APPENDIX 3

Managing volatility and risk in the CAP

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1. Introduction

The history of the EU's Common Agricultural Policy is one of gradual reforms. One of these reforms entails the gradual decline of income support with the intention, *inter alia*, to shift resources to risk management schemes (Cordier, 2014). The increased market orientation of European agriculture since the mid-1990s in general, and recently the dairy sector in particular, has exposed EU farmers to increased risk and hence increased demands for the CAP more overtly to tackle volatility and risk. An Agricultural Markets Task Force set up in 2016 to examine and improve the position of farmers in supply chains made several recommendations including: to increase market transparency, to make the risk management toolkit more attractive and coherent, using simplified loss calculations and reimbursement options and even to shift resources from untargeted direct payments to "an approach which channels CAP money into a genuine and predictable safety-net for farmers to apply in times of market imbalance" (Agricultural Markets Task Force, 2016, p. 51). More specifically,

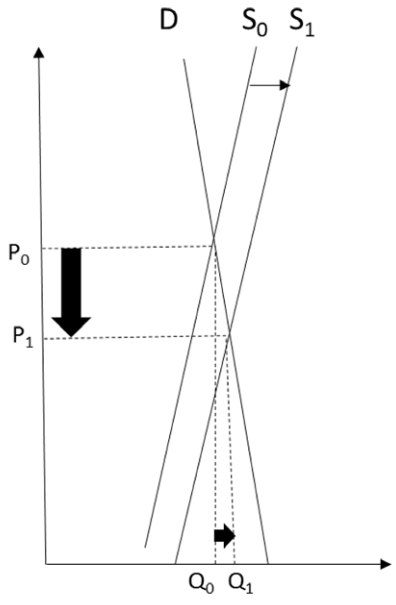
> "A resource shift should aim at introducing an integrated risk management policy at EU level that is complementary to existing Member States' strategies. We mean by this not only a loose toolbox but a structured and coherent framework of complementary private and public risk management measures. Such a framework could provide an adequate response to the variety of risks producers face. At the public level, simplified reimbursement options such as indexbased loss-thresholds, adapted as need be to regional circumstances, or other technically feasible mechanisms should make it possible to steer clear of large and bureaucratic control regimes." (Agricultural Markets Task Force, 2016, p. 51)

The aim of this paper is to take up this challenge and to suggest policy recommendations to manage volatility and risk in coherent and holistic way. The paper is structured as follows. In section 2, we discuss the nature of risk in agriculture. What types of risk exist in agriculture? What causes these risks? How are farmers affected by theses risks? Then we discuss how farmers and governments can manage the various types of risk in section 3. Section 4 summarises how the US and the EU currently deal with volatility and risk. Section 5 concludes by formulating the challenges and principles of a coherent agricultural Risk Management Policy for the EU.

2. The nature, causes and consequences of risks in agriculture

Agriculture is a particularly risky economic activity due to the biological nature of its prodution processes and its exposure to the weather. Two economic phenomena amplify this exposure. First, agriculture consists of many, relatively small firms that individually lack the capacity to deal with risk and other challenges. Second, agriculture is characterised by supply and demand functions that are highly price inelastic, such that relatively small changes in supply and/or demand generates large price effects, as demonstrated in Figure 3.1.

Figure 3.1: ***Price and volume effects resulting from a supply curve shift with high price inelasticity of both demand and supply curves***



Source: own elaboration

Both demand (D) for and supply (S) of agricultural commodities are highly price inelastic, which means that for a relatively small shift of the supply curve from S_0 to S_1, the resulting volume increase is relatively small (Q_1-Q_0), but the resulting price decrease is relatively large (from P_0 to P_1). Figure 3.1 also demonstrates that price and volume effects move in opposite direction, that is, prices are low when harvests are good and vice-versa—also called the good/bad paradox in agriculture.

The OECD classification of risk shown in Table 3.1 classifies risks in four categories that relate to production, market, finance and institutions and to three scales, micro, meso and macro.

The micro-scale is the farm. Risks that are farm-specific are idiosyncratic, which means that they are not correlated with risks on other farms and that in principle they can be insured. The meso-level applies to a group of farms that are jointly affected by the same risk, making risk covariant. At the macro-level, risks are systemic, as they influence whole sectors and regions, making them difficult or even impossible for commercial insurance to deal with.

Production risk is a result of the biological nature of agriculture and its dependence on the weather. These uncertainties may affect individual farmers, groups of farmers or even entire regions in the event of large-scale disasters. Examples of other production risks include machinery breakdown (asset risks), personal hazards and contagious diseases. Production risk can be translated into market risk in the form of large price oscillations due to the high price inelasticities of both demand and supply curves (see Figure 3.1). In addition, in an open economy, there is the risk of importing price volatility from world markets. Financial risks can be farm-specific, such as a change in non-farm income, or systemic, such as a change in interest rate on loans. Institutional and legal risks generally relate to changes in policies at different levels.

Table 3.1: ***Illustration of sources of risk in agriculture***

	Micro (idiosyncratic) risk affecting an individual or household	**Meso (covariant) risk affecting groups of households or communities**	**Macro (systemic) risks affecting regions or nations**
Production	Hail, frost, non-contagious diseases, personal hazards, asset risks	Rainfall, landslides, pollution	Floods, droughts, pests, contagious diseases, technology
Market		Changes in land prices, new requirements from food industry, health scares	Changes in input and/or output prices due to shocks (e.g., embargos), new markets, endogenous variability, exchange rates
Financial	Changes in income from non-farm sources		Changes in interest rates or value of financial assets, access to credit
Institutional/legal	Liability risk	Changes in local policy or regulations	Changes in regional or national policy and regulations, environmental law, agricultural payments

Source: Based on OECD (2009)

A particular form of volatility is the cyclical, endogenous price volatility known as the 'pork cycle'. The most popular explanation for its occurrence is based on Ezekiel's cobweb theorem (Ezekiel, 1938), which posits that farmers decide on how much to supply in the future based on current prices. The occurrence of such cycles has been studied for decades. A recent confirmation is offered by McCullough *et al.* (2012) and Nicholson and Stephenson (2015) for the US and by Bergmann *et al.* (2015) for the EU. Bergmann et al. (2015) also showed the convergence of these three-year cycles between the US and the EU after the 2003 CAP reform. McCullough *et al.* (2012) suggest that US pork and cattle cycles have been dampened due to improved technology, information exchange and vertical coordination. Recently, Mahé and Bureau (2016) have illustrated how over-optimism caused by high milk prices in 2013-14 led to increased investments by dairy farmers and have thus contributed, along with other factors, to higher milk supply and lower milk prices in 2015-16.

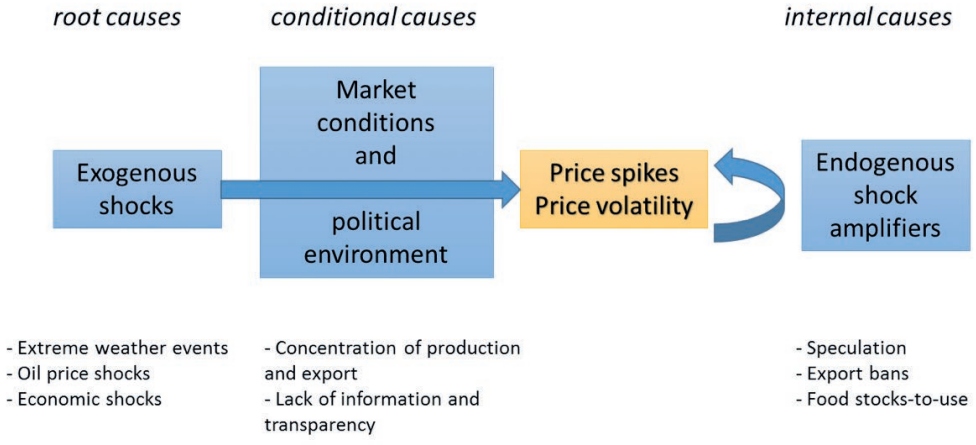
An alternative explanation for cycles can be found in the supply chain management literature and is known as the 'bullwhip' effect. Due to the misperception of customer demand, supply chain actors make decisions resulting in orders, production and inventories that are maladapted to demand and that result in price and quantity oscillations. These oscillations are larger, the farther away upstream from the final consumer, as the distortion of demand information increases upstream (Lee *et al.*, 1997). This provides an alternative explanation for why volatility is higher at the farmer level compared to the retail level, as usually reference is made to retailer market power resulting in asymmetric price transmission along the supply chain.

Tadesse *et al.* (2004) have developed a stylised framework of the causes of global food price volatility and spikes, in which they make the distinction between root causes, i.e., exogenous shocks such as extreme weather events, conditional causes related to market conditions (e.g., power concentration) and the political environment (e.g., lack of transparency) and endogenous shock amplifiers (e.g., speculation, discretionary trade policies, stock management) (see Figure 3.2).

To what extent does the exposure to all these risks—exogenous and endogenous—lead to adverse outcomes in general, taking into account differences between farm-level and sector-level effects, but also the tendency that different components of income (prices, yields, costs) may counteract each other and thus reduce exposure? Kimura and Le Thi (2011) have carried out a quantitative risk assessment based on individual farm data in Australia, Canada, Estonia, Germany, Italy, the Netherlands, New Zealand, Spain and the UK for a period of 5 to 12 years. OECD (2011) draws the following conclusions:

- In aggregate, market-based price variability is higher than weather-induced production variability (which confirms Figure 3.1). However, inidividual yield variability is larger than aggregate yield variability, while price variability is equal at individual and aggregate level.
- The majority of farms face negative price-yield correlations, which means that price changes and yield changes are correlated and mitigate overall risk.
- Price risk tends to be more systemic than yield risk, but sometimes yield variations can be highly systemic.
- Both output diversification and covariance between output and costs reduce farm income risk.

Figure 3.2: ***Stylised framework of the causes of global food price volatility and spikes***



Source: based on Tadasse et al., 2014

Conclusive evidence about the evolution of farm income volatility in the EU is lacking. Vrolijk *et al.* (2009) demonstrated that large differences in income volatility exist between countries, sectors and farm types. While many sectors have always operated in open markets, key commodity sectors (cereals, sugar, beef, dairy, wine, olives) have long been shielded from external influences through the mechanism of guaranteed minimum prices and in some cases production quotas. However, since 1992, subsequent CAP reforms have also exposed these protected sectors to the fluctuations of the market which has resulted in increased price volatility in these sectors.

3. Risk management approaches

In general, the short-run vulnerability of a farm to a hazard is mediated by the farm's exposure to the hazard, its sensitivity to the exposure and its strategies to cope with the impacts. In the long-run, also the farm's adaptive capacity must be taken into account, as farmers can take actions to change the sensitivity of their system. Hazards can be sudden shocks or enduring stresses, while exposure depends on the magnitude, duration and frequency of the hazard. This hazard-to-impact pathway is depicted in a stylised way in Figure 3.3. Risk management entails three aspects: the type of intervention, the institutional level at which the intervention is implemented and the size of risk involved, which determines at what institutional level the risk should be implemented.

A first aspect to risk management is the **type of intervention**. The best way to manage risk is to prevent being exposed to a hazard. However, once exposed to a hazard, farmers may then try to mitigate or decrease their sensitivity to that exposure either *ex ante* or *ex post*. For instance, a farmer may buy crop insurance *ex ante* or try to obtain a compensation from government *ex post*. When farmers endure the full exposure they will have to cope with the impact on their income. These three basic approaches (prevention, mitigating and coping – Holzmann and Jorgensen, 2000) are shown in the hazard-to-impact pathway in Figure 3.3.

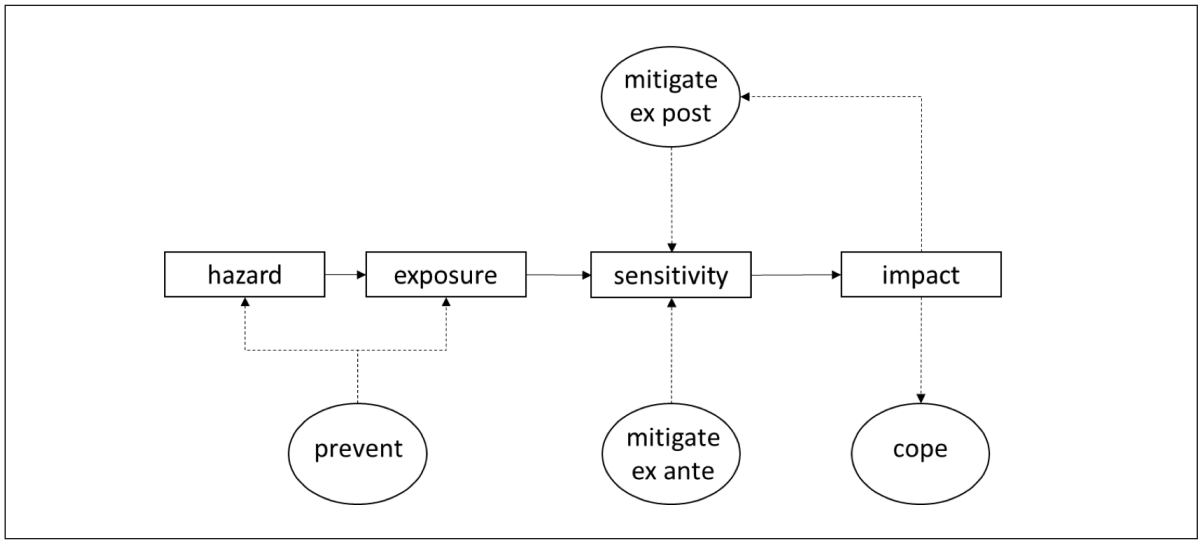
A second aspect to risk management is the **institutional level** at which the intervention is carried out. Table 3.2 provides a list of risk management instruments and strategies, clustered according to the three main approaches of prevention, mitigation and coping, and classified according to the institutional level at which these approaches are implemented: farm/household/community, market or government. Risk reduction at farm level can best be done by making appropriate technological choices. For example, to reduce yield loss risk due to drought, farmers may choose drought-resilient crop varieties or invest in irrigation (Tangermann, 2011).

A third aspect to risk management relates to the **size of risk** addressed. Typically, and following OECD (2011), a layered approach is taken that distringuishes between:

- Normal risks occur frequently, but with relatively little damage
- Marketable risks have intermediate levels of frequency and damage
- Catastrophic risks have low frequency but high damage

A layered approach to agricultural risk management involves addressing different levels of risk (layers) by different actors with different instruments (Bardaji *et al.*, 2016).

Figure 3.3: ***Risk management strategies in a hazard-to-impact pathway***



Source: own elaboration based on Brunori et al., 2016

Table 3.2: ***Selected risk management instruments and strategies***

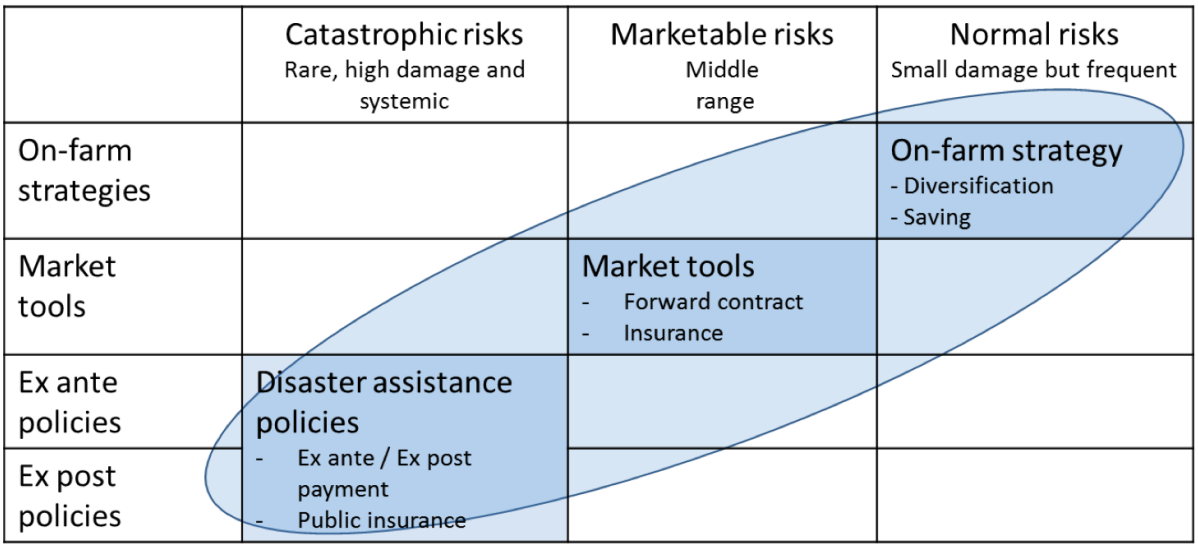
	Farm/household / community	Market	Government
Risk reduction	Technological choice	raining on risk management	Macroeconomic policies Disaster prevention Animal disease prevention
Risk mitigation	Output diversification Crop sharing	Futures, options Insurance Vertical coordination Spread sales Diversify investment Off-farm work	Tax system smoothing Counter-cyclical payments Border measures
Risk coping	Borrow from family or neighbours	Selling assets Borrow from banks Off-farm income	Disaster relief Social assistance Agricultural support

Source: OECD (2009)

Combining the size of risk with the institutional level at which risk should be addressed creates a canvas of risk management approaches as depicted in Figure 3.4. OECD (2011) defines a 'good governance diagonal' on this canvas as the most efficient set of responses: normal risks should be managed by farmers mainly using on-farm strategies, middle range risks should be addressed using market tools such as insurance or futures markets and catastrophic risks should be dealt with by government, as they cannot be dealt with by farmers or market responses.

The OECD approach especially on market level intervention emphasises the use of forward contracting (mainly through futures markets) and insurance mechanisms, while it gives less emphasis to horizontal and vertical co-ordination mechanisms. Horizontal mechanisms refer to actions taken by producer organisations, while vertical mechanisms refer to actions taken in collaboration with supply chain actors, such as food processing companies or retailers.

Figure 3.4: ***Optimal pattern of risk management strategies and policies***



Source: OECD, 2011

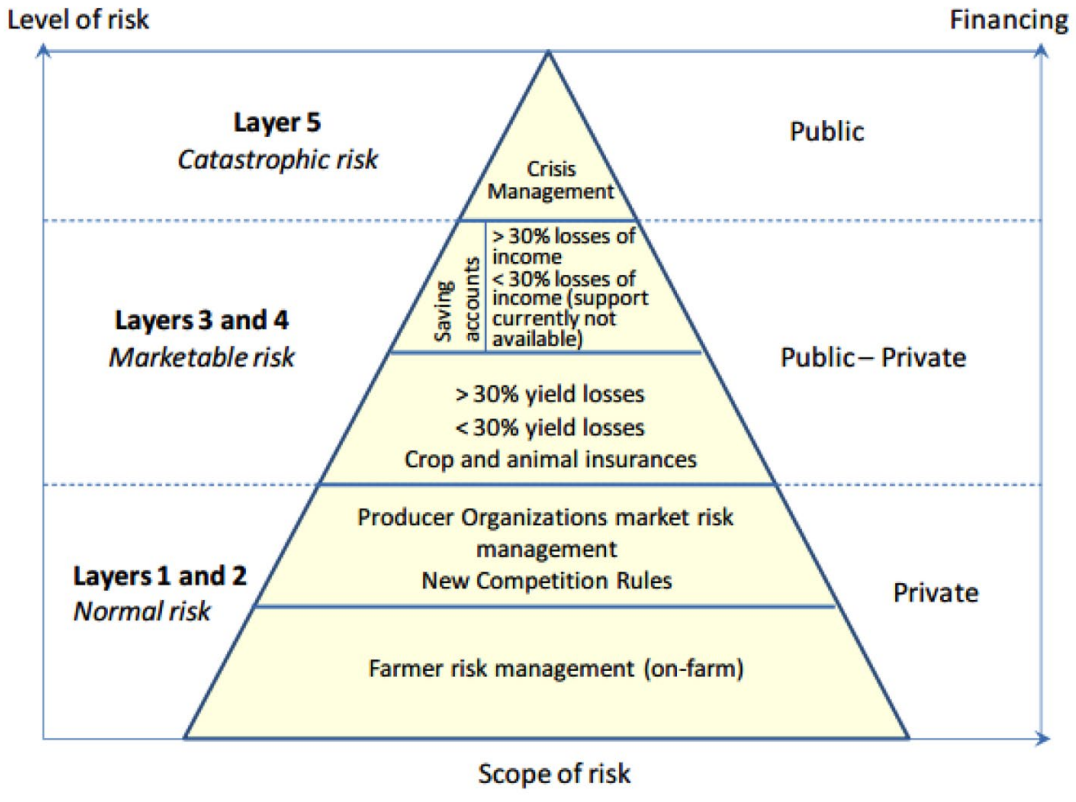
Bardaji *et al.* (2016) have refined and adapted the OECD approach by explicitly considering the role of producer organisations in addressing 'normal risk' (see Figure 3.5). They subdivide the first layer of normal risks into a part that should be addressed by on-farm strategies and a part that can better be addressed by collective action. But they also consider forward contracting—either by individual farmers through hedging or collectively through supply management—in the realm of normal risk rather than marketable risk. They further subdivide the marketable risk layer into a section addressing yield risk and one addressing income risk. They argue that both layers should be supported by government, contrary to the OECD good governance approach that suggests governments should refrain from intervening into the marketable risk space. A key question remains whether a situation of extreme income losses should be classified as catastrophic risk (OECD, 2011) or marketable risk (Bardaji *et al.*, 2016). Bardaji *et al.* (2016) note though that the frontiers between the layers should be considered in a dynamic and flexible way.

It is important to note that in these approaches on-farm strategies mainly refer to the diversification of income sources, that is, a diversified portfolio of farm enterprises and perhaps non-agricultural income activities too. In addition, farmers may store produce to wait for better prices or transform produce into more processed form, such as cheese and juice. However, where there are significant scale economies in such storage or marketing activities, they will tend to be more efficiently performed at a collective level. In several sectors, farmers have established cooperatives to forward integrate into processing and marketing (e.g., dairy, fruit & vegetables). Risk can thus be managed by diversifying into processed products. Moreover, price inelasticity of demand and supply tends to decrease with product differentiation. Such strategies are particularly important for highly specialised farmers (e.g., dairy farmers), as it is often less easy to diversify their product portfolio on farm.

A further key issue is setting the boundary between marketable and catastrophic risk. On the one hand, setting the boundary too low, will result in deadweight losses of supporting farmers beyond what is needed to deal with risk. On the other hand, *ex ante* measures in the form of insurance and mutual funds may reduce the need for crisis management *ex post*, so it may be efficient to stimulate insurance-based schemes.

It may be preferable to talk about manageable risk instead of marketable risk as the boundary between the normal and marketable risk layers is quite blurred. The use of market instruments involves transactions and thus

Figure 3.5: ***Layering approach to agricultural risk management***



Source: Bardaji et al., 2016

transaction costs, that is, the search, negotiation and monitoring costs related to each transaction. Such costs tend to be low for homogenous, storable commodities, but increase with perishable products and with differentiated products. In these cases, farmers may choose to opt for governance mechanisms other than the market, such as vertical integration ('hierarchy') or contracts ('hybrid'). These mechanisms can be carried out in a bottom-up way, for example through forward integration, or a top-down way through backward integration (Aseffa *et al.*, 2016; Bonjean and Mathijs, 2016).

4. Current risk management approaches in the us and the EU

4.1. Risk management in the US

The 2014 Farm Bill dedicates two of its twelve titles to risk management in the form of commodity programmes for a selected list of main crops and animals and crop insurance for a more comprehensive list of crops and animals.

Commodity programmes moved away from direct payments towards two main instruments: a revenue program called Agricultural Risk Coverage (ARC) and a fixed price program called Price Loss Coverage (PLC). ARC may be based on individual or county-based revenue coverage. Payments are provided when revenues fall below 86% of the benchmark revenue. PLC is a form of counter-cyclical programme that pays farmers when market prices fall below a fixed reference price (Cordier, 2014). Farmers with so-called 'base acres' had to choose in 2014 to enroll in ARC or PLC. Programmes are only paid on base acres and farmers have to comply with some conservation targets. 75% of base acres have been enrolled in ARC and 22% in PLC (Johansson, 2016). For dairy farmers, there is a Dairy Margin Protection Plan (DMPP) based on milk prices and feed prices.

Crop insurance programmes involve subsidies to the premiums farmers pay. Each year, farmers can choose the acres of which crop to cover, whether to insure yield (AYP) or revenue (ARP) and the amount of coverage. Reference yields and revenues are determined at county level. Also for these programmes farmers may have to comply to conservation targets. Most farmers have enrolled into revenue protection (70.3%) rather than yield protection (21.0%) (Johansson, 2016).

4.2. Risk management in the EU

In the EU's CAP 2014-2020, the overtly named risk management policy is located in the rural development pillar (Regulation 1305/2013). However, this interacts with the much larger direct payments and the market measures defined in the first pillar. It also sits alongside often considerable state aids granted by member states in times of disasters. Locating risk management tools in the rural development pillar means that they are co-financed by member states but also optional. Instruments include (1) crop, animal and plant insurance (article 37), (2) mutual funds for adverse climatic events, outbreaks of animal or plant disease or environmental incidents (article 38) and (3) an income stabilisation tool in the form of financial contribution to mutual funds (article 39) (Cordier, 2014). The Income Stabilisation Tool (IST) is triggered when farm income is 30% lower than a past three-year average. Payment is maximum 65% of eligible costs and limited to 70% of the income loss. Farm income is defined as revenues including subsidies minus input costs.

Member states are allowed to grant state aid on the basis of specific rules set out in the Treaty of the Function of the European Union and which are elaborated further in the Commission Guidelines for State aid in the agricultural and forestry sectors and in rural areas for the period 2014 to 2020. State aid payments correspond to payments made for catastrophic risks, but can also be used to subsidise insurance premia. During the period 2007-2013, a total of 13.5 billion euro of state aid expenditures were granted for crisis management, including natural disasters (2.3 billion euro), adverse weather events (3.2 billion euro), animal and plant diseases (4.3 billion euro) and insurance premiums (3.8 billion euro). Most of these payments are compensations for *ex post* crisis management (9.7 billion euro), while 3.8 billion euro was used for funding *ex ante* insurance funds. In 2014, a total of 1.2 billion euro was spend on state aid, which means a continuation of member states to use this instrument, but decreasingly so (Bardaji *et al.*, 2016).

Crisis prevention and management (CPM) measures can also be granted to producer organisations under the CAP Common Market Organisation in the fruit and vegetables and wine sector. During the 2007-2013 period, CPM measures included market withdrawals, green harvesting or non-harvesting of fruit and vegetables, promotion and communication, training measures, harvest insurance and support for administrative costs of setting up mutual funds. Total expenditure in this period was very low, about 36 million euro for fruit and vegetables and 137 million euro for wine.

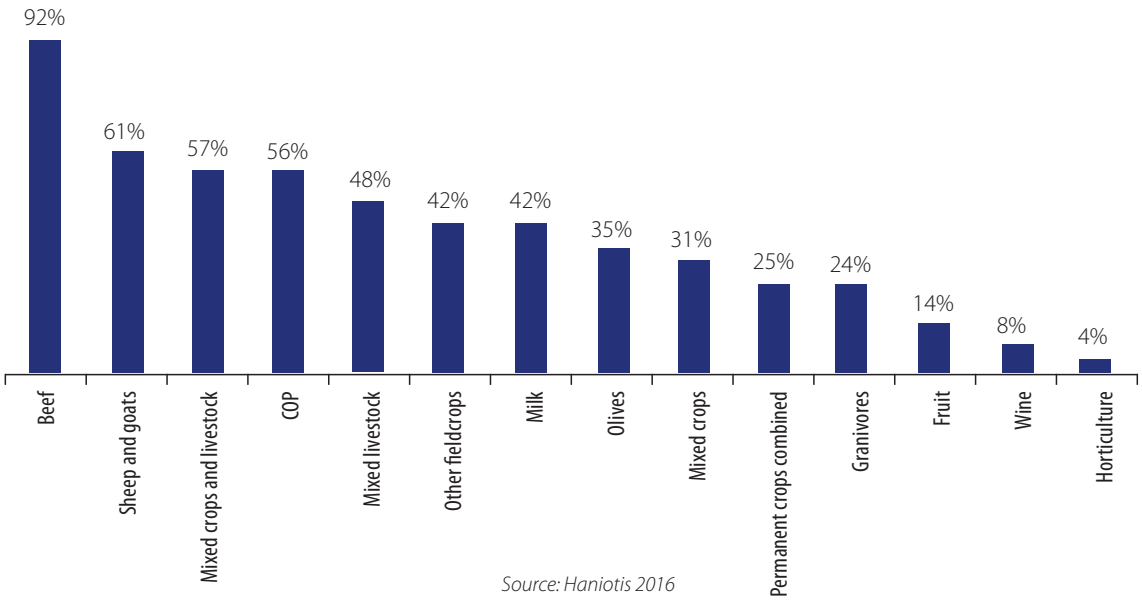
Table 3.3 lists the programmed expenditure for the 2014-2020 period on the risk management instruments. Twelve Member States have programmed at least one such instrument, 10 Member States focus on insurance premiums, 3 on mutual funds and 3 on the IST. Most of the budget is allocated to insurance premiums. Participation in these schemes greatly depends on availability of alternatives, such as direct payments and contracts with suppliers. To illustrate this, Figure 3.6 (from Haniotis, 2016) gives an overview of the dependence of different sectors on direct payments.

Table 3.3: ***Programmed expenditure on risk management measures in the EU, 2014-2020***

	Insurance premiums	Mutual funds	IST	EU contribution (%)
Belgium: Flanders	5.1	0	0	63
Spain				
Castilla y Leon	0	0	14	53
France	540.7	60	0	97.85
Croatia	57	0	0	85
Italy	1396.8	97	97	45
Latvia	10	0	0	68
Lithuania	17	0	0	85
Hungary	76.3	0	19	82
Malta	2.5	0	0	75
The Netherlands	54	0	0	27
Portugal	53.2	0	0	82
Romania	0	200	0	85
TOTAL	2212.6	357	130	63

Source: Bardaji et al. 2016

Figure 3.6: ***Share of farm income based on subsidies (excluding on investments)***



Source: Haniotis 2016

Even from this brief survey it can be seen that US and EU policies on risk management are very different. This is summarised in Table 3.4. US policy draws mainly on insurance and in a second instance on safety nets through counter-cyclical payments, while EU policy is still largely based on so-called income support in the form of direct payments. Risk management tools make up only 1% of the CAP budget. Both policies treats different sectors differently, as a result of their path dependence with eligibility for payments being based on historical claims, but the effect is stronger in the EU, due to the high importance of income support.

Table 3.4: ***Comparison between US Farm Bill and the EU CAP***

	US Farm Bill	EU CAP
Estimated budget weight of instruments:		
Income support	0 %	72 %
Insurance	47 %	1 %
Safety nets	23 %	5 %
Targeted sectors	All	Instrument dependent
Participation	Historical claims (base acres)	Historical claims for income support, initially
Conservation compliance	Yes	Yes for income support No for other instruments

Source: Own elaboration and Cordier (2014). Budget weight as % of farmer programmes in the US Farm Bill and % of CAP budget respectively.

5. Recommendations for a more coherent risk management policy

5.1. Challenges and principles

The main aim of an EU Risk Management Policy (RMP) is to enable farmers to deal with risk in order to stabilise their income. However, the design of such a policy faces problems of measurability, incentives, the need to cope with increasing or decreasing trends and the interaction with existing subsidies (Meuwissen *et al*., 2011, Tangermann, 2011) or market organisation schemes. Hence, based on these problems, we have identified five challenges that an RMP needs to address.

Challenge 1. An RMP has to take into account the **heterogeneity** of EU farmers in terms of size, cost structure and strategies. Figure 3.7 has highlighted the difference in how sectors depend on subsidies, with beef sector at the one extreme (92% of farm income from subsidies) and horticulture on the other (4% of farm income from subsidies). There is also large variety across sectors and regions in the use of contracts and other market arrangements. This heterogeneity will make it difficult to design schemes at the EU level only and will require a sector-specific and a territorial approach, as risks and strategies to deal with risk vary between sectors, but also between regions. At the same time, moving RM tools from EU-level to Member State level may undermine the single market (Mahé and Bureau, 2016).

Challenge 2. An RMP has to take into account the problem of **asymmetric information** between the insurer (government) and the insured (farmers) on the true amount of risk the insured is facing. This may lead insured farmers to change their behaviour by taking more risk (moral hazard) or it may lead to a situation in which those entering an insurance programme have a higher risk profile than those who are not. Hence, insurance schemes should only address clearly measurable risks and measurable losses (Meuwissen *et al*., 2011; Mahé and Bureau, 2016). Mahé and Bureau (2016) suggest that farmers tend to overinvest during price booms, leading to amplified price busts due to overcapacity. They illustrate this by the peak amount of investment made by specialised dairy farmers in 2012 preceding the 2015 dairy market crisis.

Challenge 3. An RMP should not **crowd out** private risk management strategies based on management measures or market-based instruments. In other words, RMP measures should be complementary to existing instruments (Tangermann, 2011). A particular issue relates to the implementation of *ex-post* safety nets, that reduce the incentive to take a pro-active approach *ex ante*. This can be tackled by limiting *ex-post* safety nets to truly exceptional incidents (Meuwissen *et al*., 2011).

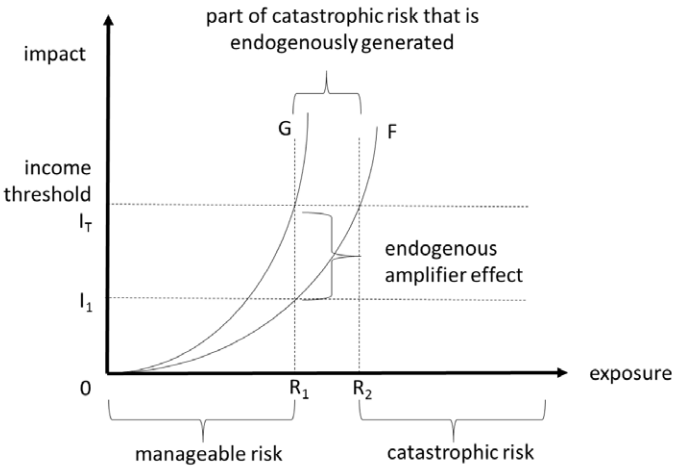
Challenge 4. An RMP should take into account the **interaction with existing policies.** Also agricultural support policies may crowd out farmers' strategies, but this depends on the type of policy and the type of risk (OECD, 2011). In the context of the EU, RMP measures are likely to be crowded out by the single farm payment scheme and the CMO measures in Pillar I of the CAP. The existence of such schemes may explain the current low take-up of

RMP measures, and it may also lead to over-insurance.

Challenge 5. Both the challenges of farm heterogeneity and asymmetric information require government to deploy detailed data when compensating for catastrophic risk, and this increases the **transaction costs** of an RMP. In addition, farm accounts, even when they are available, may not be appropriate information sources for income losses, as accounts may be optimised for fiscal reasons (Meuwissen *et al.,* 2011).

Some of these challenges are illustrated in Figure 3.7. This offers a stylised representation of the relationship between exposure to risks and its impact on farmer's income. F represents a normal relationship between exposure and impact. We define catastrophic risk as the exposure R_2 that generates a minimal impact I_T. Impacts beyond I_T cannot be managed by farmers or through the market, so this is the level at which the income stabilisation tool is triggered. Both F and I_T can be hazard-specific.

Figure 3.7: ***Relationship between exposure and impact***



Source: own elaboration

In the case that actions taken by farmers amplify risk, the impact-response function shifts upward to G. The difference between the functions F and G is the difference in impact with and without amplification effect. So, for a given level of risk R_1, the impact with amplification is I_T, while the impact without amplification is I_1. In other words, with amplification the impact threshold is triggered at a lower level of risk, R_1, than without amplification (trigger at R_2). Challenge 3 that relates to crowding out translates into the need to identify boundaries to be set between manageable and catastrophic risk (R_1) in order to determine the trigger for government assistance. Next, policies should be designed in such a way that they avoid endogenous amplifier effects *ex ante*, which corresponds to Challenge 2. For this, endogenous amplifier effects should be determined in order to identify an incentive-compatible compensation (I_1 instead of I_T) *ex post*. In other words, the total impact due to a hazard should be decomposed into an exogenous component that is beyond the control of farmers and an endogenous component.

These challenges are also reflected in and coherent with the following principles that should underpin an RMP according to Tangermann (2011):

1. Public policy should leave as much space as possible for private activity and market solutions.
2. Risk management, and public policy relating to it, should be based on a holistic approach.
3. A clear distinction should be made between dealing with risk on the one hand and providing support on the other hand.
4. Policy measures aimed at risk management should aim at minimizing distortions to markets and trade.
5. There should be clearly defined procedures and criteria for determining, and responding to, catastrophic crises that go beyond the capacity of farmers to cope and hence call for government action.

5.2. Recommendations for a holistic EU Risk Management Policy

Based on the above challenges and principles, we recommend a market and risk management policy based on building adaptive capacity making farms more resilient in undistorted markets. Therefore, we recommend restricting public support on market measures, only to be offered for temporary support to the costs of producer organisations under the CMO or the set-up of private insurance markets where these are underdeveloped. The main focus of the CMO should be the collection and dissemination of market information in order for prices to be undistorted and thus play their signaling role.

As a result, the core of our proposed EU Risk Management Policy should built on three axes: risk prevention, risk mitigation and risk coping. The RMP should evolve towards a policy in which most private and public resources mobilised are spent on risk prevention and the least on coping with risk. However, the share of government spending should be smallest in prevention (in order not to crowd out private action) and highest in risk coping. Further, risk mitigation should correspond with manageable risks, while risk coping corresponds with catastrophic risks.

A holistic RMP would also recognise and enable the full set of potential risk mitigation measures. Table 3.5 lists maps several risk mitigation measures according to the risk management mechanism and the cooperation or

market mechanism. Risk can be managed by transferring it to another party, either by vertically integrating into the next or even the final level of the supply chain (e.g., Tesco guarantees prices to cover costs of UK dairy farmers, in Community Supported Agriculture, risk is transferred to the consumer by prepaying the farmer at the beginning of the season) or by hedging. Risk can be buffered by setting up mutual funds, horizontally or vertically, or by borrowing or fiscal smoothing. Risk can be pooled and shared either horizontally (insurance) or vertically (contracts). And risks can be spread also by diversifying horizontally (enterprise diversification) or vertically (diversification through adding value and processing). Of course, not all these measures exist for all sectors and regions. Their occurrence depends on many factors such as the existence of futures markets, social capital in the farming community, legal barriers (such as competition law) and the enforcement of fair trading practices.

Table 3.5: ***Canvas of potential private risk mitigation measures***

	Horizontal coordination	Vertical coordination	Other
Transfer risk		Vertical integration	Hedging
Buffer risk	Cooperative mutual funds	Chain-based mutual funds	Borrowing Fiscal smoothing
Share risk	Insurance	Contracts	
Spread risk	Output diversification	Diversification by adding value	

Source: Own elaboration

Box 3.1 summarises the building blocks of a holistic EU risk management policy. The financing of the risk mitigation and coping parts of the RMP should be done through the EU budget to avoid differences in competitiveness between Member States and the breakdown of the single market. Risk prevention relates to different kinds of measures, such as investment support and payments for ecosystem services.

Box 3.1: ***Foundations of a holistic EU risk management policy***

Axis 1: Risk prevention

Risk prevention is based on appropriate technology use (e.g. genetics, irrigation, precision farming techniques), appropriate land management (e.g. providing ecosystem services), information management and training. Government support should stimulate farmers to use appropriate technologies and land management strategies, which can be granted in the form of investment support for infrastructure, subsidies for ecosystem services and support for training.

Axis 2: Risk mitigation

Risk mitigation is based on private risk management measures that are complemented by an income stabilisation scheme (see axis 3). A comprehensive and coherent legal framework should be provided to enable the development and use of a wide set of private risk management instruments that spread, buffer, share and transfer risk, both horizontally (cooperatives, producer organisations) and vertically (supply chains). For this, competition legislation may have to be further adapted to strenghten farmers' bargaining power in the supply chain. Government support should be limited to the temporary support of underdeveloped private risk management schemes, such as crop insurance.

Axis 3: Risk coping

Residual risk not mitigated by private risk management measures can be covered by a sector-specific income stabilisation tool as a form of *ex post* risk coping strategy. Farmers pay a premium that is proportional to the income they want to insure. Farmers who can demonstrate that they participate in private risk management schemes receive a discount on the premium. The income stabilisation scheme is activated when a reference income index is reduced by more than 20%. The reference income index is composed of price, yield and cost indices, that are defined at appropriate levels (EU, member state, region, sector or even farm). Government support is financed by the Crisis Reserve. Exceptional risks not covered by the IST, but that are locally systemic, can still be covered by state aid schemes.

5.3. Discussion

The rationale for the choices suggested in the RMP and some of the implementation details are as follows.

1. *Why should government support an Income Stabilisation Scheme (IST) and not mitigation tools*? The main reason is that government should only intervene in the case of catastrophic risk. Supporting mitigation tools will crowd out private mitigation measures and thus shift too much risk to the taxpayer.

2. *Why stabilise income and not prices or yields*? Stabilising income is key to a holistic approach. Price, cost and yield changes may evolve in different directions, thus cancelling out some of the risk. In addition, price stabilisation measures may distort markets and hence decrease the signaling function of prices in markets. Also, subsidising crop insurance too much or providing counter-cyclical payments will crowd out private schemes and strategies, based on savings and diversification.

3. *What income definition should be used?* We propose to define income as gross farm income (output + net subsidies – intermediate consumption), as factor costs greatly depend on non-market considerations. In some cases, where yield is relatively stable, margins defined as output price over variable input price may be used (as in the US dairy margin protection programme).

4. *Why use a trigger-mechanism based on indices?* Ideally, schemes should be based on individual income but this requires farmers to keep standardised accounts. In addition, the administration costs do deal with each farmer individually will be very large. Therefore, index based schemes are probably the only practical option.

5. *Why should farmers pay a premium to participate*? The IST scheme should be designed in such a way that farmers are incentivised to use private mitigation tools and only insure residual, catastrophic risk using the IST tool. This can only be done by making participation in the IST scheme dependent on income and on participation in private schemes. This will reduce moral hazard and adverse selection problems.

6. *What are the budgetary implications of the RMP?* While the risk prevention part of the RMP coincides with other parts of the CAP, the budgetary implications of the IST scheme are difficult to predict. In the long run, with proper risk prevention and private risk mitigation measures in place, the burden on the budget should be limited. In the short run, as a rough indication we can compare the total CAP budget for the 2014-2020 period that amounts to 408.3 billion euro, with the 13.5 billion euro that have been paid through state aids in the 2007-2013 period, and which represents less than 5% of the total CAP budget. The European Commission has estimated the cost of an IST scheme in the EU-25, assuming 20% of all farmers would receive compensation each year at 4-7 billion euro (European Commission, 2011).

6. Concluding remarks

A Risk Management Policy should address the variability of farmers' income and not the level of income. The best ways to manage risk is to prevent risk from happening and to make farmers more resilient. We therefore argue that prevailing risk management approaches are far too piecemeal, as they attach too little attention on building long-term resilience, while paying too much attention on addressing short-term volatility. Building resilience involves reducing exposure to risk by dissuading farmers taking actions that actually increase volatility and maximising strategies that reduce the sensitivity of farmers to risk exposure. The former should be done by building incentive-compatible measures, while the latter involves making the right choices with respect to farm technology and land management. An important principle underlying a successful RMP is that farmers make their own choices about the instruments they use and the coverage they desire.

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