability of each farmer to manage the risk, which also depends on the time horizon. For example, variations in product prices are viewed as a negative uncertainty in the short-run, but as providing opportunity in the longer term as farmers can develop strategies and instruments that benefit from price movements.

The key role of data and information

18. Notwithstanding the useful insights on farmer risks and farmer risk perceptions from micro data and surveys, the available evidence is scarce and partial. Most OECD countries have good agencies and research institutions that collect data on aggregate risks of different kinds, but there is little analysis available of risk at the individual farm level that uses surveys. The information on risk perceptions and preferences is rarely comparable in scope, and across time and farm constituencies. This suggests a continued lack of fact-based knowledge about farmer individual risk and risk perceptions and preferences, despite the fact that the issue of farming risk is increasingly featured in the governments' policy agendas. There is scope for improvement on the collection and analysis of data for risk management purposes, and on the communication of this information to farmers and policy. Government should promote farmers' education and training on risk management. This would help to improve the efficiency of farmers' management of risk and government policy design.

Policy implications

- Exogenous shocks on yields and input prices can explain a big part of historically observed market price variability. Exceptionally high price volatility can happen even when markets work efficiently. Risk management policies should therefore put emphasis on enhancing farmers' capacity to manage risks from prices as well as other sources of risk.
- Risk exposure at the farm level differs from what is observed at aggregate level: individual production risk is relatively higher, and natural hedging between price and production is lower but still significant for a large number of farmers in many countries. Farmers' income variability is reduced by correlations among different risks, in particular price-output correlations and revenue -

cost covariance. Farm income variability is also reduced because of the use of product diversification on farms. Efficient risk management policies should empower farmers to proactively benefit from correlations and diversification.

- In order to inform policymaking, research into farmers risks and perceptions (as well as farmer risk preferences and management strategies) needs to become more systematic and comprehensive. Coordination amongst various research groups is required on the scope, design and methodology of surveys, with governments and industry ensuring applicability, longer-term coherence and sustainable funding for such work. This should inform the development of risk management education and training programmes for farmers.

3. Empowering farmers to manage normal risks

19. Business management and risk management are part and parcel of the same management activity. Farmers face a diversity of risks, which are a “normal” part of their business. These risks are frequent, associated with relatively small losses and usually farm-specific. The farmer is the person best placed to deal with such risks because he is in the position to have the most complete information about his business and to promptly act on this information in day-to-day farming activities. Diversification is found to be a very important risk management strategy while government policies focused on reducing normal farming risk are typically ineffective because they crowd out diversification and other strategies. Collective action and non-sectoral policies are also useful tools in many countries.

Farmer strategies

20. One basic risk management strategy consists of borrowing and saving money in response to the financial results of the farm. This strategy is particularly powerful when financial markets are efficient and give farmers access to liquidity on the basis of their expected returns from assets and government payments. The evidence and discussions with farmers in the thematic reviews showed that production risks are primarily managed at the farm level, with risk management techniques often an integral part of production technology. Farmers manage not only production risks, but are increasingly pro-active in managing market risks. They look beyond their own farms for information, seek consulting or outsource the management of some market risks to more specialised companies (e.g. for financial management). Farmers need to be empowered for their actions, and the government’s impact on business activities should not weaken individual incentives to implement risk management strategies, nor should it encourage the farmer to take more risks than he would otherwise do. Cooperatives and advisory services often play an important role in providing farmers information and training on risks, tools and techniques that they can implement in their farms.

21. Farmers generally perceive themselves as having the primary responsibility for managing normal risks; however, perceptions on the degree to which this responsibility should be shared with the rest of society differ across countries. For example, in New Zealand the spirit of free entrepreneurship seems to be strong and pervasive in the farming community and farmers regard self-reliance as a key principle of operating their business. This applies also to Australia with the exception, to a certain extent, of drought risk. In Canada, for decades society has accorded various forms of assistance to farmers with respect to their normal risks, and less than a half of Canadian farmers agree that business risk management is their own responsibility. In EU countries, mitigation of normal risks in farming is at the core of the CAP, with its border and domestic price support system in key sectors and its direct income support.

22. In some countries, it is difficult to estimate the farmers’ potential to manage their business risks as the risk environment is typically altered by policies as is the farmer’s behaviour. Most likely, the ability of farmers to adjust and manage various risks is underestimated by policy makers and society in general. In

New Zealand, in the years following the economic liberalization farmers demonstrated that they have a high capacity to adjust to a subsidy-free environment, to develop individual risk strategies, and benefit from market opportunities, such as output-price correlations. The stability of the overall macro-economic and regulatory framework was crucial and enabled farmers to adapt and develop market and on-farm strategies.

23. Enhancement of farmers' knowledge and skills is a prerequisite for successful risk management. The country reviews confirm that this is largely consistent with farmers own perception: they attach high importance to technological improvement, rating it as an effective means to manage production and market risk. Knowledge, extension and advisory systems should be in place and function efficiently in order to foster the diffusion of knowledge and growth in innovation amongst farmers. The need for systematic research, information and extension related to the sources and characteristics of risks faced by farmers and the rest of the agro-food chain are highlighted in all country reviews. Knowledge about natural risks has become more important in the context of climate change, while extension and advisory systems need to enable farmers to adapt to these risks. There is also much scope to improve farmers' awareness about their "marketable" risks and how to use and benefit from available instruments – such as insurance, futures hedging and contracting – to manage such risks.

Diversification

24. Diversification has always been a key risk management business strategy in all sectors, and this is also the case in agriculture. Diversification does not need the transfer of risk to other agents with imperfect information, and is likely to be an efficient risk management strategy, particularly if farmers are well informed about options for diversification. Diversification decisions often need to trade-off the gains in terms of reduced profit variability with losses from reduced scale economies; the optimal scope and composition of the diversification portfolio is specific to each farm.

25. Diversification in production involves producing a range of products, or using a variety of practices. The scope for production diversification may be sometimes limited if there is a high correlation between the prices of some outputs. But this is often a subtle strategy, for instance using different varieties of crops with different maturation or storage characteristics. Production practices can involve considerable differences, e.g. growing dry land and irrigated crops, as well as subtle differences, such as between some early seeded and some late seeded crops. Diversification strategies also concern marketing, e.g. selling at different times or through different channels, investment in a range of assets (different land locations, financial assets, and human capital) and economic activities in the farm household, including off-farm.

26. All these forms of diversification are present to varying degrees in the countries reviewed. Diversification across products was specifically examined for all countries and it was found that it is an important risk reduction strategy as product prices and yields are seldom perfectly correlated. The samples of arable farms in seven OECD countries (OECD (2010) and [TAD/CA/APM/WP(2010)29/FINAL]) and a sample of pastoral farms in New Zealand ([TAD/CA/APM/WP(2010)16/FINAL]) show that the variability of aggregate returns is always lower than the variability of returns for each single product. In some cases, coefficient of variation of aggregate returns with the observed product mix is more than halved compared to simulated monoculture returns. It is more difficult to assess the risk effects of subtle forms of diversification. However, they can play an important role, including on farms which are highly specialized in terms of products. For instance, the reports on Australia and New Zealand analyse the importance of livestock farms diversifying the sources of feed throughout the year; interviews in New Zealand and the Netherlands indicated that diversified marketing channels, locations, and timing are important producer strategies. Off-farm income from different activities outside agriculture was found to be an important and sometimes increasing (e.g. Spain) source of income of farm households. This is often a matter of life style

and career choice, but has strong implications for risk management. The study on Canada finds that off-farm income is used as a risk management strategy that contributes to improving on-farm profitability.

27. At the same time, all country reviews show an apparent trade-off between product diversification and specialization as a strategy to reap economies of scale for increased profitability. Specialisation is reported to be important in sectors such as dairy and greenhouse production and where natural conditions constrain product variability (e.g. pastoral farming in New Zealand). Diversification is also a means of increasing expected profitability. For example, crop rotations are important for disease control, weed management and soil fertility. Producing a variety of crops in the appropriate order can have beneficial effects on expected profits. Production and income diversification can also be a means to utilize more fully lumpy resources such as labour, seeding and harvest equipment. By producing crops with different timing requirements, farmers can better utilize limited capacity. Diversification also allows the production of high return products even when these imply more risky outcomes because they can be pooled in a farm household portfolio.

28. Producers are typically risk averse or face increasing costs to finance business risks or, most likely, both. Some may choose to diversify, sometimes giving up some expected returns in exchange for a reduced variability of these returns. It is not always better to reduce the level of risk at the farm level, and each farmer must find his optimal level of risk and returns. The extent and specific form of this trade-off between risk and returns is influenced by natural conditions, the returns to specialization, the opportunities for diversification, and the willingness of the farmer to take on risk. As noted, diversification can take subtle forms the impact of which on income variability may be difficult to quantify. To date, producers and policy makers continue to be insufficiently aware of the relevance of such forms of risk management. Diversification in all its forms continues to be one of the most important risk management strategies on the farm. And, unlike government policies and market strategies, diversification always responds to individual risks faced by each farmer because they are designed by those who best know these risks: the farmers themselves.

Collective action for risk management

29. Where there is sufficient convergence of interests, farmers can act collectively to generate services necessary for risk management and also implement collective risk management strategies. There is strong evidence of such a collective action across countries. So-called levy organizations, which serve farmers who produce specific commodities, operate in Australia and New Zealand, while the Netherlands is known for its Product Boards, which link all major businesses along specific agro-food chains. These industry organizations demonstrate various forms of collective action for the development of specific services on behalf and for its members, a “co-operative like solution” for certain activities. A great deal of such activities either directly or indirectly relates to risk management and they have proved to be effective in areas that require mutual monitoring, such as pest and diseases.

30. These industry organizations are often empowered by law to impose rules on their members; these may concern the general funding of these institutions (e.g. obligatory levies), building common funds (e.g. veterinary emergency funds), the imposition of certain production practices (e.g. hygiene actions), or marketing requirements. They represent a unique institutional arrangement between its members on the one hand, and between the members and the government on the other to provide collective action.

31. Some of the activities of industry organisations directly address farmer risks by using their legal powers. For example, livestock levy organizations in New Zealand participate in the implementation of the bovine tuberculosis programme and Product Boards in the Netherlands have the authority to develop and enforce industry rules beyond EU and national government regulations (e.g. rules on crop rotation or defining the areas for growing resistant varieties). They develop quality assurance schemes, hygiene codes

and promote certification schemes, e.g. to maintain high sanitary standards, and can be instrumental in designing procedures for emergency responses to catastrophes and implementing post-catastrophe assistance. There are prominent cases where they implement collective risk management schemes, such as the development and management of common funds to share the costs of disease risks (e.g. the Netherlands), or serving as a single agent in contracting commercial insurance for their members (e.g. New Zealand).

32. Other activities include facilitating the adoption of sustainable farming practices by farmers, improving their organisation and business management, and thereby contribute to reducing farmer risks. Finally, these industry organisations can also collect, produce and disseminate information, knowledge and applied research results, and provide technical assistance to develop farmers' risk management skills.

Non-sectoral policies: tax and social security

33. Tax and social security provisions can play a role in the management of normal farming risks, as is the case for all sectors. Progressive income tax rates and income and asset tests to qualify for social welfare represent general mechanisms for welfare redistribution regardless of the economic sector. However, farming has specificities that may require adjustments to general rules. First, returns from farming can be more variable than wages and other sources of income and secondly, self-employed farmers tend to own substantial non-liquid assets. This has led governments to implement special provisions for farmers.

34. Income tax averaging schemes for farmers are available in Australia and Canada, and in the Netherlands these provisions are not specific to farmers. Similar provisions are also available in other countries such as Sweden (OECD, 2009). They allow spreading losses across several years. In Canada, farmers can also declare taxes based on cash accounting rather than on accrual basis, which provides additional possibilities to smooth taxable income. Farmers benefit from this flexibility that allows them to pay less taxes, but these measures are not income smoothing: they typically just reduce the taxes paid in good years.

35. A simplified income tax system for farmers based on fixed percentage returns from sales of each crop exists in Spain. The system eases the administrative burden on farmers and can reduce their income taxes. It presents two inconveniences however: first, it reduces the income smoothing properties of the income tax system because it does not appropriately take into account increases in input costs; and second, it creates political pressure on the government to adjust the fixed return parameters with frequent extraordinary fiscal decisions. This simplified scheme seems to have worked in bringing farmers to pay income taxes, but it fails to provide good incentives for efficient risk management. The Netherlands provides flexibility to taxpayers (and not only to farmers) to manage cash flows and gives companies the possibility spread their profits over three years.

36. Several countries provide a deposit option to farmers with a tax incentive for saving income in good years, which can be used in bad years: the deposits are tax free with certain limits, but withdrawals are taxable. The Farm Management Deposit in Australia, the Income Equalization Scheme in New Zealand, the disaster and investment tax deduction in France, and the recent Tax Free Saving Account for all taxpayers in Canada are different versions of this type of income tax regulation. However, the incentives to use such scheme come from tax deductions and, in some countries, the incentives are reduced if the tax averaging and other provisions reduce total taxes paid by farmers. These tax free deposits have the potential to create good saving incentives for risk management purposes, while allowing farmers to take their own risk management decisions. The Canadian AgrInvest accounts programme (formerly NISA) goes beyond the tax system and provides direct support by matching farmer's deposits. Under this policy, farmers' savings are determined more by seeking support than by risk management *per se*.

37. Social security provisions for farmers in Australia, Canada, the Netherlands and New Zealand are similar to those granted to other citizens with the status of self-employed or worker. The Dutch study highlights the difficulties of self-employed farmers to access these benefits due to their high level of assets. In Australia, the Exceptional Circumstance programme provides income support using the same parameters as the general social security system, but with a relaxed asset test for farmers. In Spain, there is a compulsory special social security system for farmers, while in the Andalusia and Extremadura regions there is also a special welfare support programme for unemployed farm workers. The problem of such specific farm systems is that they cannot be compared with the general system, and therefore it is hard to analyze them in terms of equity. Anchoring income support to the same standards as the general social security system, and weakening or adjusting some of the conditions for access, particularly in terms of assets, seem to be a reasonable policy approach.

Interactions of agricultural policies with farmer risk management

38. The key idea that emerges from the OECD holistic approach to risk management is that if government policy covers a particular risk, the incentive to use other risk management strategies is reduced. Microeconomic model simulations systematically confirm the importance of interaction between policy and producer risk management strategy, mainly represented by product diversification in the model. The main finding is that all these agricultural policies are likely to reduce the farmers' use of other risk management instruments.

39. The extent to which policy crowds out other risk management strategies depends on the type of policy, as well as the characteristics of the risk. Highly decoupled payments, such as the Single Farm Payment in the European Union, are found to have a very small crowding-out effects and limited effect in reducing income variability. Similarly, Canada's AgriInvest programme, which is designed to reduce normal fluctuations of income by providing incentives to save through fixed topping-up of savings, has minimal risk effects and is mainly used to increase the level of income (support) rather than managing its variability. It has a small crowding out effect on other risk management strategies, such as crop diversification and the use of crop yield insurance.

40. In contrast, variable payments tend to have stronger crowding-out effects. Canada's AgriStability programme, which provides support when the producer experiences a margin decline of over 15%, has been found to have crowding-out effects on other risk management strategies. Such comprehensive risk coverage creates an incentive for farmers to specialise in riskier crops that generate higher returns. Moreover, AgriStability partly covers the "market" risk layer which overlaps with risks covered by crop yield insurance, which is quicker in delivering indemnities. Australia's interest rate subsidy under the drought policy (Exceptional Circumstance Interest Rate Subsidy) is another example of policy crowding-out. This policy induces farmers to rely more on debt and crowds-out financial risk management as well as product diversification.

41. Other policies that directly intervene in the insurance or product markets, such as crop insurance subsidies and minimum intervention prices, are also shown to have crowding-out effects on diversification and may even offset the initial reductions in income variability if the level of subsidy is too high. EU minimum intervention price mechanisms for cereals in the United Kingdom and Spain are found to benefit crop farms through higher returns, rather than from reductions in income variability, and their effectiveness in reducing income variability is higher at low levels of intervention price. Setting a higher intervention price for the concerned commodities is found to lead to stronger crop specialization and may even increase the variability of income. On the contrary, very low levels of intervention price generally do not interfere with crop diversification. However, it is also argued that price support may create incentives to use risk-reducing inputs such as pesticides (Serra *et al.*, 2005)

42. The same applies to crop insurance premium subsidies, where a higher level of subsidy may result in higher income variability due to the crowding-out of crop diversification. A policy that induces farmers to fully insure yield risks improves the farmer's welfare, but may have an unintended consequence of increased income variability because of crowding-out of crop diversification. However, the extent to which agricultural policies crowd-out other risk management strategies also depends on the specific characteristics of risk exposure. For example, if the risk is more systemic, such as drought, the scope to use a crop diversification strategy as an income risk management tool is reduced. In such a case, policies, such as crop insurance subsidies, have a relatively less crowding-out effect on a diversification strategy (e.g. in Australia and Spain).

43. The marginal risk reduction effects of intervention prices and insurance premium subsidies decrease as the level of subsidy increase; in other words, these policies are more effective when their level of support is low. Therefore, it is desirable that policy makers do not concentrate high levels of support on single risk management policies. Since the characteristics of risk exposure at the farm level are different across regions and farms, providing farmers the choice from a diversity of risk management instruments is a desirable policy approach.

Policy implications

- Diversification takes many forms, from the production of different products to the more subtle differentiation of production practices and marketing systems, and to both farm-related and non-farm investment and income diversification. Product diversification is shown to significantly reduce variation of producer returns. The impact of other forms of diversification is more difficult to capture with available data, but there is evidence of its high relevance and governments should not interfere with these efforts.
- Farmers are best placed to deal with normal risks and should not be hindered in developing appropriate strategies. Farmer's potential to adjust is usually underestimated. Governments can further improve the level of risk awareness responsibility of producers in risk management by providing knowledge and facilitating training for active engagement in the development of individual and collective risk management strategies.
- Integration of producer and industry organisations in the risk policy process can contribute to policy efficiency, knowledge of risk management tools and techniques, and a clearer division of responsibilities between government and private business for risk management. However, it is also important to avoid that the policy design process is captured by industry interests.
- Income tax and social security provisions can be used in the management of normal farming risk. However, general provisions can be too constraining for farmers and may need adjustments. These adjustments should stay anchored to the general system that defines society-wide redistribution criteria, e.g. adjusting the asset tests for the eligibility of farmers while maintaining the rest of general social security provisions. Tax concessions benefit farmers by reducing the amount of tax, but they also reduce the potential of the tax system to smooth net income and manage risk. Income deposits with tax incentives can be useful because they encourage a pro-active strategy that is individually managed by the farmer.
- Agricultural producer support policies have crowding-out effects on farmers' strategies. However, the extent to which policy discourages farmers' pro-active strategies depends on the type of policy and the characteristics of the risk. Policies that directly reduce income variability have stronger crowding-out effects than do more decoupled payments. But the effectiveness of particular policy instruments depends on the complementarities with other policy instruments and strategies

- The crowding-out effects of a specific policy become stronger as the government increases the level of support to that policy. Policy makers should not concentrate high support on a single risk management policy instrument; this includes intervention prices that are only effective in reducing risks when they are low.

4. Enhancing risk markets

44. Risk management instruments available to farmers go beyond the individual farm. They allow farmers to transfer risk to others by paying a price or premium. Various market institutions like insurance, futures and contracts, operate for transferring and sharing risks across the broader economy. Governments should encourage the development of these market instruments with stable macroeconomic policies and economic environment. Subsidies neither solve information asymmetries nor can they overcome the potential market failures that may ensue.

Insurance markets performance depends on local risks and institutions

45. The potential effectiveness of crop insurance is largely determined by the characteristics of risk and other policy measures in place in each country. For example, asymmetric information between an insurance provider and the farmer can be a major source of high transaction costs and potential market failure. If yield risk is systemic there is more potential to reduce high transaction costs by developing index insurance that covers risky events (e.g. the amount of rainfall) based on an index that is highly correlated with individual yield risk. This approach has more potential in countries like Australia where systemic drought risk dominates agricultural risk and crop insurance markets are less developed than in some other OECD countries. Government may contribute to the start up of these instruments through investment in weather stations and research on appropriate indexes.

46. The analysis of farm-level data shows that Spain has the combination of circumstances which makes crop yield insurance a relatively effective instrument to reduce farm income risk in this country: production risk is systemic across different outputs; yield variability is more important than price variability; and there is little natural hedging due to the weak negative correlation between prices and yield, some of which is due to policies. The cereals intervention price truncates the distribution of prices, thereby significantly modifying the risk environment in which farmers take their decisions. They increase the importance of production risks in the portfolio of farming risks, and reduce potential negative correlations between prices and yields. When the intervention price is decreased, the effectiveness of yield insurance to limit farm income variability is also reduced and the demand for insurance is likely to shrink. In the current context in which intervention prices have been reduced over the last twenty years in the European Union, this may have implications for the insurance system in EU countries, such as Spain. Yield insurance is likely to become less effective and the demand is likely to contract because farmers are likely to shift demand towards broader revenue or income based risk management tools.

47. The Dutch insurance market presents examples of small mutual insurance companies that focus on specific producer groups and their specific risks. Such mutuals provide coverage against particular diseases in the potato, poultry and pig sectors. Access to such insurance is usually conditional on observance by producers of certain rules, e.g. concerning the ways animals are kept, hygiene standards, and vaccinations. There are mutuals that also offer coverage against specific natural perils for crops. Risks covered by these relatively small scale companies are generally not covered by the larger insurers. Small mutuals can better address information asymmetries and create incentives for risk prevention which may reduce the cost of insurance. They typically have direct access to their clients and good knowledge of their members, who are involved in the company through its board. There is, in general, a strong sense of ownership in such companies as well as trust amongst stakeholders. They can adopt flexible regimes of premium collection by the mutuals tailored to the cash flows of their clients. Governments can provide the

initial incentives to create such funds by way of start-up capital and attracting private expertise for product development, as was the case in the Netherlands. However, specialized mutual companies may suffer from limited financial robustness due to their relatively small size and the small scope for diversification of their risk portfolio, which can require at times re-insurance support from the government. Their business decisions may also be more susceptible to pressure from members.

How can public insurance improve the functioning of markets?

48. Fully private insurance exists in New Zealand and Australia, where general insurance companies offer coverage for personal risks (e.g. from accidents²), for farm asset losses from specific perils such as fire (Australia) and flooding (New Zealand), and single peril (hail) insurance for crops. In New Zealand, two collective insurance schemes exist for kiwi fruit and wheat producers, the first one operated by the principal exporter, the second one by the industry association. The lack of insurance markets for other risks is a reflection of either strong information asymmetries or the high financial cost of covering systemic risks, or both. This situation is reported in several feasibility studies in Australia which show that high transaction costs make insurance premiums too expensive, and are above what farmers are willing to pay.

49. Public insurance systems exist in other countries covered by the thematic review: Canada's fully public insurance, managed by provincial governments under a common federal AgrInsurance framework; the Spanish hybrid insurance system based on a public-private partnership; and the recent subsidised multi-peril insurance programme in the Netherlands within the European Union policy framework. The first two have a long history that provides useful policy insights, while the latter is very recent and it is yet premature to draw any conclusions about its performance. All three programmes emerged as subsidized market tools to respond to catastrophic risks, and as an alternative for governments that wanted to avoid *ad hoc* assistance for risks for which insurance was not offered. However, both the Canadian and Spanish systems run insurance policies that clearly belong to the "marketable" risks, such as hail insurance.

50. Canada, the Netherlands and Spain provide insurance subsidies which are not able to overcome the problems of moral hazard and adverse selection that are at the origin of the missing insurance markets. These problems are due to information asymmetries that can only be reduced through information incentives in the policies. Both Spanish and Canadian insurance systems try to reduce moral hazard by basing indemnities on actual damage rather than yield reductions, and adjusting individual premiums to real risks with so-called *bonus malus* incentives, these latter being less effective with high rates of subsidy. They try to reduce adverse selection by obliging farmers to insure all plots on which the insured crop is planted, but there is evidence in Spain of remaining moral hazard (Garrido and Ziberman, 2008). In fact, all these provisions could be imposed by private insurers and do not sufficiently justify government intervention.

51. Canada and Spain also provide public reinsurance; through the Insurance Compensation Consortium (CCS) in Spain, and the provincial/federal arrangements in Canada. The CCS is a unique reinsurance agency with competencies beyond agriculture and it plays a significant role in ensuring the viability of the system by building a significant reserve fund that makes the reinsurance system financially sound in the medium run. Since 1996 arrangements in Canada include national guidelines for self-sustainability, and periodic independent actuarial assessments of the federal re-insurance fund. Clear rules governing the reinsurance system are needed to avoid reinsurance becoming a non-transparent form of subsidy.

2. In New Zealand, there is a compulsory national no fault insurance for personal accidents which provides a minimum level of coverage.

52. The Spanish insurance system has compiled a massive database on risk, coverage, indemnities and purchasing strategies since 1978, but has failed to provide public access to this data and thereby increase competition amongst private insurers. Such a database can be an important source of information for researchers, policy makers and insurance companies. It has the potential to reduce information asymmetries and to facilitate the functioning of insurance markets. This database, however, belongs to a private Spanish company, Agro-seguro, which is the single provider of insurance services. In Canada, databases with individual information are owned and managed by the provincial governments. In neither Canada nor Spain, is the information shared with different insurance providers that could compete on the market. Lack of long time series of information is a major barrier for an insurance market to begin to work with actuarially fair and competitive premiums. Should such a database be developed, the resulting system should increase the scope for competition amongst insurance providers, while keeping the obligation to share information through the insurance database. Insights can be obtained from the Spanish system on how the database can be created, but if it is not fully exploited it will not increase competition. Experience in Canada with its Private Sector Risk Management Partnership program, particularly for livestock, shows the potential to develop private tools with government technical starting-up assistance.

53. Both the Canadian and Spanish systems subsidize different policies to different degrees,³ but they have not succeeded in implementing a differentiated subsidy strategy that would allow for the development of insurance lines that in turn would progressively lose their dependence on subsidies and instead become fully market-based instruments. Insurance lines that cover risks that are less systemic, with stronger demand and performance, and where information asymmetries are progressively reduced, should evolve in such a way as to require lower subsidies and able to better withstand market competition. This is consistent with the empirical evidence showing that farmers' demand for insurance increases once they have experienced indemnification; this provides space to reduce subsidies. Subsidised insurance can become a main agricultural support policy (as in the United States in recent years) and can be subject to strong political economy pressure that impedes its evolution and reform.

54. According to the evidence from the financial accounts of the Canadian and Spanish system, the full market premium continues to be well above farmers' effective willingness to pay, which means that the public system is unable to solve the economic problem behind the missing insurance markets. The ratio between the average farmer's indemnities and total premiums in recent years is around 70% in both countries, implying total transaction costs of around 30%; this according to experts, is not out of the range when compared to other private insurance. The results, however, remain mixed: public insurance systems have not solved the asymmetric information problem, but there is no evidence of its being less efficient than comparable private insurance.

Futures markets

55. Most of the countries reviewed have commodity futures markets which allow price risk to be hedged. The Australia Securities Exchange offers futures contracts for barley, canola, sorghum, wool and wheat, but contracts for commodities, such as lamb and cattle failed because of lack of liquidity. A new whole milk powder futures contract was recently launched by the New Zealand Stock Exchange. In Canada, the major futures market is the ICE, located in Winnipeg, for canola and feed barley. The Europe there are several futures markets. Eurex offers contracts for potatoes, hogs, butter and skimmed milk powder. The NYSE Euronext offers contracts for skimmed milk powder, corn, barley, rapeseed and sugar. In Spain, there is a futures market for olive oil. Futures exchanges are international markets, and US Boards of Trade such as in Chicago, Minneapolis or Kansas are accessible and can be used by traders from

3. The general rule in Canada for basic multi-peril insurance is a government subsidy of 60% for premiums and 100% for administrative costs, although there are catastrophic lines for risks beyond the 93 percentile that receive 100% subsidy. In Spain, there are "viable" and "experimental" policies and six subsidy groups.

all countries. There are also exchange rate futures that are particularly useful for export oriented countries, as well as futures for interest rate and other financial indicators.

56. In EU countries, the CAP in the past applied public intervention that protected from downward price fluctuations. These mechanisms have been reduced and become less relevant today. This applies to the Marketing Loan programmes for crops in the United States. Several price pooling options via marketing arrangements were provided in the past by the Australian Wheat Board and continue to be by Canadian Wheat Board. All these policies are strong substitutes for price hedging in futures markets and create disincentives for the use of this market instrument. It has also been argued that the existence of perfect capital markets reduces farmers' incentives to directly hedge prices in the futures markets (Simmons, 2002). This could partly explain why, despite potential benefits, the five country reports show that the use of futures and options is infrequent amongst farmers. Many big producers, particularly those with exporting interests, actively trade in futures markets in all countries, but most farmers in the five countries are not directly involved in futures trading. However, farmers benefit from futures as price discovery mechanisms (many use futures prices as a reference for their decisions) as well as through their marketing arrangements. Farmer cooperatives, such as Fonterra in New Zealand, make extensive use of futures for management of price risk on behalf of its members. Private companies that offer contracts to farmers also use futures to transfer part of their risk.

57. Currently, futures are expanding towards derivatives, with OTC (over the counter) contracts that are better tailored to the needs of each trader. They combine several futures products in a single contract. Some experts think this type of product may have potential demand from farmers that will use financial intermediaries to manage their price risk, but big farmers with exporting interests are the most likely customers for these products. Recently, Alberta, Canada, a Cattle Price Insurance Program which effectively represents a combination of futures on cattle prices, exchange rates and basis risk has had apparent success. There could be scope for such initiatives to be offered by the private sector.

58. Futures are "standardized" markets and, as such, they need strict rules, most of which are established by the exchange boards. They are also part of broader financial markets which also need appropriate regulatory frameworks to improve their efficiency. Issues of the regulatory framework under which future markets work in different countries and their link with spot markets are beyond the scope of the thematic reviews and current work on risk management.

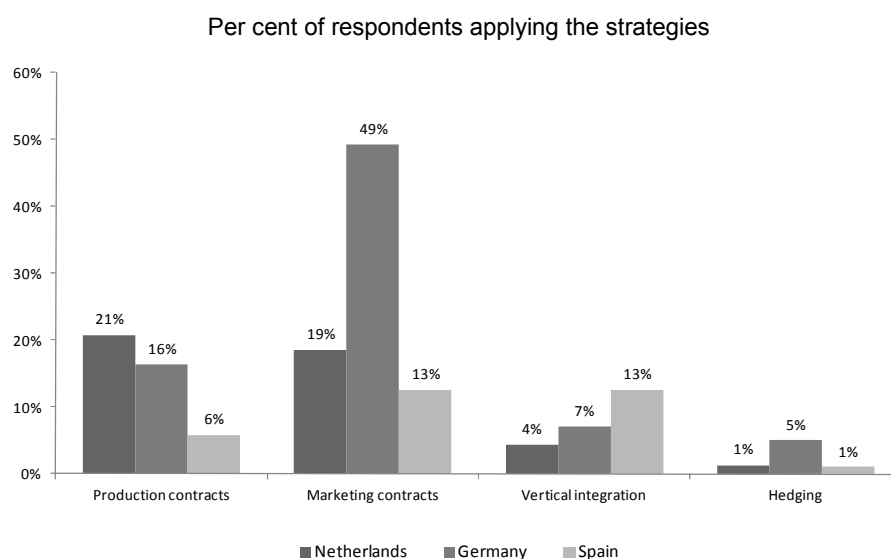
Cooperatives and forward contracting

59. The country reviews reveal that output market institutions play an important role in farmer risk management. Many producers use forward contracting, and/or are integrated into co-operatives or vertically integrated with companies. All these arrangements perform important risk management functions and extend the marketable risk layers to cover a large part of output, financial, and market risks of producers.

60. Co-operatives are a specific institutional form of a secured contract which may imply a number of important risk management functions. Co-operatives apply direct strategies to reduce members' risks, such as pooling of prices across time and markets, developing payout regimes to smooth fluctuations of member returns and maintaining the market to ensure continuity of returns. Co-operatives collectively engage in input and output price hedging and diversifying risks. Many forms of diversification can be employed, such as vertical integration, and product and market diversification, geographic diversification and investments outside agro-food business. However, co-operatives may not emerge as a preferred approach in all sectors.

61. Production and marketing contracts are important strategies for farmers (Figure 3). Forward contracts on price, quantity and quality have been in place in many sectors for some time. Forward contracts can be combined into price pooling contracts or combine their contracts for buying inputs or selling outputs). Increasingly, contracts evolve from relatively simple agreements on prices, quantity and timing of sales (or purchases) to more diverse agreements, including production and marketing provisions that become part of the risk management environment. They can contribute to management of some risks but they can also create commitments that involve other risks. Sophisticated international supply chains and strong relationships characterize many agro-food segments today.

Figure 3. Use of contracting and other market arrangements by agricultural producers in selected EU countries



Source: Palinkas and Székely, 2008

Policy implications

- The effectiveness of insurance markets in managing risks is country-specific and depends on the characteristics of risk and the existence of other policy measures. Index insurance has a potential for development, particularly for systemic risks such as drought in some countries, but may not develop because of uncertainties and initial investment costs.
- Mutual insurance funds targeted to specific risks and specific producer groups can better deal with problems of asymmetric information and moral hazard, and thus can fill the market niches that otherwise would not be covered. However, they may lack financial robustness and become dependent on government support.
- Insurance subsidies do not tackle the source of the problem of a potential market failure in insurance markets. The existence of missing insurance markets is mainly associated with information asymmetries and any improvement in the way markets work should focus on tackling the information problem through information databases and sharing arrangements.
- The combination of insurance subsidies and the development of risk databases has proved to contribute in a positive way to the development of insurance (Spain and Canada). With time, however, these public systems have shown difficulties to evolve and progressively step away from

on-going subsidies for the insurance lines for which information and demand have already developed.

- The direct use of futures markets by farmers is limited. Price and output support policies, particularly in the past, can only partly explain the limited use of an instrument that is more widely used by traders along the food chain. Farmers benefit from futures, even if they do not trade on these markets directly; first, they use future markets for price discovering; second, futures are used by downstream companies and cooperatives, which enables them to offer forward contracts to farmers.
- Production and marketing contracts between farmers and the downstream industry continue to be an important risk management tool, whose risk management functions have become more sophisticated. The legal system should underpin the development of these contracts, allowing enough flexibility and security of transactions.

5. Steering disaster assistance

62. Layering risk into catastrophic, marketable and normal is a key principle of the holistic approach to risk management. Risk layering suggests the existence of boundaries between these different risk layers and imply the responsibility of policymakers to contribute to a better delineation of such boundaries. This is of particular relevance to catastrophic risks because societies in OECD countries will inevitably expect government action with respect to such risks. By definition, catastrophic events surpass the capacity of farmers, individually or collectively, and markets to cope with them and is the layer where government action is most justified. Governments and societies need to agree on a common and effective definition of “catastrophic” events that require public assistance, what type of assistance, and how such assistance is triggered. These *ex ante* mechanisms are a major governance challenge in all countries; it is crucial to create clear signals to producers on the limits of government responsibility in coping with disasters in order to maintain farmers’ incentives for pro-active risk management strategies.

Boundaries of catastrophic risk

63. Establishing an explicit boundary of catastrophic risk for policy purposes means defining the circumstances which call for government assistance. This boundary should cover risks that are infrequent, highly damaging and systemic, and for which market solutions are more likely to fail. But the boundary is defined by government practices and this can become blurred when there is a high level of government support related to marketable and normal risks. The boundaries and risk management incentives will be defined by the differentiated policy response and government assistance to the “catastrophic” risk, as compared to a lack of response to non-catastrophic risk. There are differences in all countries concerning the boundaries of catastrophic risk as it relates to market, weather and disease.

64. For instance, can *market risks* be regarded as catastrophic? That is, when markets experience abnormal (infrequent) shocks, leading market participants to suffer high and systemic losses, can government assist in the name of a “catastrophic” event? Countries take very different approaches to this question. Australia and New Zealand have a clear boundary: risks coming from markets and prices are not considered as catastrophic and do not require government assistance or compensation. In contrast, Business Risk Management policy in Canada is oriented towards smoothing fluctuations in producer margins, including losses, which implies that the government takes a broad responsibility for the consequences of market shocks on producer business income. The CAP framework in the European Union has similarly been oriented towards supporting prices and producer incomes.

65. In addition to these formal price and income support systems, countries apply *ad hoc* measures in times of economic crisis or specific market events. For example, since 2005 several countries have taken measures to compensate farmers for high fuel prices; following the economic and financial crisis in 2008-09, some countries provided *ad hoc* support, as well as tax concessions, preferential credits and debt restructuring. Canada has often provided support programmes in response to bad market conditions, such as in the tobacco and hog sectors in 2008. The European Union has traditionally used the price stabilization mechanisms such as intervention prices as a formal *ex ante* mechanism and boundary in some sectors, but has progressively reduced the scope of price risk interventions. In both the European Union and Canada, market risks continue to be perceived as potentially “catastrophic” within poorly defined limits, and very susceptible to *ad hoc* policy action.

66. In the area of *risks related to weather*, the definition of catastrophes for policy purposes takes very different forms. Australia, New Zealand and Canada have specific frameworks to deal with adverse climatic events, and in which the qualification of a climatic event as a catastrophe most commonly boils down to a general reference to “severe damage”, or “inability of local communities to cope with it”. In Australia, a formal definition of a climatic catastrophe makes an explicit list of events which can be considered as natural disasters and those that cannot. In addition, catastrophic droughts, Australia’s major climatic disaster, are defined as “rare and severe” events, occurring on average once every 20-25 years, lasting more than 12 months, affecting the incomes of a significant proportion of farm businesses in the area, and not part of a long term structural adjustment process. Catastrophic drought may lead to an exceptional circumstance declaration and eligibility for assistance. In the countries where insurance markets for climatic risks are supported by government, the boundary of the catastrophic risk layer can be considered as being defined by the existing climatic peril insurance (e.g. in Spain, the Netherlands and Canada) and the corresponding deductibles, typically a 30% loss threshold. However, in these three countries as elsewhere, *ad hoc* additional measures are often triggered which blurs the boundary of government and farmer responsibilities.

67. In sum, catastrophic risks related to climate events usually remain poorly defined and there are rarely explicit criteria that discipline the triggering of policy actions. This makes climatic catastrophes susceptible for *ad hoc* assistance based on decisions taken under considerable uncertainty and often strong political pressure. The policy analysis undertaken promotes the idea of disciplining climatic disaster assistance by introducing explicit and more precise definitions of catastrophes, possibly based on lists of specific events, probability thresholds and degrees of damage.

68. In the areas of *pest and disease risks*, the frontier of catastrophic risk is set more explicitly. This is because a formal classification of diseases into the most and least harmful exists both in international organisations (the OIE) and at the national level. All countries have lists of harmful organisms for both plants and animals, with the most harmful groups effectively delimiting the catastrophic risk. For example, such groups are “notifiable” animal diseases and “regulated” crop diseases in the European Union, and “exotic” (non-endemic) pests and diseases in New Zealand. Due to the strong cross border and externality aspects of pest and disease risks, this responsibility is taken by national governments and is in part governed by international regulations or regional systems. The international dimension of pest and disease risks is an additional factor that necessitates the existence of well developed formal frameworks for catastrophic risk management in this area. In all countries, national governments have an explicit responsibility with regard to the most harmful organisms: building and maintaining appropriate phytosanitary and veterinary systems for the prevention, control, and monitoring of diseases. In the case of the EU countries, the functions of the national systems are largely set at the EU level. The Community on its part assumes financial co-responsibility.

69. Many aspects of managing catastrophic disease risks also fall under the responsibility of producers: they typically finance the cost of phytosanitary and veterinary inspections and share the costs

with the (national and EU) government related to control of disease outbreaks. Producers also assume (fully or partially) risks of consequential losses resulting from disease outbreaks, which must be contained by producers either individually, or through market or public-private arrangements, such as insurance or collective funds. In all countries, producers are typically compensated, at least partially, for the cost of compulsory actions after outbreaks to ensure notification incentives.

Ex ante frames for ex post disaster assistance

70. Catastrophic risk by nature is difficult to foresee and it is difficult to develop policy measures that are triggered under specific catastrophic circumstances. Events may unfold very differently and catastrophes typically generate a social demand for solidarity that can translate into political economic pressures to support those who are affected. The policy dilemma is between tying government hands with *ex ante* measures and letting the government decide *ex post* about the type and scope of the measures to apply. When a disaster occurs, information is imperfect and asymmetric, particularly in the very short run when decisions must be taken immediately after the event. Under these circumstances it is good to have a framework that guides the assessment of the consequences of the events and the decision upon which policy measures are triggered. It can help reduce rent seeking behaviour after disasters. In reality, disaster assistance systems are composed of both *ex ante* and *ex post* elements.

71. New Zealand's On-Farm Adverse Events framework is a very interesting case of this type of equilibrium. The framework includes a typology of events by size (small, medium and large scale), a set of potential assistance measures, a correspondence between sizes of events and the sets of assistance measures, and a procedure for adverse events declaration. The list of measures goes from basic emergency measures, such as evacuation and food assistance, to on-farm restoration support (a Special Recovery Measure). This latter can only be triggered for large scale events. The national Adverse Events Committee is in charge of co-ordinating decisions while involving stakeholders in informing these decisions in a very flexible way.

72. Australia's National Drought Policy (NDP) focuses on rare events that are not part of long term structural adjustment processes. The NDP is based on the declaration of Exceptional Circumstances (EC) in a specific region. Farmers in EC regions are automatically eligible for a well defined set of programmes, namely, the EC Relief Payments, the EC Interest Rate Subsidies and the EC Exit package. The process of EC declaration is initiated by the territorial government that compiles and submits applications to the Australian government who developed an information system NAMS to assist them on this task. The Australian government decides about EC declaration after an assessment by the National Rural Advisory Council (NRAC). There is the perception that EC declarations have been too frequent in recent years.

73. These disaster management frameworks in Australia and New Zealand are the main agricultural policies that directly support farmers and apply only to natural disasters. This is not the case in the other countries of the thematic review. In 2006, Canada implemented AgriRecovery, a disaster assistance framework to respond to natural or disease events. This is a much looser framework that includes only a small set of provisions: 60%/40% federal/provincial cost sharing, the formation of a province/federal multi-agency team after an event, and the capacity to quickly mobilise budgetary resources up to certain limits. However, these measures are only the residual after other programmes such AgriStability, AgriInsurance or *ad hoc* market assistance are triggered, normally with longer delays.

74. In the European Union policies to deal with catastrophic risks are designed and implemented at national level. In Spain, the main *ex ante* provision is the subsidized insurance system; for risks that cannot be insured, other support measures such as compensations, interest subsidies and tax measures are decided on an *ad hoc* basis with very few specific constraints. In the Netherlands, the approach to disaster assistance has traditionally been *ad hoc*, but in recent years after a disaster, the government has decided to

support the development of an insurance solution to facilitate the announcement of the end of future disaster support for that risk (e.g. Potapol and Avipol). The recent use of EU funds to introduce multi-peril insurance is announced also as a way of reducing *ad hoc* assistance in the Netherlands.

75. The experience in different countries shows there is a need to develop an *ex ante* framework for disaster assistance. First, this provides signals to farmers on what the government considers catastrophic and what support could be expected after a disaster, allowing a farmer to take any further risk management decisions required; second, it helps to discipline *ex post ad hoc* assistance that typically is decided on the basis of poor information and under political pressure from society and the media. The framework will play its role efficiently if it is flexible enough to adjust to different situations and credible enough to deter rent seeking behaviour. In New Zealand, the equilibrium that has emerged is a good example, but it may not be applicable in the context of countries with more levels of government and federal structures. Canada's AgriRecovery has the advantage of rapid implementation in a country with complex decision making that involves several levels of government, but which is only a minor element within an overcrowded set of policies.

Information asymmetries and cost sharing

76. One of the main difficulties of *ex post* disaster assistance is access to good information in time. Most often access to information is asymmetric: locals have better information than central government. To discipline assistance, a set of information incentives and a good assessment process can help. The Australian Exceptional Circumstances (EC) has proved that information asymmetries between government levels require appropriate cost sharing incentives, while crop insurance systems in several countries have been developed as disaster assistance devices that collect information.

77. During the process of EC declaration in Australia, the state and territory governments are responsible for compiling and submitting EC applications to the national government based on concerns raised by the local community or industry body. The EC declaration process is initiated by local governments, but the cost of the programmes is almost entirely financed by the Australian government. The state/territory government has strong incentives to apply for an EC declaration because it will get most of the credit from the citizens and bear little of the costs. The Australian government bears the burden of the budgetary costs of a potential EC declaration, but has few means to compare information and apply strict criteria to the EC declaration. This asymmetric information situation potentially creates moral hazard behaviour in state/territory governments, which could have contributed to the frequency of EC declarations. Despite the stated criteria of an EC declaration, the percentage of land EC declared has been close 50% of total land since 2003. A number of Australia's agricultural producing regions have been EC declared for at least eight years. A cost sharing agreement between different levels of governments, similar to that for pest and diseases risks, could help prevent moral hazard behaviour by local governments. Financial contributions by local governments creates an incentive to reveal the true damage. Other factors contribute to the high frequency of EC declarations, such as the evidence that climate change is having an impact in terms of higher temperatures and lower rainfall in Australia; historical data, however, does not allow to accurately discern between extreme and normal drought events.

Crop insurance as a disaster assistance device

78. The main rationale for subsidies to crop insurance is their role as a device to make disaster assistance more efficient. The country studies on Canada and Spain have shown that insurance has several advantages as compared to government payments for disaster assistance. First, farmers participate financially and share part of the responsibility for managing risk; second, the system is transparent and allows damages to be evaluated by experts, and indemnities paid relatively rapidly; and third, the government can be rid of the risk in its budget and of the administrative burden, which are transferred to

private insurers. This third advantage is not present in the Canadian system because it is fully run by provincial government units rather than by private insurers.

79. The efficiency of insurance as a disaster assistance device depends on its performance in three areas. First, its ability to limit the scope of disaster assistance that it provides: if non-catastrophic risks are covered and supported by the system, they will crowd-out farmers' own pro-active risk management efforts. Second, its capacity to deter *ex post ad hoc* assistance. And third, the efficient administration of the system. Both the Canadian and the Spanish thematic reviews found scope to improve the system in all three areas. The two insurance systems cover risks below catastrophic. Both countries have significant additional measures to deal with "disasters" that are not covered by the insurance system. There seems to be scope for efficiency gains in Canada where specialized insurance companies could manage the insurance system rather than government officials, and in Spain where competition amongst insurance companies could be enhanced. These gains will depend on how well private insurance markets function.

80. The Canadian and Spanish agricultural insurance systems currently benefit from the information databases and experience gained over several decades. Recently established subsidized insurance systems, as in the Netherlands, are unlikely to benefit from improved information during the first years of implementation. Countries must acknowledge the fixed costs of making an insurance system work and the need to make the system evolve as it matures.

Externalities in plant and animal diseases

81. Pest and disease risks have a specificity that an outbreak on one farm can spread to other farms, sectors, up- and down- stream industries and even countries. They can also lead to long-lasting crises of consumer confidence and export losses. The actions of farmers to prevent and notify pests and diseases are often unobservable and have positive externalities on other farms, sectors and countries. Therefore, government assistance for these risks must ensure that farmers share the responsibility and have appropriate incentives for preventive action and notification. In this context, cost sharing between stakeholders, *ex post* partial compensation of outbreak mitigation measures, and industry co-responsibility are elements of a practical industry-wide arrangement to prevent moral hazard.

82. This is why pest and disease frameworks and cost sharing arrangements between stakeholders are often in place in OECD countries. The probability and damage of contagious animal and plant disease outbreaks depend on the stakeholders' risk management measures: if a farmer does not adopt appropriate measures the probability of a disease outbreak increases. If the government does not implement quarantine measures quickly enough after the detection of a disease, the probability of damage to other farms increases considerably. Moreover, the costs of inappropriate risk management measures adopted in one livestock industry are not limited to that specific industry, but may have wider consequences for the economy and society. Individual farmers do not internalize the cost of insufficient prevention measures or late notification to other farms and sectors. Due to these externalities, the system of bio-security risk management has to be carefully designed so that it creates prevention incentives, co-operative behaviour and mutual monitoring.

83. In Australia, the cost-sharing mechanisms between stakeholders have become a device to mitigate moral hazard in animal and plant disease control. Under the bio-security partnership arrangement scheme, the participating stakeholders, including both national and state/territory governments, share the cost of the emergency response programme based on the specified formula that tries to equate the benefit received and the cost incurred. For example, the scheme stipulates four categories of animal diseases and the shares of the cost borne by the government and applicable industries. The diseases that seriously affect human health or the environment, but which may only have minimal direct consequences to the livestock industry, are defined as Category 1 diseases and any related quarantine measure required is fully funded by

governments. Diseases that are not expected to significantly affect the national economy and for which the main effect is limited to the livestock industry are categorized as Category 4 diseases for which the industry pays 80% of the cost of compensation for the quarantine measures.

84. In the Netherlands, animal diseases are classified into three groups according to their harmfulness: highly contagious diseases (former OIE List A), diseases transmittable to humans, and other. Diseases in the first two groups are subject to obligatory notification as they are considered to represent high risks. Diseases not included in the list are in principle outside the responsibility of the government and must be controlled by producers. The government is responsible for building and maintaining appropriate veterinary systems for the prevention, control, and monitoring of diseases subject to obligatory notification. Furthermore, the Netherlands is part of the European Union where the functions of such national systems are largely set at the EU level. The direct control costs of livestock epidemics are shared between the European Union, the national government, and producers. Producer contributions to the direct control costs of livestock epidemics go through a Livestock Veterinary Fund, which is raised through levies per slaughtered/exported animal, or per units of milk sold in the milk sector. The Fund effectively sets the maximum amount of producer contributions to cover the direct control costs in the case of a disease outbreak. Any spending beyond this limit is equally shared by the Dutch government and the EU Veterinary Fund.

85. Both Australia and the Netherlands provide positive examples of a public-private partnership that shares the financial responsibility to deal with livestock epidemic risks, and that attempts to promote responsible prevention and notification behaviour through individual incentives, cost sharing agreements and institutional settings that promote industry cooperation in this area. Unfortunately, the analysis of the provisions and incentives in these agreements as a whole is beyond the scope of this study on risk management.

Policy implications

- Market risks are excluded from disaster assistance policy in Australia and New Zealand. In other countries, the boundary of catastrophic risk requiring policy assistance is blurred, making governments more vulnerable to political and economic pressures. Regarding climatic risk assistance, the boundaries of catastrophic risk are either not well defined or not working properly, or both.
- OECD governments will always be called on to provide disaster assistance in particular cases. It is efficient to draw *ex ante* rules to define at least the circumstances, the type of measures, and the process that would trigger this support. The *ex ante* framework should serve to discipline the *ex post* assistance, but should not be so detailed as to compromise flexibility and credibility. Each country should adapt its disaster assistance framework to its institutional reality and implement appropriate processes that are transparent, predictable and accepted by all stakeholders.
- Subsidised insurance can have advantages as a disaster assistance device as compared to *ad hoc* measures, particularly the expert evaluation of damages and the financial participation of farmers. To date, experience has failed to limit insurance subsidies to catastrophic risks or to deter other *ad hoc* assistance. Subsidized insurance as a disaster device should fall within the *ex ante* disaster assistance framework that defines the limits of disasters that will trigger support, ensure consistency, and discipline additional *ad hoc* measures.
- The management of pest and animal diseases risks is more complex than other catastrophic risks because unobservable actions by farmers have strong externalities. All OECD countries have developed frameworks to deal with these risks, including incentives, cost sharing agreements and

institutional arrangements to promote industry co-operation in this area. The main policy challenge in this area is to ensure appropriate incentives for farmers and other stakeholders to take socially efficient action to prevent outbreaks.

6. “Income” support, income stabilization and governance of risk management in agriculture

86. Governments support to risk management policies should focus on catastrophic risks that are beyond the farmers’ capacity to cope. However, many OECD governments provide income support for farmers and some of them provide this support through payments made to farmers that experience a year of low income. There are different ways to define the triggering mechanism of these payments. Some countries like Canada have made significant efforts to target the payment to a good measurement of individual income with programs like AgriStability; this type of payments is generically referred to as income stabilization payments. Other countries, such as the United States, have designed payments that are countercyclical with an aggregate indicator that is narrowly related to farm income such as market prices (Marketing Assistance Loan and deficiency payments) or revenue (ACRE). Finally, there are countries that provide fixed payment to farmers, like the European Union’s Single Payment Scheme, or fixed incentives to save money in a saving account such as Canada’s AgriInvest; this money can be used by farmers in “bad” years. All those programs are focused on supporting farmers’ income to manage normal risk and therefore are likely to be inefficient risk management tools. Policy experience illustrates the difficulty of targeting these payments to low income due to information asymmetries.

Agricultural support and income targeting

87. Although income risk is sometimes defined as the variability of income, farmers usually care about low income risk, which may threaten the sustainability of their farm or even their livelihood. Some countries, therefore, design policies to help farmers manage reductions in income and provide countercyclical support related to income, price or yield. Moreover, this type of countercyclical or income stabilization payments is often driven by income support rather than risk management objectives: it may be more politically acceptable than continuously providing fixed decoupled support to farmers.

88. Income stabilization payments that are triggered when an individual farmer experiences low income (e.g. AgriStability in Canada, and, under condition of a government declaration of exceptional/adverse circumstance/event, EC Relief Payment in Australia and Rural Assistance Payment in New Zealand in Annex Table 1) are more targeted to low income risk than fixed decoupled support or payments linked to any aggregate indicator or index such as revenue, price or yield at the regional or national level (e.g. ACRE and counter cyclical payment in the United States, and direct payments for core farmers in Japan). However, the payments based on individual low income needs to overcome very strong information asymmetries between the government and the farmer on timely and accurate farm income information. Information is a flow, not a stock. It is valuable when it is accurate and gets to government at the time the decision of triggering assistance is made. Unfortunately, this is rarely the case for individual income. The income stabilization payments based on aggregate indicators suffer much less from such information asymmetries. Trade-offs between targeting and avoiding or managing major information asymmetries is at the core of the design of any risk management policy. A well targeted risk management policy needs to create the opportunity and incentive for participants to reveal the appropriate information. Is it possible to design a policy that generates an appropriate flow of information? There are at least three challenges to overcome.

89. The first challenge faced by the government is the information collection for income objectives. Income stabilization payments based on aggregate indicators usually require information only from the agricultural statistics (e.g. state level yield and market price). However, if the policy is targeted to the low income risk of individual farmers, the government needs to capture the income information on the

individual farm basis. In OECD countries, the most efficient source of information on individual income is usually collected each year through the income tax system. It is less costly to use the existing tax information in terms of the administrative burden of both farmers and governments. The payment could also make use of the social security provisions and databases. For example, Australia's EC Relief Payment or New Zealand's Rural Assistance Payments link farm income support to the general social welfare system with specific provisions for farmers (e.g. special condition of asset test) makes use of existing social security information and has the advantage of ensuring equity between farm and non-farm sectors.

90. Tax information, however, may not capture accurately the individual income situation. For example, farmers in OECD countries are often allowed to declare taxable income on the basis of cash accounting which provides flexibility to farmers to manage their tax obligations (e.g. Canada). This tax arrangement is good for farmers but makes it more difficult to capture income fluctuations. Canada is the country with the most sophisticated combination of databases as it completes its tax file with supplementary information provided by producers, and it collects additional information through the Farm Financial Survey (FFS) of a representative sample of all farms. Tax information is collected with clear rules that create incentives to declare income information in ways that reduced the amount of the tax. The cash accountancy system gives room to farmers to try to smooth their income and pay less tax, given that income tax has a progressive rate. The information collected through the tax files has this inevitable "bias" in the measurement of income to reduce tax obligations.

91. The second difficulty is the timing of the payment. If the payment is delayed significantly after the incidence of low farm income, the effectiveness of countercyclical payments in managing low income risk is reduced or even lost completely. The late compensation can still be useful to manage normal risks, but can never be appropriate for catastrophic events that typically require quick action to avoid short term shocks and liquidity constraints. Annex Table A shows that *ad hoc ex post* payments are usually paid immediately after catastrophic events. Crop insurance also has the advantage in delivering indemnities immediately after the yield loss assessment. However, the timing of the payments based on individual income depends on the schedule of tax filing and additional data collection. For example, in Canada, AgriStability payments are typically made with a significant delay of up to two years after the event. Furthermore, the payment may ultimately come during a period of high income for the farmer, making its capacity to reduce income variability questionable. However, payments based on the index do not require individual income information and, therefore, are delivered typically within the year of the event.

92. Finally, governments face moral hazard due to wrong business incentives. A government programme dealing with some risks typically crowds-out risk management strategies for these risks and provides an incentive for the farmer to take on more risks. This is a typical moral hazard problem that can only be resolved by ensuring that farmers continue to have enough incentives to manage these risks, such as through participation costs that are dependent on behaviour. This is technically difficult for any kinds of insurance, and almost impossible for a programme like Canada's AgriStability in which the farmer pays a fee that is only a small fraction of the actuarially fair premium (Schaufele *et al.* 2010). Moreover, the underlying risk and the income reduction at farm level cannot be observed because farming risk changes even before the first payment is made. In general, a stable support programme affects this environment only marginally and does not create moral hazard. But a countercyclical payment that changes observed variability of income will be in general larger than if the programme was not in place.

93. These effects reduce the degree of targeting in practice because they imply inaccurate and delayed measurement of the theoretically well-defined target. Table 2 provides ranking of different risk management and income support measures according to different income targeting criteria. *Ad hoc* payments are rapid, but suffer from a lack of definition of the target and from very strong asymmetric information. Fixed payments are not targeted to reduced income but can be relatively quick, they have few information problems, and they can likely be used as collateral for borrowing. The crop insurance

programme has a target definition in term of yields which only imperfectly represents income, but can be paid relatively quickly and some of the adverse selection and moral hazard problems can be partially overcome through the policies and premiums.

Table 2. Ranking of income related payments in terms of their targeting to reduced income

	Target definition	Rapidity	Asymmetric information	Total target ranking
<i>Ad hoc ex post</i> payments	?	1	5?	?
Crop insurance programme	2	3	3	?
Income Stabilization payment based on individual income	1	5	4	?
Countercyclical payments based on aggregate indicators or indexes	2	4	2	?
Fixed payment	4	2	1	?

94. Income stabilization payments that are based on individual income have the best definition of the target and rank first in column 2 of Table 2. Canada's long experience with this type of programme - AgriStability is one example - has proved that it is possible to create sophisticated databases linked to income tax files in order to make payments more targeted to income reductions on an accrual basis. However, farmers are not necessarily paid in a timely manner and are usually subject to significant information asymmetries. An alternative policy design to mitigate these delivery issues is the income stabilization payment in the form of a tax credit which uses only tax file information to calculate an approximate income and renounces additional adjustment of farm income data. This could be applied more consistently if the option of declaring income on a cash basis was eliminated, and would improve the ranking of these programmes in terms of its information asymmetries (column 4 of Table 2). The main advantage would be an improvement in the timing, a reduction of the adverse selection problems, and an increase in the transparency and predictability of the payment formula, while reducing additional information needs.

95. The definition of the target of countercyclical payments based on an index or aggregate indicator is much weaker and does not represent what really happens with individual farm income. But the payment can be made more quickly and with reduced information requirements as compared to a programme based on income. The effectiveness of this type of programme depends on the correlation between the parameter(s) used as indices and the income on the farm. The higher this correlation, the better targeted this programme will be. For example, if yield risk is highly idiosyncratic to each farm, the payments based on regional level yield can be ineffective in covering the low income risk of many farmers.

96. Targeting to low income is not a linear path by which with more effort and resources governments can achieve better targeting. Attempts to perfectly target income lead to increased payment delays and information asymmetries. In this sense, sometimes "more" targeting may not imply "better" targeting due to information constraints. An appropriate level of targeting is found in a balance between the precision of the definition of the income target and the imprecision of measurement and lags. For catastrophic risks, speed should be the priority. For normal risks, rapidity is not a priority and borrowing from financial markets is likely to be an efficient available tool.

Governance

97. Five country reviews indicate that agricultural risk management systems are very diverse across OECD countries. The governance of agricultural risk management in each country reflects the specificity

of risks and the institutions in place. For example, agricultural risk in Australia is largely dominated by drought risk, which makes risk management policy more oriented to a single source of risk. Farmers in Australia and New Zealand do not expect market risks (e.g. low commodity price) to be covered by government policies. This is largely to do with a societal agreement that has evolved over time, with an implicit or explicit complex set of rules. In Spain, the risk management policy is largely focused on expanding the risk coverage of the insurance system in accordance with the insurance law that was approved back to back with the Spanish constitution in 1978. In Canada, there is a long history of focusing agricultural policies on exhaustive risk management policy tools and agricultural insurance is seen as “constitutionally” part of the competences of the provinces. In the Netherlands, the recent development of subsidised insurance programmes occurs in the context of the CAP reform framework. Annexes B to F give an overview of the main governance and policy in the five countries of the thematic reviews and the implications derived from the the holistic approach (Figure 1) to each of them.

98. Policy design of risk management in agriculture is constrained in different ways by history and institutions, and the natural conditions of each country. There is no optimal set of risk management policies that is universally applicable. The reforms of agricultural risk management policy should build on existing frames and data sources and avoid frequent changes that do not exploit the already existing systems. This does not necessarily mean that the existing institutions should remain unchanged, but that policy reform should harness the evolution of the institutions towards more efficient policy and institutional mixes. Changes, however, require well designed and stable governance structures. This brings the discussion and design of risk management policies into the broader discussion of farm support, in particular, into the search for socially acceptable ways of providing support to farmers.

Policy implications

- The first step in the development of any income policy is to precisely define the income target. Targeting policies to this objective is not a linear path, however, which simply requires more effort and resources by governments. In general, attempts to perfectly target income lead to increased payment delays and information asymmetries. If payments are based on the individual income situation, it is better to use the tax file information to calculate income, even if this information is approximate. When tax declarations are made on a cash basis, the recalculation on an accrual basis may improve the target, but at a cost in terms of delays and access to additional information. The main advantages of using tax files information only are improved timing in issuing the payments, avoidance of the adverse selection problems, and greater transparency and predictability of the payment formula.
- Income stabilization payments based on aggregate indicators or indexes are less targeted to individual income risk. However, they have less information constraints and can deliver the payment relatively quickly. The degree of effectiveness in reducing individual income risk depends on the correlation between the index and the risks faced by individual farmer. Fixed payments are predictable and have the least information constraints and moral hazard problems, but they are also the least targeted to low income risk.
- The governance of agricultural risk management in each country reflects the specificity of risks and the institutions in place. The policy instruments in one country may not be as effective in another country. Policy reform should harness the evolution of the institutions towards more efficient feasible outcomes.

There are several emerging topics in risk management in agriculture. The specificities of developing and emerging economies are likely to be different from those of OECD countries, in particular because of the higher priority given to food security and poverty alleviation. Climate change has raised new concerns on

managing the related changes in uncertainties and the need to adapt risk management tools. Finally, the economics of animal disease risks deserves more in-depth analysis in view of the complexities associated with the externalities of actions taken by farmers. These three topics pose significant governance and policy challenges that could be analysed in future work.

Annex A. Examples of income related programmes

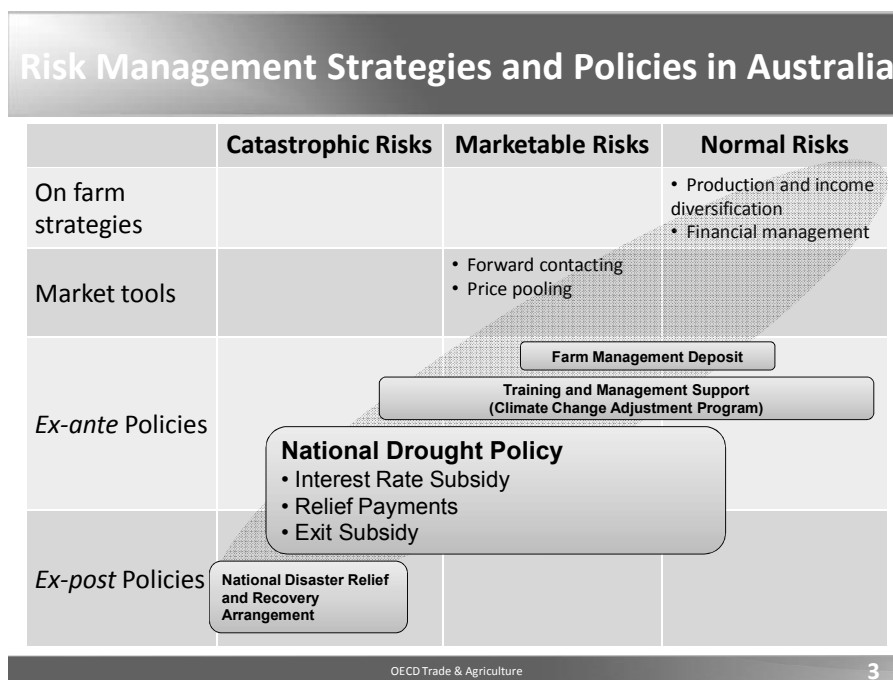
	Triggering parameter	Support	Source of risk	Approximate timing of payment after the event	Information source	Relationship with other programmes
Ad hoc ex post payments						
AgriRecovery (Canada)	None (Unusual disaster circumstance)	Ad hoc to resume business	Natural hazard	Immediately	Loss assessment by the government officials	Takes into consideration eligibility for payments under other programmes
Ah hoc compensation payment by ENESA (Spain)	More than 30% loss of production , which is not covered by the insurance system	Equivalent to the indemnity paid for the adjusted loss with a 20% deductible	Risks not covered by the insurance system	Up to one year	Loss assessment by the government officials	Not eligible if producer does not contract insurance policy
Ah hoc assistance (Canada, Spain, The Netherlands)	None	Ad hoc (payments, tax or credit concessions)	Any	Immediately	Loss assessment by the government officials	None
Crop Insurance Program (Canada, Spain, US, Japan and etc..)	Yields decline more than deductible (e.g.,20%)	Value of yield loss exceeding deductible	Natural hazard	Immediately	Loss assessment by the insurance provider	May link to disaster assistance or income payments
Income Stabilization payment based on individual income						
AgriStability (Canada)	More than 15% of individual margin loss	Up to 66.5 % of individual margin loss	Any	Up to two years. Advance payments are available	Tax files, supplementary inventory data from producers, and other sources	AgriRecovery and indemnity from crop insurance are considered allowable income
EC Relief Payments (Australia) / Rural Assistance Payments (New Zealand)	Government declaration of EC or AE + Household income falls below extremely low income	Equivalent to social security welfare payment	Natural hazard	After income and asset test	Social security database	None
Income Stabilization payment based on index						
The Average Crop Revenue Election (ACRE) Program (US)	State average and farm-level revenues by crop fall below their guarantee or benchmark	Difference between guarantee and actual state revenue per unit of land times current area of production adjusted by farm productivity index	Market price and natural hazard	Up to one year	National agricultural statistics and farm records	Cannot enroll with counter-cyclical payment program, direct payments reduced by 20%, marketing loan rate reduced by 30%.
Counter-Cyclical Payments (US)	The effective price falls below the targeted price at the national level	Difference between effective and target price times historical area and yield	Market price	Up to one year	National agricultural statistics	Cannot enroll with ACRE payment
Direct payment for core farmers (Income based component) (Japan)	Prefecture average revenue fell below prefecture benchmark revenue by crop	90% of prefecture revenue loss per unit of area times area of production	Market price and prefecture average yields	Up to one year	National agricultural statistics and auction price	Indemnity from crop insurance is deducted from the margin
Fixed Payment						
Single Farm Payment (EU)	None	Fixed payments per historical area	Any	Paid every year	Not required	None
AgriInvest (Canada)	None	1.5% of annual net sales	Any	Paid every year	Tax file	None

Annex B.

Executive summary of the study on Australia [TAD/CA/APM/WP(2010)15/FINAL]

99. Farmers in Australia benefit from the large area of agricultural land per head of population and exports most of the production in international markets. Climate characteristics vary across the country; the Mediterranean climate of south-eastern and south-western Australia and the temperate climate of eastern Australia. The major source of risk as perceived by Australian farmers is yield risk, which a consequence of the variability of seasonal weather conditions. Rain varies greatly from one year to the next, and thus the supply of water for irrigation from rain that runs off the land into catchments and underground is limited and highly variable.

100. The main risk management policy in Australia is its drought policy. The current drought policy framework is triggered by a government declaration of Exceptional Circumstance (EC) in a specific area; farmers become eligible for *ex post* payments such as interest rate subsidy and income safety-net support. The recent drought policy reforms placed more emphasis on *ex ante* policies to help farmers prepare for future drought risks by introducing such measures as training and management support. However, the degree of government involvement in developing crop insurance markets is much less than in other countries. Currently, no insurance product is available to cover drought risk.



101. The major challenge for risk policies in Australia is to refocus from mitigating financial impacts of short-term adverse climatic events to facilitating farmers' adaptation to changing climate conditions. Climate projections predict that severe drought will become more frequent, making it more important to establish an efficient risk governance system able to discriminate between farms and activities that are or are not sustainable under these new conditions. Current drought policy framework, in particular the interest rate concession programme, impedes farmers from adjusting to the changing climate conditions and creates

incentives to depend more on debt. Government policies need to enhance the farmer's capacity to proactively manage risks derived from all sources, including changing climate conditions.

102. The governance of drought policy should be improved to facilitate the reform process towards more successful catastrophic risk management. The process of declaring EC is initiated by local governments or farmer's organisations which supply the necessary information. However, it is the Australian government which finances almost the entire cost of drought programmes. The lack of a cost sharing mechanism creates an incentive for local governments to issue EC declarations for ever wider regions. As a result, the EC declaration threshold of one in 20-25 years event based on historical records is not respected. The governance of drought risk could also be improved by increasing the role of *ex ante* policy measures. While providing more information on future climate conditions or training opportunities could help farmers prepare for future droughts, the federal government could explore the possibility of developing insurance markets for drought risk: creating the database or implementing a feasibility study. Linking insurance tools with *ex post* payments can help the government to limit its responsibility to the extent that the government covers catastrophic yield loss and disciplines the *ex post* payment. Given high and systemic yield risks observed in Australia, index-based insurance is more feasible than traditional crop yield insurance, which requires individual loss assessment.

Annex C.**Executive summary of the study on Canada
[TAD/CA/APM/WP(2010)29/FINAL]**

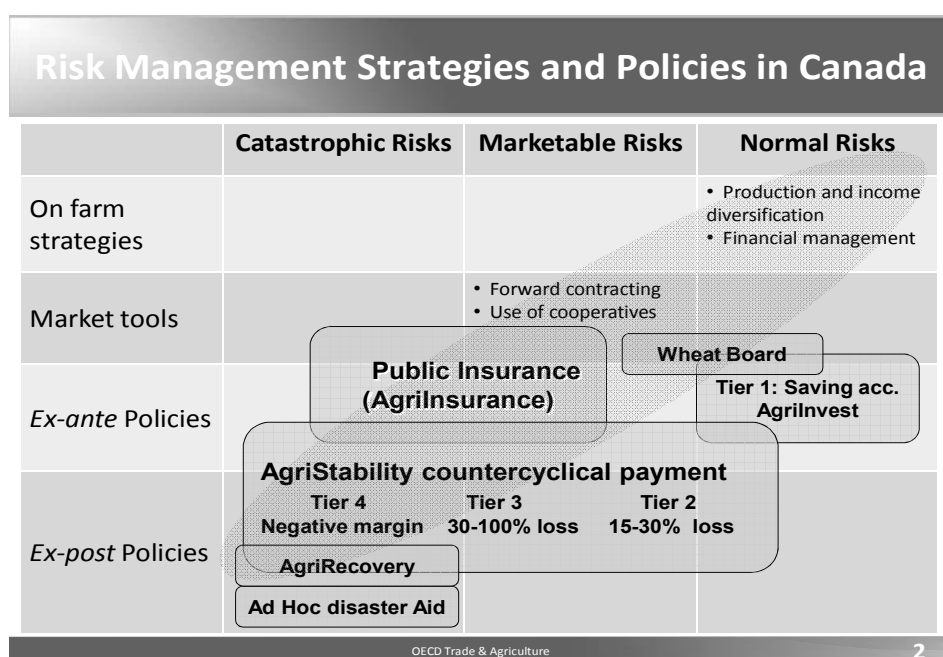
103. Canada is a large country, stretching from the Pacific to the Atlantic Ocean. There are two main agricultural zones: the western prairies where large-size farms produce field crops and livestock products for export markets and the east where relatively small-size farms produce a variety of products (e.g. vegetable, dairy and poultry) mainly for domestic markets. These two agricultural zones have contrasting production environments; while irrigation is rare in the west and farming depends largely on the level of moisture and length of the growing season, farming in the east is much less weather constrained (e.g. moisture) and has a longer growing season.

104. The major risk perceived by Canadian farmers is market risk. In particular, as a significant net exporter, as it pertains to prices, exchange rates and trade policy risks. Weather risks tends to be less significant than price risks, but one can cause the other, like weather events affecting production quality rather than quantity, although catastrophic weather events occasionally occur (such as droughts). Other risks – such as interest rates, policy risks, animal health and bio-security or input costs – are less frequent but also impact farm returns, particularly in the way of price risk.

105. Business risk management (BRM) has been central to policy objectives in Canada for several decades and forms the main motivation underlying support. The extensive coverage of risk by BRM policies seeks to smooth the income from farming, but reduces the space of normal risks that farmers manage on the farm. None of the BRM measures attempt to enhance the development of market instruments to manage risk. Most of them are often triggered and can be considered as dealing with normal risk. AgriStability payments are triggered by reductions in margins or income below 85% of historical income. Deductibles in AgriInsurance policies are most often 30%, but there are policies with only 10% deductible, which means triggering indemnities when yields are reduced below 90% of historical averages,. Such frequency can only be considered as “normal” risk, and the corresponding programmes AgriInvest, AgriStability and AgriInsurance cover at least part of normal risks. Insurance is a provincial government service with few similarities to private insurance instruments: there are no private companies involved, but government offices and agencies make premium calculations and provide subsidies. Futures are used only by some farmers, particularly ICE for Canola, and the CWB offers different price risk pooling arrangements to western grain producers. AgriRecovery is supposed to be the main catastrophic risk management instrument in Canada. By design, it is likely to be triggered infrequently, but it lacks a clear definition of the disasters that would entitle farmers to receive some aid.

106. The major policy challenge in Canada is maintaining farmers’ incentives to pro-actively develop risk management strategies and to improve the targeting of policies to income risk. The coverage of the set of BRM programmes is so comprehensive that it crowds out farmers’ proactive risk management strategies. AgriStability and AgriInvest cover normal risks. AgriInsurance is designed to equip the farmers to manage middle range to catastrophic risk layers, but AgriStability is also covering the same layers of risks. In addition, AgriRecovery and AgriStability both cover a catastrophic risk layer. The system is overcrowded and unable to signal risk layers for which farmers should take on as their own responsibility to manage. AgriStability, the main component of the BRM programmes, is designed to provide income support to farmers experiencing low income in a precise way, but the design and delay of the payment reduces the counter-cyclical benefit of the programme.

107. There is a room for the government to improve the definition of boundaries between programmes and layers of risk. For example, AgriStability should refocus on the medium range of risks (non-catastrophic and non-normal risk). Tier 2 coverage of small “normal” risks was seen to be ineffective at reducing risk while at the same time causing the most interference with private risk management strategies. In addition, AgriStability seems unable to provide a viable response to catastrophic events due to the delay between the income loss and the payment. Tier 4 is therefore not an effective response to large income declines. The main focus of AgriStability could be Tier 3 coverage, which could be reshaped to avoid overlapping with policies dealing with normal and catastrophic risk. Moreover, the system could also be improved by allowing farmers to choose between two alternative programmes, AgriStability and AgriInsurance, depending on the risk environment they are exposed to. Producers will reveal their risk preferences enabling better targeting of programme benefits and give valuable feedback for programme design. The participation fee in AgriStability could be increased appropriately to compete with crop insurance and converted to a premium adapted to the risk of each farm to reduce moral hazard.



108. The delivery mechanism of AgriStability can be improved and its targeting reconsidered. AgriStability is targeted to the reduction of individual producer margins, which requires that individual margin losses be estimated with sophisticated adjustments to income tax data using additional information collected from farmers. True targeting of income risk is difficult by the very nature of the problem: more accurate information leads to more complexity and more delay, which leads to producer uncertainty about the benefits of the programme. This complexity reduces the transparency and effectiveness of the programme by causing delays, makes the payment unpredictable and creates several incentives to adjust the information provided by the farmer. These problems cannot be resolved by simply improving the data collection device. The trade-off between timeliness and precision must be considered carefully. Linking the tax declaration directly to the AgriStability payment can potentially improve the predictability of the payment. The Canadian experience shows that this is difficult in practice and subject to trade-offs that cannot be ignored in policy design. Where significant information asymmetries exist, the comparison between AgriStability and AgriInvest provides a good example of the trade-offs between a well targeted sophisticated programme and a non-targeted simple programme.

109. AgriInsurance provides an instrument that responds to some catastrophic natural events. However the insurance system is managed by provincial public agencies or ministerial departments and suffers from

the exclusion of private professional insurers, and the complete lack of competition or incentive for provinces to deliver support effectively. Government involvement in the management and financing of insurance corporations also limits risk pooling across provinces and the capacity to evaluate long term sustainability. Canada should explore possibilities of involving private specialized businesses in crop insurance, including private/public partnerships and information sharing arrangements.

Annex D.

Executive summary of the study on the Netherlands
[TAD/CA/APM/WP(2010)30/FINAL]

110. The Netherlands has a mild, maritime climate, and its landscape is dominated by flat and low lands. The country's natural conditions favour diverse agricultural activities. There is a prevalence of highly specialised and capital-intensive production systems based on advanced technologies. The majority of agricultural units function as part of an integrated vertical system that enhances value across the food chain. Dutch agro-food chains extend far beyond the country borders and rely strongly on external markets as sources of inputs and outlets for its finished products.

111. Epidemic disease risks, price and personal risks score the highest in perception of Dutch farmers, with the most recent studies also identifying policy risks as a top concern. The micro-level data on crop farms confirm that prices generally represent a more important source of risk for Dutch growers compared to yield risks. However, the level of price volatility across specific crops differs markedly, with price policies likely being an important factor explaining these differences. Crops with high price volatility are also those that demonstrate strong negative correlations between yields and prices. This suggests that high price volatility to a certain extent arises from active adjustments between prices and yield (output), a mechanism that naturally stabilises crop revenue. This mechanism may be weaker for commodities whose prices are strongly linked to export markets; however, this conclusion should be taken with caution as this is largely an empirical question.

112. The Dutch agro-food sector has developed considerable capacity to manage various farming risks through the adoption of advanced technologies, effective co-ordination mechanisms across the value chain, and building industry institutions (product boards) that develop common rules, promote best practices and provide services to support farmers in their individual risk management strategies. Dutch product boards also assume important functions in the design and operation of public-private partnerships for risk management, that have also proved to be instrumental in emergency responses to catastrophes.

Risk Management Strategies and Policies in the Netherlands

	Catastrophic Risks	Marketable Risks	Normal Risks
On-farm strategies			<ul style="list-style-type: none"> • Financial management • Strict hygienic rules • Quality assurance
Market tools		<ul style="list-style-type: none"> • Forward contacting • Cooperatives • Private insurance 	
Policies <i>Ex-ante</i>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Subsidised insurance climatic disasters</div>		<div style="border: 1px solid black; padding: 5px; text-align: center;">CAP: Single Farm Payment Price Support</div>
Policies <i>Ex-post</i>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Livestock Veterinary Fund</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Ad Hoc Disaster Assistance</div>		

113. The main risk-related policies in the Netherlands are implemented as part of the EU policy framework. Protection from price and income risks is provided within the guarantees established by the CAP. Common EU regulations also determine the responsibility of the Dutch government with respect to plant and animal health. The focus of specifically national policies has been placed on catastrophic risks. The Dutch government has made consistent efforts to move away from *ad hoc* responses to catastrophes towards promoting public-private partnerships and supporting the development of *ex ante* arrangements to deal with catastrophic risks. Thus, several types of disease and climatic insurance schemes, including the most recent multi-peril crop insurance, co-subsidised by the European Union, and a Livestock Veterinary Fund for livestock epidemics were the principal steps to base disaster assistance on a formal contract. The key challenge for the Dutch government is to build on the experience gained to date and to develop coherent policy sets to deal with catastrophic risks.

114. One step towards this objective would be to develop an *ex ante* policy framework for disaster assistance related to natural catastrophes. It should introduce explicit conditions for triggering the disaster assistance, as well as *ex ante* procedures for the provision of public support. Interactions with other broader frameworks of public assistance related to natural catastrophes should also be considered to avoid duplication of measures. In parallel, access of self-employed farmers to social safety nets could be improved by adjusting the asset test criteria for farmers to take into account higher farm assets.

115. The efforts above should be complemented by a development of a medium to long term policy strategy on insurance, specifying in particular the role of government in supporting insurance. As an initial input, a comprehensive review of the insurance schemes recently introduced could be undertaken to explore why some schemes have been successful without or with little government involvement, why some have limited participation and require government support, and why others have failed. The new multi-peril crop insurance needs to be monitored and evaluated in terms of administrative costs, financial robustness, timing and amount of the subsidy, and the actuarial soundness of premium rates. A transformation of this insurance into a broader public-private partnership could be considered, including the creation of a shared database, a reinsurance fund, and possible phasing-out or reduction of premium subsidies. Insurers, producer and industry organisations should be involved in the process of assessment and formulation of a longer-term strategy through consultations.

116. The range of crop diseases is broad and farmer exposure to such risks varies significantly depending on their specialisation, production systems and location. The heterogeneity of the crop disease risk environment reduces the potential for market instruments to manage these risks due to potential difficulty to have sufficient risk pools. However, a comprehensive assessment of profiles of different crop sectors and farm groups with respect to plant disease risk is worth undertaking as a necessary starting point to evaluate the feasibility of market risk instruments. It is also important to continue promoting producer own risk management strategies. Incentives for the adoption of technologies that reduce plant disease risks could be strengthened, and information, communication, extension and advice on crop diseases extended. Finally, industry and producer organisations should be encouraged to promote best practices for plant protection.

117. The Livestock Veterinary Fund is a positive example of a public-private partnership that enables to share financial responsibility amongst stakeholders with regard to livestock epidemics. However, there are areas where the effectiveness of this instrument could be improved. Additional incentives to strengthen risk prevention, rapid disclosure, compliance with control requirements, and rapid disclosure of infections could be built into the scheme. There may also be a need for an assessment of a broader scope of epidemic risks to determine the size and use of the fund, as well as introducing principles on topping up of the fund in the case of an emergency deficit, and how and whether the fund can be used in the outbreak of a totally new disease.

118. Finally, the review highlights the need to continue increasing risk awareness amongst all participants in the agro-food system. An appropriate level of risk awareness is a prerequisite for stakeholders to understand their responsibilities in risk management and actively engage in the development of individual and collective risk management strategies.

Annex E.**Executive summary of the study on New Zealand****[TAD/CA/APM/WP(2010)16/FINAL]**

119. New Zealand's climate is temperate with relatively mild temperatures, moderate rainfall and abundant sunshine. Compared to neighbouring Australia, where climatic risks are dominated by droughts that affect large territories, New Zealand is exposed to more diverse and localised climate risks that are less systemic. The dominant agricultural activity is pastoral farming based on year-round outside grazing. New Zealand's geography is characterised by a combination of small size and remoteness from its key markets. At the same time the country agricultural sector is one of the most export-oriented in the world, with over 80% of the total production of key livestock products and over 50% of horticulture and wine destined for export.

120. Variations in product prices feature permanently as a top risk amongst New Zealand farmers. For a sector whose main output is destined for exports, the volatility of domestic prices derives from two principal sources: fluctuations in international commodity prices and variability in the value of the New Zealand dollar. Weather events represent another top source of risk. These risks are prominent due in particular to their link with pasture conditions, a key factor that determines the performance of the majority of New Zealand farms. Recently, uncertainty about local laws and regulations has moved up in farmers' ranking on risk, reflecting the greater focus by regional authorities on environmental issues. New Zealand farmers distinguish risks that generate threats and those that generate opportunities, and consider risk as a normal part of business.

121. Since the broad economic liberalisation in the mid-1980s, New Zealand agriculture has operated with no policy interventions on the markets. The government's primary role has been to develop and enforce basic rules and regulations, and to ensure that the economic system remains competitive and the macro-economic framework stable. The government plays an active role in risk management in agriculture, but the scope of its involvement is strictly limited. Its actions – and the underlying financial transfers – are concentrated on building and maintaining a system of prevention of pest and disease incursions. Although this system serves the farming sector, the rationale for this policy is broader, as its objective is to preserve the country's natural resources and human health. Governments at the local level are responsible for preventive and control measures related to natural disasters. Post-catastrophic assistance, delivered within the Adverse Events Framework programme, is largely financed by the central government. These activities are not specific to agriculture, but part of a broader territorial policy of assistance to local communities. Finally, the government contributes to knowledge and information systems that support private risk management efforts.

Risk Management Strategies and Policies in New Zealand

	Catastrophic Risks	Marketable Risks	Normal Risks
On-farm strategies			<ul style="list-style-type: none"> • Financial management • Pasture and feed management • Flexibility in business decisions
Market tools		<ul style="list-style-type: none"> • Forward contacting • Use of cooperatives • Interest rate hedging 	
Policies <i>Ex-ante</i>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Biosecurity</div> <div style="border: 1px solid black; padding: 5px; text-align: center; margin-top: 5px;">Water and pest management</div> <div style="border: 1px solid black; padding: 5px; text-align: center; margin-top: 5px;">Adverse Events Framework</div>		Free market policy framework and regulations
Policies <i>Ex-post</i>			

122. New Zealand's farming sector is confronted with pressures to remain a competitive export-oriented business and at the same time to meet growing societal demands for sustainability. The pressure for competitiveness implies intensified use of natural resources and practices associated with high production, financial and market risks. The pressure for sustainability implies constraints on how resources can be exploited and an increasing internalisation of resource use costs into farming costs. The key challenge for the farm risk management system in New Zealand is to develop strategies that would reconcile these competing pressures.

123. The situation in New Zealand is unique in that there are no apparent political claims for the provision of transfers to support the farming business. Moreover, strong political restraints on such policies exist stemming from the overall public perception of farming as a "normal" and lucrative business. The management of risks in the farming business is viewed as falling largely outside government responsibility, in particular market risks. The policy recommendations for New Zealand therefore concern areas of research, information, and extension – the principal areas of responsibility of the New Zealand government in what concerns agriculture.

124. Business and the government in New Zealand may need to strengthen the view of farms as multi-activity enterprises, focussing on interactions between commodity markets and various farm activities. In particular, it is proposed to investigate broader the potential of output and other forms of diversification to reduce farm income variability in New Zealand. The farm-level analysis undertaken in this review for pastoral farms suggests that, as concerns output diversification, this potential may be important. Another recommendation is to enhance cross-sectoral approaches to the provision of information, advice and extension services: the industry (levy) organisations, which are the main providers of such services, are focussed at present predominantly on commodity-specific issues.

125. The insurance market in New Zealand operates within a subsidy-free environment and is relatively limited. The improvement of information on risks is highlighted as a way to help expand agricultural insurance. Consultations with insurers and other stakeholders are proposed with a view to identifying areas where information on risks can be improved, in particular those that are theoretically

“insurable” but for which insurance markets have hardly developed or failed. The importance of supporting further research into farming risks is stressed, as well as the possibility of an information-sharing system on risks to help reduce transaction costs incurred by insurers to obtain information and facilitate the implementation of actuarially sound insurance premiums for different risk groups. It is also recommended to support information programmes for farmers as potential users of insurance and other risk management tools.

126. The problem of the lack of contract discipline in New Zealand’s meat sector is highlighted, and which may not be unique to that sector. This problem stems from the fact that advantages of an important risk management tool, such as contracting, are not fully exploited. It is recommended that the government offers assistance to improve the industry’s attitude towards contract discipline by providing analytical evidence on the trade-offs between short-term gains and long-term consequences of poor contract discipline, and undertaking an inquiry into existing contract enforcement procedures to identify areas where they can be simplified. It is also pointed out that the industry could look for ways to strengthen and diversify the incentives incorporated in supply contracts to farmers

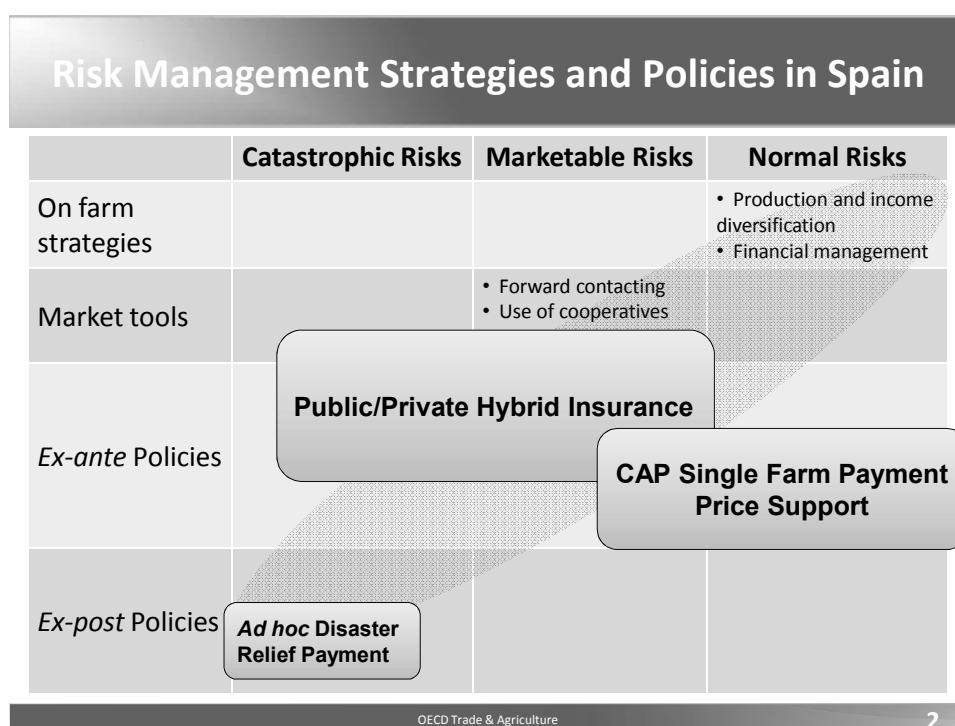
127. Developments in environmental policies at the regional level will require changes in farming practices and will generally imply higher costs for farmers. Such changes are inevitable and legitimate in a society that is increasingly concerned with environmental sustainability. In terms of farming risks, the issue concerns the uncertainty of farmers as to the exact nature of such regulations and the costs that will be incurred. The central government could play a facilitating and guiding role in the process of developing environmental policy instruments at the regional level by providing assistance to regional governments in their assessment and design of alternative policy instruments. The central government can also help by developing and providing environmental information to support policy design.

Annex F.

Executive summary of the study on Spain [TAD/CA/APM/WP(2010)17/FINAL]

128. Farmers in Spain are exposed to a diversity of climate risks. Three major types of climate prevail in Spain: oceanic in the north, continental in the centre, and Mediterranean in the east and south. The main characteristic of Spanish climate as a whole is irregular precipitation and the frequency of extreme weather events. Due to a relatively stable market environment under the EU Common Agricultural Policy (CAP) framework, farmers tend to perceive weather related risks as the most significant risk in farming. The analysis of micro farm-level data shows that farm yield risk has a strong systemic nature and dominates price risks.

129. Spain has been an EU member since 1986 and producers make their decisions within the EU market and policy environment. Although direct payment schemes, in particular the CAP Single Farm Payment, were not designed as a risk management policy, they have significantly helped farmers manage normal business fluctuations. Intervention prices and mechanisms of the CAP have also been crucial to buffering price variability of agricultural commodities and are highly relevant in determining the risk management options and decisions of Spanish farmers. However, agricultural insurance is at the core of the Spanish risk management system and the main risk management instrument. The Spanish Insurance Law has been applied as a continuous expansion of insurance to all sectors, areas and risks, and is a key objective of the government's agricultural insurance policy since the early 1990s. This has had strong implications on the boundaries of the different risk layers. The risks covered by this insurance include non-insurable hazards because of their "catastrophic" nature, due to information failures, or because of a large probability of its occurrence (normal risk). Although the insurance system also covers some catastrophic risks, it does not fully replace *ad hoc ex post* assistance in the form of direct compensations, interest and guarantee concessions for loans and fiscal measures.



130. The main challenge of the Spanish risk management system is to ensure the evolution of the insurance system in response to a changing policy environment, while reinforcing the role of insurance in disciplining *ex post* disaster assistance. Spain has developed a sophisticated hybrid insurance system based on a public-private partnership, premium subsidies, and governance rules. The system has shown institutional stability over the years and in the last decade it has improved its financial performance following the endowment of the reserve fund by the public reinsurer CCS.

131. The evolution of the insurance system should include reconsidering the policy objective of universal insurance for all risks, products and locations. Some risks can be better managed through other instruments. It is the responsibility of farmers to identify the most suitable strategy for their particular farm, and the government should empower them to do so. The insurance system should also differentiate between “marketable” and “catastrophic” policy lines or risks. The distinction between these two groups of policies would respond to the principle of risk layering and this would be the main criterion for adapting and rationalising the conditions of subsidy, deductibles and reinsurance for each group. The government should consider a schedule of subsidy reduction for “marketable” policy lines. For example, while the Spanish insurance system provides a premium subsidy to hail insurance, other countries have a private insurance market that offers hail insurance.

132. The insurance system should also increase competition amongst private companies participating in *Agroseguro*, particularly for marketable risks, while ensuring that risks are pooled and information shared through a database. Insurance could be directly provided by each insurance company to ensure that there are sufficient incentives for better services and therefore increased efficiency. For this purpose, the government should allow a broader use and analysis of the present insurance database. Investigating methodologies to distinguish between different lines of insurance can help rationalise the insurance subsidy policy. The system should also enhance the assessment of risk and the capitalization of experience, knowledge and information amongst different agents and insurers.

133. In addition to the insurance system, the government should facilitate the development and use of a variety of risk instruments such as forward contracting / futures, tax system, savings accounts, off-farm income and diversification, and enhance innovation in risk management tools. This is because farmers have the best knowledge on the type of risks they face and which risk management strategies and instruments they should choose.

134. The Spanish experience shows that expanding the coverage of the insurance system does not deter the demand for *ex post* disaster assistance. Thus, the government should introduce a definition of a disaster or a catastrophe that is eligible to receive public support; a definition that would be based on the magnitude of the impacts and on the probability of occurrence. It should also introduce some *ex ante* protocols on how disaster assistance is implemented: who takes the initiative to start an enquiry on disaster assistance, who is consulted, and who takes the final decision. Current tax provisions for farmers simplify the farmer’s task in completing tax forms, but reduces the capacity to adjust income tax to situations where profits are very low or negative. This has necessitated frequent adjustments to the tax parameters (“modules”) for different years and locations; as a consequence, the predictability of the tax is reduced. Current tax policies should be adjusted to facilitate the role of the income tax system to smooth income.

REFERENCES

- Garrido, A. and D. Zilberman (2008): "Revisiting the demand for agricultural insurance: The case of Spain". *Agricultural Finance Review*. Spring 2008. Vol.68, p43-66.
- Newbery, D. and J. Stiglitz (1981): "The Theory of Commodity Price Stabilization: A study in the Economics of Risk". Clarendon Press, Oxford.
- OECD (2001), *Income Risk Management in Agriculture*, Paris
- OECD (2009), *Managing Risk in Agriculture: A Holistic Approach*, Paris.
- OECD (2010a), *Farm Level Analysis of Risk and Risk Management Strategies and Policies: Cross Country Analysis* by Kimura, Sh., J. Antón and Ch. Le Thi, OECD Food, Agriculture and Fisheries Working papers No. 26, Paris. <http://www.oecd.org/dataoecd/15/60/45532673.pdf>
- OECD (2010b), Thematic Review on Risk Management: Australia, [TAD/CA/APM/WP(2010)15/FINAL], Paris.
- OECD (2010c), Thematic Review on Risk Management: New Zealand, [TAD/CA/APM/WP(2010)16/FINAL], Paris.
- OECD (2010d), Thematic Review on Risk Management: Spain, [TAD/CA/APM/WP(2010)17/FINAL], Paris.
- OECD (2011a), Thematic Review on Risk Management: Canada, [TAD/CA/APM/WP(2010)29/FINAL], Paris.
- OECD (2011b), Thematic Review on Risk Management: the Netherlands, [TAD/CA/APM/WP(2010)30/FINAL], Paris.
- Palinkas, P. and C. Székely (2008): "Farmer's perceptions on risk and crisis risk management" Chapter 3 in Mewvissen, van Asseldonk and Huirnde, eds. (2008),
- Schaufele, B., J. R. Unterschultz and T. Nilsson (2010): "AgriStability with Catastrophic Price Risk for Cow-Calf Producers". *Canadian Journal of Agricultural Economics* 58 (2010) 361-380.
- Simmons, P, (2002): "Why do farmers have so little interest in futures markets?". *Agricultural Economics* 27 (2002) 1-6.
- Serra, T., D. Zilberman, B. Goodwin and K. Hyvonen (2005): "Replacement of Agricultural Price Support by Area Payments in the European Union and the Effects on Pesticide Use". *American Journal of Agricultural Economics* 87 (4) 870-884.