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Risk Management in Agriculture in Spain

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OECD

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Abstract

RISK MANAGEMENT IN AGRICULTURE IN SPAIN

by

Jesús ANTÓN and Shingo KIMURA*

This report analyses the agricultural risk management system in Spain, applying a holistic approach that considers the interactions between all sources of risk, farmers' strategies and policies. The policy analysis is structured around three layers of risk that require a differentiated policy response: normal (frequent) risks that should be retained by the farmer, marketable intermediate risks that can be transferred through market tools, and catastrophic risk that requires government assistance. The Spanish risk management system is dominated by public insurance. Two main policy issues are discussed in this paper. First, the contribution of the insurance system to market efficiency; this comes from the information sharing arrangement in the public private partnership, rather than from the premium subsidies. Second, the insurance system as a device for catastrophic assistance.

JEL: Q18

Keywords: Agricultural policy, risk management, catastrophic risk insurance, public-private partnership, information sharing.

* OECD Trade and Agriculture Directorate.

FOREWORD

The OECD project on risk management policy in agriculture (www.oecd.org/agriculture/policies/risk) developed the framework and methods originally published in *Risk Management in Agriculture: a Holistic Approach* (OECD, 2009). These were then applied to the analysis of the risk management policies of five countries: Australia, Canada, Netherlands, New Zealand and Spain.

All five country studies which resulted from this project followed the same process of preparation. The key inputs to these reports were: responses by governments to a detailed questionnaire prepared by the OECD Secretariat; a background report drafted by a national expert; an OECD Secretariat visit to the country with the participation of national and international experts; and a report on the country visit by an international expert.

The OECD Secretariat would like to highly acknowledge financial, information and organisational assistance of the Ministry of Environment, Rural and Marine Affaires (MARN) and the State Agricultural Insurance Body (ENESA) in preparation of this and other components of the project.

This project was led by Jesús Antón. The authors of this report are Jesús Antón and Shingo Kimura. The experts preparing the background report and the visit report for this study were, respectively, Professor Alberto Garrido* from the CEIGRAM research centre in Spain, and Professor Jean Cordier from Agrocampus in France. Statistical assistance was provided by Alexandra de Matos Nunes and Christine Le Thi. Editorial work was done by Michèle Patterson. The authors would also like to acknowledge the useful comments and discussions with several OECD colleagues.

* Co-authored by A. Garrido, I. Bardají, J.M. Durán, J. Estavillo, A. Iglesias and F. Medina.

Table of contents

Tables

Figures

Boxes

Abbreviations

	Spanish	English	website
ADNS		EU Animal Disease Notification System	*www.ec.europa.eu/food/animal/diseases/adns*
AEMET	Agencia Estatal de Meteorología	Meteorological State Agency	*www.aemet.es*
Agroseguro	Agrupación Española de Seguros Agrarios Combinados	Spanish Association of Combined Agricultural Insurers	*www.agroseguro.es*
CCAA	Comunidades Autónomas	Autonomous Communities or "regions" (with regional government)	
CCS	Consorcio de Compensación de Seguros	Insurance Compensation Consortium	*www.consorseguros.es*
CEIGRAM	Centro de Estudios e Investigación para la Gestión de Riesgos Agrarios y Medioambientales	Research centre for the Management of Agricultural and Environmental Risks	*www.ceigram.upm.es*
ENESA	Entidad Estatal de Seguros Agrarios	State Agricultural Insurance Body	*enesa.mapa.es*
ICO	Instituto de Crédito Oficial	Public Credit Institute	*www.ico.es*
MARM	Ministerio de Medio Ambiente y Medio Rural y Marino	Ministry of Environment Rural and Marine Affairs	*www.marm.es*
MEH	Ministerio de Economía y Hacienda	Ministry of Economy and Finance	*www.meh.es*
MFAO	Mercado de Futuros del Aceite de Oliva	Olive Oil Futures Market	*www.mfao.es*
RASVE	Red de Alerta Sanitaria y Veterinaria	Spanish network of Sanitary and Veterinary Alerts	*www.mapa.es/es/ganaderia/pags/rasve/rasve.htm#inicio*
SGAPC	Subdirección General de Análisis y Prospectiva del MARM	Unit for Analysis, Outlook and Coordination of MARM	

PART I.

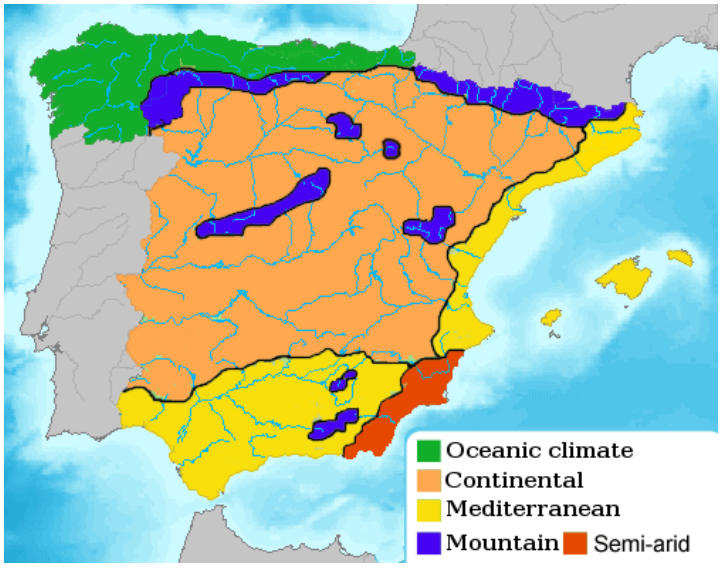
RISKS, STRATEGIES AND POLICIES IN SPAIN

1. An assesment of agricultural risk in Spain

Climate conditions: geographical diversity and irregular patterns of rainfall

The climate in Spain is diverse due to the country's geographic position and landscape characteristics. Only the northern part of the country is exposed to the jet stream path, and thus has regular and abundant rainfall. Several mountain chains isolate the inner plateau from the influence of the sea. Three major types of climate prevail in Spain[2] (Figure 1): oceanic in the north with mild winters, and warm summers and abundant rainfall over the year; continental in the centre with wide daily and seasonal temperature variations and low and irregular rainfall; and Mediterranean in the east and south, with rainfall concentrated in the autumn and spring periods, and irregular rain patterns. All this implies significant diversity of climate risks across the country.

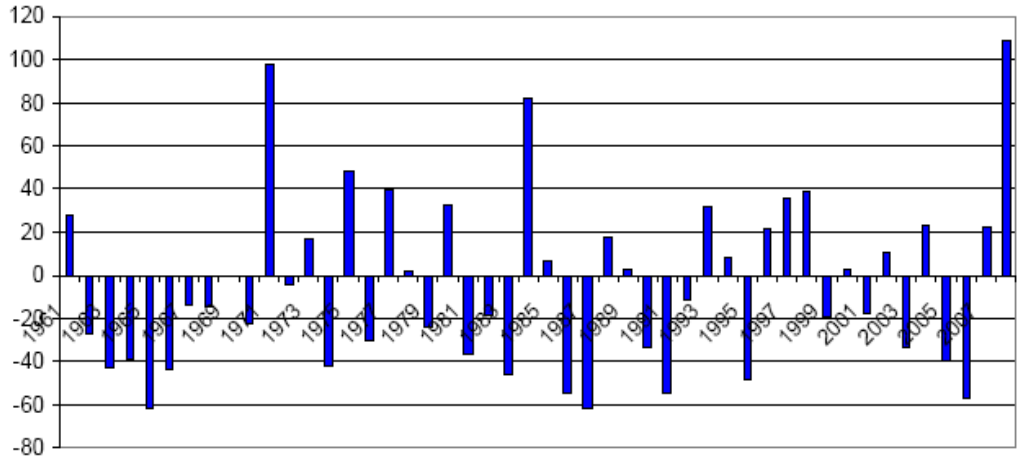
Figure 1. Major types of climate in Spain



2. In addition, the Canary Islands have a subtropical climate, the highest mountains in the Iberian Peninsula have an alpine climate, and the southeast region covering Alicante, Murcia and Almeria is the driest area with a semiarid climate.

In addition to this diversity of climate across regions, Spain as a whole is subject to significant variability of weather conditions. The deviation of annual precipitation from the average reference period level (1971-2000) exceeds 20% every fifth year. The deviations for individual months are even larger; for example, in May precipitation deviates from the reference period average by more than 30% every second year (Figure 2). This irregular precipitation and frequency of extreme weather events are characteristic of the Spanish climate and are important factors of agricultural risk in Spain.

Figure 2. Deviation of precipitation from the average level in the reference period for the month of May



Reference period is 1971-2000.

Source: AEMET (2009) *Annual climate summary 2008*.

Market conditions shaped by the Common Agricultural Policy

Spain has been an EU member since 1986 and producers make their decisions within the EU market and policy environment. Up to 2007, there existed 21 Common Market Organizations with different rules and policies. Heavy intervention and protection of markets have been reduced over the last two decades. Border measures have been relaxed and the institutional prices of different commodities reduced or abolished. Following the 1992 reform, cereal intervention prices were cut by 30%; smaller cuts in institutional beef and butter prices were implemented and direct payments per hectare or per animal introduced. The Agenda 2000 reforms further reduced the intervention prices for cereals (15%) and beef (20%), and also reduced by 15% intervention prices for dairy products with compensation in the form of direct payments. In 2002, the intervention price of beef was replaced by a basic price for storage with weaker impacts on market prices. The 2003 reform bundled many payments into a more decoupled single farm payment, and the intervention price was cut by 50% for rice and by 10% for butter. Recent sectoral reforms have also reduced or phased out price intervention mechanisms such as the payments for processed fruits and vegetables and the distillation schemes for wine. In 2008, a single Common Market Organization for all agricultural products was introduced. Intervention prices and mechanisms of the Common Agricultural Policy (CAP) have been crucial to buffering price variability of agricultural commodities and are highly relevant in determining the risk management options and decisions of Spanish farmers.

Perceived risks in agriculture

According to the *Barometer of Agricultural Insurance* (Ikerfel, 2008), crop producers identify hail as the most important risk (Table 1); the exception is viticulture where frost is the highest-ranking risk. This latter risk is also an important one for fruit growers who rank it second-highest. Price drops are the second risk for cereal, vegetables and citrus producers, and third for the other crop producers. The risk of drought ranks third for cereals, but fourth for other crops. Animal producers, however, perceive price drops as their main source of risk, followed by the major animal diseases.

Table 1. Risk perception rankings

Crop farming	Hail	Price drops	Frost	Drought	Other risks not controllable Diseases	Strong winds	Torrential rain	Floods	Excessive rain	Fire
Fruits	4.8	4.2	4.5	3.1	3.2	3.2	2.7	2.9	2.3	2.7	2.0
Viticulture	4.7	4.5	4.8	3.7	3.3	3.8	2.8	2.7	2.5	2.6	1.9
Cereals	4.6	4.5	4	4.4	4.2	3.9	3.3	3.5	3.6	3.4	3.9
Vegetables	4.8	4	3.8	3.5	3.5	3.2	3.2	3.3	3.1	3.1	2.6
Citrus	4.9	4.7	3.8	3	3.4	3	2.6	2.6	2.4	2.7	2.2

Animal farming	Price drops	Mastitis	Death at birth	Other diseases	Other accidents	Food poisoning	Death by choking	Wildlife attacks	Fire	Drowning by immersion
Bovine	4.3	3.9	3.9	3.3	3.3	3.2	3.2	3	2.9	2.6

Scale of 1-5: 1 = not important; 5 = very important).

Source: *Barómetro del Seguro Agrario* (IKERFEL, 2008).

Palinkas and Székely (2008) conducted a survey of risk perceptions in five EU countries (Germany, Hungary, the Netherlands, Poland and Spain). For all countries except the Netherlands, they found that the first and second-ranking risks were weather/natural disasters and price volatility. For the Netherlands, animal diseases/epidemic constituted the highest risk. This scored the third in most of the other countries. This survey also showed that in Spain farmers give significantly higher scores to weather and natural disaster risk than in Germany and the Netherlands.

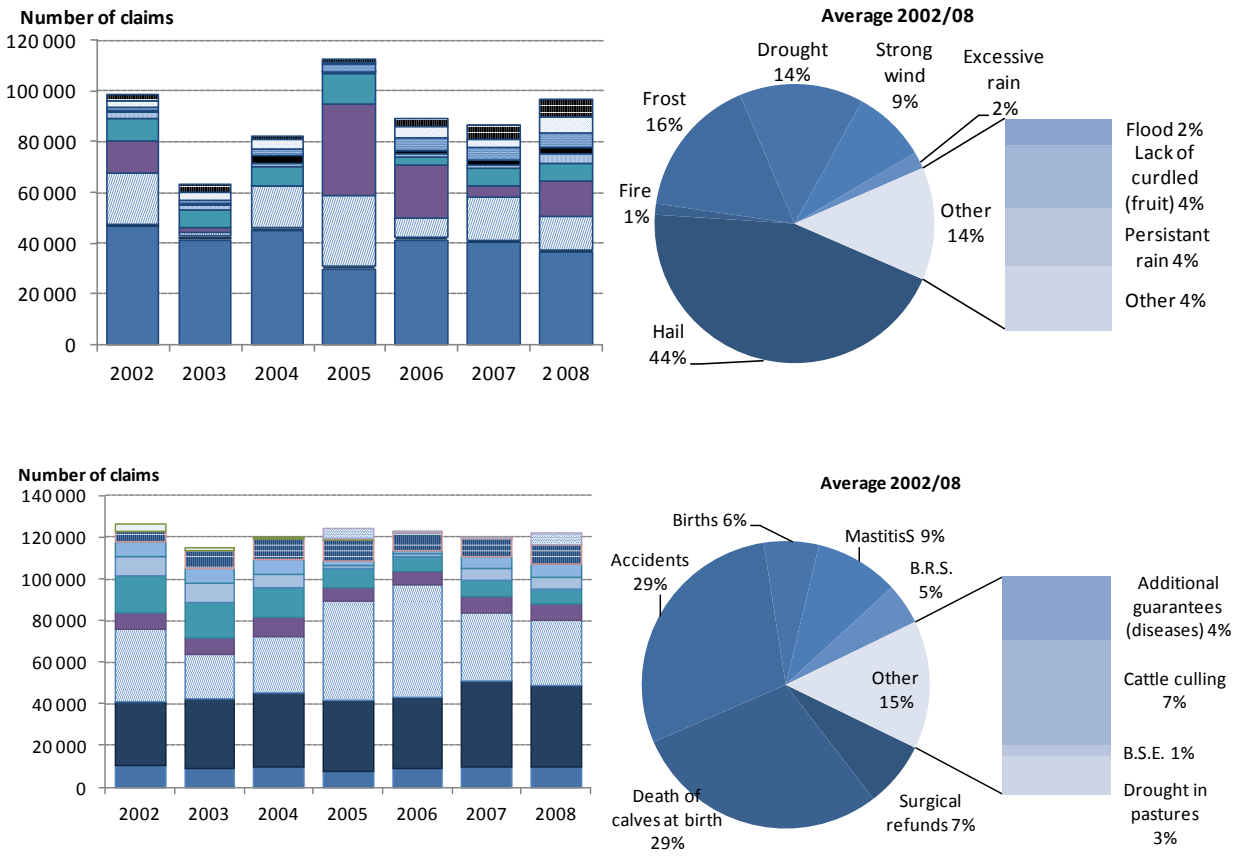
Using data from the insurance database from ENESA, Garrido *et al.* (2003) estimate the relative risk aversion coefficient of a sample of Spanish farmers in the provinces of Albacete and Zaragoza. They estimate coefficients that for 70% of the farmers are below 1, a level normally considered as "normal" or "somewhat risk averse" (Hardaker, 2000).

Quantitative assessment of agricultural risk

The only publicly available source for quantitative assessment of different agricultural risks in Spain is the database on claims for insurance indemnities developed and maintained by Agroseguro. The Farm Accountancy Data Network (FADN) is also a useful information source to analyze the risk faced by individual farmers following the methodology developed in OECD (2010).

The information provided by Agroseguro refers only to the number of claims, as reflected in Figure 3. Claims related to crops predominantly concern hail (44% of all claims in 2002-08), followed by frost (16%), drought (14%) and wind (9%). Among livestock claims those related to accidents and deaths at birth account for 29% each, followed by mastitis (9%) and surgical refunds (7%). These data have to be interpreted with caution for two reasons. First, the number of claims is not indicative of the amount of damage and the indemnities paid would be a better measure of risk. However, this information is not publicly available. Second, although the Agroseguro database provides information about the insured risks, it does not include risks outside the insurance system.

Figure 3. Main agricultural risks in Spain as revealed by insurance indemnity claims: crop and livestock sectors



Source: Agroseguros, *Annual reports*, Distribución de los Siniestros por Provincia y Riesgos (Agrícolas).

Table 2 summarizes some indicators of different sources of variability for cereal farms in Spain. They are extracted from individual information taken from a sample of farms, but may not be representative for all farms in Spain. Yield variability measured by the coefficient of variation (CV) is larger than price variability for the two commodities presented Table 2 (wheat and barley). This is frequently the case for countries in the European Union where, despite the reductions in intervention prices, this mechanism remains in place in order to reduce price variability. Yield variability is significantly larger at the individual level than at the aggregate level. For instance, in the case of barley the CV of yields at farm level was 36% as compared with 24% at aggregate level and 82% of the farms in the sample experienced yield variability above the aggregate average level.

In contrast to the results for the majority of other countries, price and yield are positively correlated in the Spanish sample, even though with relatively weak correlations of 15% for wheat and 22% for barley. Farmers in the sample cannot count on natural hedging to reduce their risk, but diversification strategies continue to play some role; the CV of revenue from wheat and barley is 55% and 54% respectively, but due to diversification in production, farm revenue is less variable with a CV of 42%.

Table 2. Some variability indicators of a sample of cereal farms in Spain (2001-07)

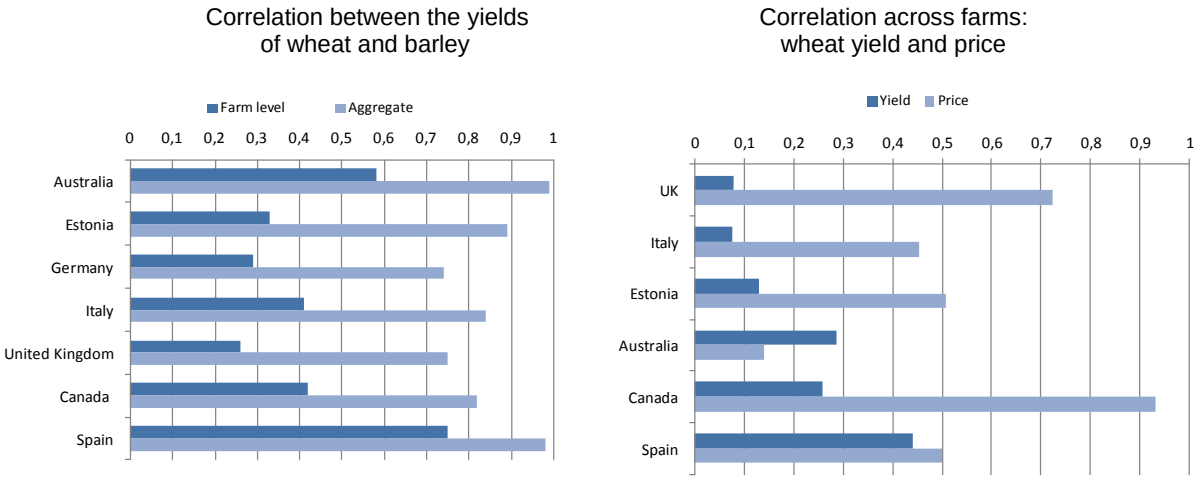
			CV Wheat	CV Barley	Correlation (wheat, barley)	Correlation across farms (wheat)	Correlation across farms (barley)
Yield							
	Farm Yield		40	36	75	44	48
	Aggregate yield		29	24	98		
	% of farms with higher variability than aggregate		78	82	29		
Price							
	Farm Price		21	21	73	50	54
	Aggregate price		18	15	95		
	% of farms with higher variability than aggregate		68	73	45		
		CV total farm					
Revenue							
	Farm revenue	42	55	54	75	40	60

Source: OECD calculations on the basis of a non-representative sample panel of 107 crop farms from the FADN database.

The main characteristic of the risk profile of cereal farms in the Spanish sample as compared to other countries is the strong systemic nature of the risk. Most indicators of correlation across farms and across commodities show numbers of similar magnitude for price risk (this is by nature highly systemic) and yield risk. In fact production risk as represented by yield variability is very systemic in Spain. The correlation between yields of barley and wheat is 75% at the farm level and 98% at the aggregate level. These are among the highest numbers in the left-hand graph of Figure 4. Wheat yield correlation

across farms is as high as 54% in the Spanish sample, the highest number among the countries in Figure 4, followed by 28% in Australia. Spain and Australia share a common characteristic in their risk profiles: the systemic nature of their production risk that to a great extent is linked to these countries having similarities in climate conditions, in particular the incidence of droughts.

Figure 4. Correlations between different sources of risk in different countries



Source: OECD (2010b) and OECD calculations based on a sample of FADN data.

It is difficult to evaluate the importance for Spanish farmers of other risks not included in the Agroseguro and FADN databases such as financial or regulatory risks, because there is no relevant database. The survey by Palinkas and Székely (2008) estimated the rating of debt and political risk. Farmers in Spain gave lower importance to these risks as compared to price and weather risks, and as compared to the rating observed in Germany and the Netherlands.

Work undertaken by Vrolijk and Poppe (2008) identified the differences between farm income volatility across EU farms, including Spanish ones, focusing specifically on FADN categories of "arable farms" and "intensive livestock farms." For arable farms, their results show that while crop yields exhibit relatively higher volatility in Spain than in Germany, Hungary and Netherlands, Spanish farms are more financially robust. This is because they are less indebted and are less leveraged financially. For instance, these authors estimate that following a global crisis with a 30% drop in output revenue, 77% of Spanish arable farms would continue to have income that is higher than the opportunity cost of capital and labour, whereas this share is would be only 30% in Germany, 31% in Hungary, and 17% in Netherlands. Spanish arable farmers supposedly rely less on external sources of capital, have lower operational and opportunity costs, but have greater exposure to yield volatility. In contrast, Spanish intensive livestock farms do not show marked differences from those in other EU member states.

Information and communication on risk and risk management

There are several agencies and institutions in Spain that collect and provide information about risks that are relevant for farming (Box 1). Most of this information is related to recent meteorological data by the Drought National Observatory, or the

Insurable Risks Observatory, or short-term forecasts, particularly by the Spanish Meteorological State Agency that provides customized services by subscription.

Box 1. Sources of information about agricultural risks in Spain

The Spanish Meteorological State Agency AEMET's website provides climate information and detailed geographical information about recent past and one week predictions about meteorological conditions, with a diversity of maps. More targeted services can be obtained by subscription.

The Spanish Ministry of Environment, Rural and Marine Affairs (MARM), maintains a Drought National Observatory that provides on its website updated information about water availability and precipitations and makes reports about drought management in Spain (http://www.mma.es/portal/secciones/aguas_continent_zonas_asoc/ons).

The Spanish State Agricultural Insurance Body (ENESA) maintains an observatory of insurable risks (http://aplicaciones.mapya.es/pwe/pwe_uva.p_inicio?p_Cod_Menu_Anterior=20000) which provides information through its public website –mainly in the form of maps- about ground temperature, frost, snow, storms, floods and sun hours in the previous few days. This information is provided by the Tele-detection Laboratory of the University of Valladolid. The ENESA website has detailed information about the insurance system, legislation and subsidies in Spain and also statistical information, although it is under protected access for identified users.

AGROSEGURO is the owner of the insurance micro data base in Spain. Its website provides annual reports on the financial results of the company and some aggregate information about the different insurance lines. It also provides information about the characteristics of the insurance policies in each year. Most information is restricted to specified users.

CEIGRAM is the Research Centre for the Management of Agricultural and Environmental Risks, created in 2007 as a partnership project between the Madrid Polytechnical University, ENESA and the insurance company Agromutua. Its main focus is on scientific knowledge about risk management in the rural environment, with a priority on agricultural insurance. Its website does not provide statistical information or analysis of different risks in agriculture.

The Food Price Observatory of the MARM collects weekly information about the evolution of prices along the food chain for about forty mainly fresh products. These are national weighted average prices based on market observations in different geographical locations. The full time series and some reports are available in the website. The objective of this instrument is to add transparency to the markets along the food chain.

For animal diseases, there is a European Animal Disease Notification System (ADNS) to which the Spanish system RASVE is connected. It is part of the World Organization for Animal Health (OIE) and gives information on animal diseases outbreaks in Spain and in the world in real time.

The micro information from the insurance database is managed by the private company Agroseguro which provides aggregate information to the public on agricultural risks, although this information is limited in scope. Individual researchers and research centres like CEIGRAM provide one-off studies on agricultural risk management with particular emphasis on insurance, sometimes using information available from the Agroseguro database. To date, research and information on risk management in Spain has placed little focus on price and market risk issues.

There are several outreach initiatives – mainly led by ENESA and implemented through producer organizations – to disseminate the content and operation of the insurance programmes. These activities are focused on informing farmers about available supported insurance programmes, rather than on increasing their general knowledge and awareness of the whole set of risk management instruments and strategies available to farmers.

2. Risk management strategies and policies in Spain

Table 2 is a summary of risk management instruments and strategies that are of special importance in Spain. The strategies are classified in the table according to two criteria following the framework in OECD (2009): whether it reduces the probability of occurrence (risk reduction), the magnitude of the damage (risk mitigation) or the impact on consumption (risk coping), and whether its main action takes place at the farm household / community level, through markets, or through government measures. The strategies and instruments in Table 2 do not claim to be exhaustive, but highlight the strategies that have special relevance in the country. This allows comparisons to be made with the main strategies used in other countries. The mapping between these strategies and the risks that have been defined in Chapter 1 are specific to the risk and institutional environments of each country. There are risks that because of their catastrophic nature (low probability but high damage) are difficult to manage at the farm level or through market instruments, and for which government policies typically play an important role. There are risks that are more "normal" (low probability and low damage) and which are typically managed at the farm business or household level, without significant involvement by markets or government. Finally, there are risks with medium probability and medium damage that are more appropriate for risk transactions through market instruments.

This chapter successively analyses the strategies that are used at the household level, market strategies and government measures that deal with catastrophic risk. In practice, there are government measures that have direct implications for the three layers of risk, normal, marketable and catastrophic, and are discussed back-to-back with the corresponding farm household, market and catastrophic risk strategies. The last subsection of this chapter is dedicated to an overview of government measures which are listed in Table 13. The classification of measures follows the criteria based on policy implementation and policy objectives, and the analysis is intended to clarify how the different policy measures fit into the different risk layers. The boundaries between different risk layers are, in practice, endogenous to the specific risk and policy environment.

Unfortunately, no single source exists that could help quantify the use of different risk management strategies in Spain. Table 3 summarizes the key risk management instruments available. The insurance system is at the centre of the available risk management strategies. Due to regulation and subsidization by the government, the insurance strategy in Spain constitutes a hybrid institutional form combining both market and government involvement.

Table 4 shows the results of a survey by Palinkas and Székely (2008), according to which 59% of respondents in Spain used crop insurance and 37% used livestock insurance. These shares are slightly below those in Germany, but above those in the Netherlands. Other strategies, such as diversification, marketing or production contracts, off-farm investment or employment, credit/reserves or hedging, are generally used less in Spain than in other countries.

Table 3. Risk management strategies having special importance in Spain

	Farm household and community	Market	Government
Risk reduction	• Production practices • Irrigation		• Prevention of diseases • ***CAP Price support****
Risk mitigation	• Diversification in production • Off-farm income	• Sales through cooperatives • Vertical integration in pork and broiler • **Insurance**	• ***Control and compensation of contagious disease****
Risk coping	• Family assistance		• Disaster relief • ***CAP Single Payment Scheme****

* These policy measures are subject to the CAP or coordinated by the European Union.

Table 4. Share of farmers using different risk management instruments

Per cent

Percentage of cases	Germany	Netherlands	Spain
Crop insurance	68.7	30.5	59.2
Livestock insurance	42.8	37.2	36.6
Diversification	28.4	11.5	18.8
Marketing contracts	49.3	18.6	12.6
Production contracts	16.4	20.8	5.8
Off-farm investment	49.8	6.2	5.8
Off-farm employment	36.8	17.7	4.7
Property insurance	75.1	66.8	29.8
Vertical integration	7	4.4	12.6
Avoiding Credit	31.3	38.1	36.6
Hedging	5	1.3	1
Holding financial reserves	61.2	22.6	22.5

Source: Palinkas & Székely inM. Meusissen and M. Van Asseldonk, *Income stabilization in European Agriculture*, Wageningen Academic, 2008. Results from a survey of about 1 000 farmers.

Strategies at household / community level

Diversification and off-farm income

Single-crop farms are rare in Spain as most farms are diversified. There is, however, no information on the contribution of diversification and rotation practices to smoothing farm returns.

There is some evidence that non-farm income is becoming more important for Spanish farm households. According to the *Survey of the Structure of Farm Holdings in 2007*, the farm owner and his/her family provided 65% of the farm labour. However, this contribution is gradually falling, as is the percentage of farm household heads who work exclusively in farming (Compes and García Álvarez-Coque, 2009). The same Survey shows that only a maximum of 3.7% of farmers undertake non-farming activities (Table 5), somewhat below the 4.7% reported by Palinkas and Székely (Table 4). Despite the low importance of off-farm diversification (according to Moreno Pérez, 2009 there is still a wide gap with respect to diversification in other EU countries), it seems to be of growing interest in the farming sector.

Table 5. Importance of off-farm economic activity in Spanish farm holdings

	2003		2005		2007	
	Number of holdings	% of total number	Number of holdings	% of total number	Number of holdings	% of total number
Tourism	10 408	0.92	4 598	0.43	5 551	0.54
Crafts	654	0.06	354	0.03	407	0.04
Product transformation	11 106	0.98	15 014	1.40	13 048	1.26
Wood processing	372	0.03	130	0.01	297	0.03
Fish farm	88	0.01	78	0.01	90	0.01
Renewable energy initiatives	98	0.01	270	0.03	585	0.06
Contracted services	2 324	0.21	1 633	0.15	6 254	0.60
Other activities	1 933	0.17	12 265	1.15	12 471	1.20

Source: INE, *Encuesta de Estructura de las Explotaciones*, various years.

Saving / borrowing

Agricultural producers in Spain have good access to credit markets and rural banks. In most cases, farmers borrow to meet their working capital needs, and to a much lesser extent to purchase machinery or land. Farmers' outstanding debt grew to EUR 23 billion in 2007, from EUR 16 billion in 2004, increasing at an annual rate of 12.6%. Outstanding debt was equivalent to the sector's net income in 2006, whereas it was only 55% in 2004. In 2007, the debt decreased to 91% of the farms' net income and comprised 96% of the sector's gross value added. Farm financing can be obtained from both public and private credit institutions (Table 6). Public participation in the credit system takes place mainly through the *Cajas* (saving banks owned by provincial or regional governments, with a special tax and management status).

Table 6. Evolution of debt in the agricultural sector

EUR million

	2004		2005		2006		2007	
	Value	%	Value	%	Value	%	Value	%
Commercial banks	4 263.9	26.9	5 515.7	30.0	6 516.6	31.41	7 350.1	32.45
Public banks (Caja de Ahorrro)	6 089.4	38.4	6 940.8	37.7	8 095.6	39.03	8 827.8	38.98
Credit cooperatives	5 236.4	33.1	5 655.4	30.7	5 791.7	27.92	6 120.2	27.02
State banks and others	250.2	1.6	280.0	1.5	340.7	1.64	349.5	1.54
Total	15 839.9	100	18 391.9	100	20 744.6	100	22 647.6	100

Source: Bank of Spain.

Government measures to support farm household strategies dealing with "normal risk"

Social security

There is a compulsory social security system specific to farmers. Historically, the stock of farmers' social security holdings has been insufficient to finance pensions and outlays, so this system had to rely on transfers from the general social security system. This is because farmers' contributions have been generally low, and because many active farmers have been retiring without being replaced (Table 7). The special Social Security farm regime runs an annual deficit of about EUR 200 million, although the average pension for farmers is only EUR 440 per month. The number of retired people has been well above the number of active workers over the past decade. The gap widened between 2000 and 2008, mainly due to the high number of retirements of self-employed farmers, rather than of hired labour. The contributions of active workers are equivalent to about 10% of all pensions underwritten in the system. The remaining 90% is contributed by the state budget (Garrido *et al.*, 2009).

In addition to the pension regime, the Social Security System offers special welfare support for unemployed farm workers in the Autonomous Communities of Andalusia and Extremadura (Table 8). These two communities have the largest proportion of temporary farm workers in Spain.

Table 7. Number of workers registered in the social security system

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Registered									
Self-contracted	332 800	315 600	301 800	293 500	283 700	271 800	259 300	247 900	(1)
Hired	806 900	812 000	821 700	840 700	802 200	772 000	739 900	721 000	744 500
Total	1 139 700	1 127 600	1 123 500	1 134 200	1 085 900	1 043 800	999 200	968 900	744 500
Retired (with pension)									
Self-contracted	895 570	882 751	866 723	846 740	826 480	808 185	790 272	771 008	(1)
Hired	676 510	674 024	672 064	667 929	662 211	659 750	655 742	650 935	648 547
Total	1 572 080	1 556 775	1 538 787	1 514 669	1 488 691	1 467 935	1 446 014	1 421 943	648 547

1. After the Law 18/2007 entering into force as of 4 July, self-contracted workers became integrated the Special Regime of Self-contracted Autonomous Workers.
Source: Ministry of Labour and Immigration.

Table 8. Number of beneficiaries among temporary unemployed farm workers (in 1000)

Autonomous Communities (Regions)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Andalusia	195.5	203.9	196.09	174.0	170.3	165.3	160.3	151.7	143.7
Extremadura	28.7	29.6	28.53	28.06	27.0	25.9	24.5	23.5	22.6
Total	224.2	233.5	224.62	202.06	197.3	191.3	184.9	175.2	166.3

Source: Ministry of Employment and Immigration.

Tax system

Available data convey no clear message about the income-stabilization effect of the personal tax paid by farmers (foresters and fishermen). Farmers with an agriculture turnover that does not exceed EUR 300 000 can choose to be taxed through a special Objective Estimate method for personal income tax. This method involves a simplification of the calculation of the net return of each production as a fixed margin on the value of sales plus the amount of the subsidies. This margin expressed as a percentage is called "module". The modules depend on the type of production and vary between 13% and 56%, with an approximate average of 28% margin on sales. The application of this simplified calculation method also implies a reduction in the number of formal requirements farmers must comply with; the use of this simplified method has gradually expanded and is currently used by the majority of farmers (more than one million). There is no provision to allow for a "moving average" adjustment of farm income.

The calculated margin is not automatically adjusted in "bad years" when the economic margin between output prices and input costs is smaller, and the system loses

part of its automatic stabilization feature. This explains why modules have often been used as a discretionary instrument of disaster relief. Since 2000, at least 16 Royal Decree-Laws modifying the modules that apply to specific locations have been published. The reductions are approved by the Ministry of the Economy and Finance (MEH) based on a proposal by MARM. Declared agricultural returns represent between 17% and 53% of total declared income (including non-farm income) for the most frequent ranges or income. The system seems to be advantageous because of its simplicity for tax declaration (there is no need for detailed accounting reports) and because it is likely to underestimate returns, but it has the inconvenience of weakening the income smoothing potential of the tax system.

Fuel tax rebates

In December 2005, the government signed an agreement with farmer organizations to undertake several measures that reduced the impact on farmers of higher input prices, particularly fuel. The measures included a reduction in income tax and value added tax for farmers, estimated to add up to more than EUR 300 million (MARM. 2007). The measures also included a fuel tax rebate to be extended until 2008 if oil prices remained above a certain threshold. The fuel tax rebate was estimated at about EUR 100 million per year. It was refunded to farmers with a significant delay, sometimes beyond one year. This was considered as an extraordinary measure and the mechanism was designed to be countercyclical with fuel prices However, it was triggered several consecutive years, thus becoming a part of the farmers' tax regime. This tax rebate was coordinated by the Ministry MARM through the unit that deals with *ad hoc ex post* assistance (SGAPC), and in that sense was treated as an "exceptional" measure that could be perceived as part of the catastrophic risk layer.

Market price support (MPS) measures

MPS measures include border measures such as import tariffs and export subsidies, and domestic measures such as production quotas, administered prices, intervention purchase, and assistance to private storage. These are all decided and provided at the EU level rather than at the national level and, despite the progressive reduction of these measures in the last two decades, several mechanisms remain (Table 9). The implementation of these measures is governed by a single Common Market Organisation (CMO). The CMO also include various aid schemes such as aid for processing or for consumption, and provides rules concerning marketing and production standards, the recognition of producer and operator organisations by member states, and competition within the Common market, including rules applying to State aids. In 2009, EU expenditures on MPS measures accounted for 8% of CAP expenditures and 10% of Pillar I funds.

The MPS category of the OECD PSE does not consider expenditures on specific measures described below, but calculates support to producers of a given commodity resulting from MPS measures as the difference between observed domestic producer prices and equivalent prices at the border. In 2007-09 MPS estimates accounted for 29% of support to producers, as measured by the PSE. By its own nature MPS and some of these measures reduce the variability of domestic prices in the European Union and in Spain.

Table 9. Market price support measures in the European Union in 2009/10

	Wheat	Other cereals	Rice	Oil-seeds	Sugar	Fruits and veg	Milk/ dairy	Beef	Sheep	Pigs	Poultry/ eggs
Import tariffs	x	x	x		x	x	x	x	x	x	x
Tariff rate quotas	x	x	x		x	x	x	x	x	x	x
Export subsidies	xo	xo	xo		xo		x	x		x	x
Production quotas					x		x				
Public intervention	x[1]	x[1]	x[2]		*		x	xo			
Private storage					xo		xo	xo	xo	xo	
Market withdrawals						x					
Consumer subsidies						x	x				

ε: negligible; x: exist in 2009/10; xo not currently used.
1. Ceiling set to 3 million metric tonnes for common wheat, ceiling set to zero for durum wheat, barley, maize and sorghum, abolished for rye (never existed for oats).
2. Ceiling set to zero.
* Ends with the marketing year 2009/10.
Source: WTO notifications; PSE database; OECD, 2009.

All agricultural support policies in the European Union's Common Agricultural Policy (CAP)

CAP programs have offered a number of payments that facilitate the management of risk. Since the introduction of the single payment scheme in 2006, a significant part of farm support has become decoupled from production of specific commodities. Due to higher transfer efficiency, support has now a larger impact on farm income than in the past, although total revenue is more exposed to price risks. Payments varied significantly by crop, and are higher for cereals and oil crops and for extensive livestock production (Table 10). Among typical Mediterranean crops, the largest aid is directed to the olive oil sector. The distribution of aids among farm holdings can affect their capacity to facilitate risk management. The distribution of the original CAP schemes based on price support mechanisms, have determined to a great extent the current distribution of direct payments.

Table 10. Common Agricultural Policy aids to specific agricultural sectors in Spain

	2000/2002		2003/2004		2006	
	EUR Million	%	EUR Million	%	EUR Million	%
Single aid payment					2 197.42	47.36
Arable crops	1 688.03	35.04	1 650.48	34.23	587.86	12.67
Set-aside	333.05	6.91	91.80	1.90	6.58	0.14
Rice	22.81	0.47	72.52	1.50	52.51	1.13
Olive oil	929.19	19.29	958.11	19.87	221.71	4.78
Pulses	61.25	1.27	57.75	1.20	7.12	0.15
Cotton	213.52	4.43	218.10	4.52	70.33	1.52
Flax and hemp	31.37	0.65	0.15	0.00		
Fruits and vegetables	295.82	6.14	378.45	7.85	383.5	8.26
Banana (Canarias)	132.62	2.75	97.75	2.03	46.49	1.00
Tobacco	114.13	2.37	111.09	2.30	76.91	1.66
Bovine	552.86	11.48	802.18	16.64	745.25	16.06
Sheep and goat	442.60	9.19	382.78	7.94	244.53	5.27
Total	4 817.27	100	4 821.15	100.00	4 640.21	100.00

Source: Ministerio de Medio ambiente y Medio rural y marino (MARM) *La agricultura, la pesca y la alimentación*.

Hybrid insurance system

The agricultural insurance system in Spain is an institutional arrangement whose origins date from the consensus years that allowed the approval of the Spanish Constitution in 1978 (Box 2). As a consequence, the agricultural insurance policy has enjoyed political stability and a sustained expansion of budgetary allocations for more than three decades. The system is characterized by a set of arrangements and institutions that maintain a delicate balance. Farmer organizations participate in the management of the system, insurance companies are interested in supplying the policies, the Spanish and regional governments give their political support via their budgets, and all actors are supposed to oversee for the actuarial soundness of the system (Section 3). It is a hybrid arrangement in which the risks are transferred to private insurance companies, farmers contribute by paying part of the premiums, and the government covers the rest of the costs. It has been designed to "cover the consequences of catastrophic events" and was to be a substitute to *ad hoc ex post* assistance the government could not afford under the unstable economy and policy environment of the late 1970's. Before this Law, only single-event perils, such as hail and fire for cereals, were insurable through a private system and the government provided *ad hoc* disaster assistance.

Agricultural insurance policy in Spain is not just trying to solve a market failure in the agricultural insurance market, it is designed as a governance device to reduce the recourse to *ad hoc* disaster assistance by the government in the context of a public-private partnership. Sections 3 and 4 analyze the strengths and weaknesses of the system to tackle both insurance market failures and social demands for disaster assistance.

Box 2. The legal basis of the Spanish Insurance system

In 1977, Spain was suffering the deepest economic crisis in many decades, with growing, and already two-digit inflation and unemployment. Less than two years after the death of Franco and the coronation of Juan Carlos, the country was suffering from economic, social and political instability while new democratic institutions were emerging. In June 1977, the main democratic parties and trade unions signed a historical agreement called *Pactos de la Moncloa* which sought to create minimum economic and social stability to fight the recession and to strengthen the democratic institutions. Concerning agriculture, the most relevant element of the agreement was the commitment to present to Parliament an Agricultural Insurance Law that "would protect farmers from the consequences of catastrophic events".

The Agricultural Insurance Law was approved by the Spanish Parliament and made law in December 1978, just a few weeks after the approval in referendum of the Spanish Constitution that brought democracy to the country. This was the first Law under the new Constitution and it was negotiated at the same time that political parties were drafting the Constitution. Since then the Law and the insurance system that it developed has been identified with the consensus spirit of the political transition to democracy and, consequently, it has been defended by all Spanish governments and main political parties, and it has survived to the integration in the European Union and the application to Spain of the Common Agriculture Policy and its successive reforms.

The main principles in the Law are the following: the subscription of insurance policies will be voluntary; farmers will participate in the system through their own associations; the State will enhance statistical and actuarial research; products, areas, and risks will be added progressively until there is "total coverage"; the financial support from the government will be between 20% and 50% of premiums. There is hardly any reference in the Law to private insurers and there is a clear mandate to make the system "progressive" in terms of protecting farmers with less economic means, while giving incentives to collective subscription policies.

The Law of Combined Agricultural Insurance of 1978 states that the insurance covered by the system includes damage to agricultural production caused by abnormal variations in natural conditions, such as hail, fire, drought, frost, flood, wind, snow, pests and diseases. It also states that "the combined insurance of all these risks, will be put in place progressively for different sectors, areas and risks, until their full coverage".

The system is financed by the Spanish and regional governments. The EU declares these subsidies (State aids) under the Agreement for Agriculture in WTO as non-commodity specific *de minimis*. Following the CAP Health Check it is possible to use EU funds to subsidize insurance policies under certain conditions (new Article 68), but Spain currently does not plan to use EU funds for this purpose. Making the Spanish support to agricultural insurance suitable for funding from Article 68 of the CAP or for green box declarations under current WTO rules would require some adjustments to the current system.

Box 3. Agricultural insurance in different European Countries

Agricultural insurance is available in different countries in a wide variety of formats and with varying degree of public-sector involvement. The European Commission report *EC (2006)* and Bielza *et al*. (2009) offer a detailed compilation of the situation in the European Union, which is evolving over time and in some EU member countries such as Austria, Italy, France and Spain, has expanded significantly in the past few years.

Penetration rate is defined as the share of production that has some insurance. This rate varies significantly across EU countries: the largest percentages for crop production are in Austria, Germany and Luxembourg with more than 50% of the value insured; for livestock, the Czech Republic and Germany and Spain with more than 40%. In the middle group, are Luxembourg, Cyprus, France, and Spain, the latter with around 30% of the value of production insured (Garrido and Bielza, 2008). Other indicators of the development of insurance are the spread of different risks and the proportion of capital (guarantee level) that is covered by the insurance policies. This is normally called insurance coverage, but it is not reflected in the penetration rates (Tables 9 and 10).

There are a number of factors that explain these differences. First, agricultural insurance exists both with and without government support in the form of premium subsidies. Second, even if a country has a very high insurance penetration rate among crop and livestock farmers, this does not mean that the majority of crop or animal risks are covered. Garrido and Bielza (2008) identify a group of Mediterranean countries (Portugal, Italy, Spain, Slovenia, and Romania) with higher subsidy rates, and premiums that are relatively large with respect to total insured production because the coverage provided is high (many risks and/or high risks). At the other extreme, they identify Germany, Denmark, France, Ireland and Sweden with premiums and subsidies that are relatively small or zero. Penetration rates are greater in countries where insurance is less subsidized, but coverage is broader in the first group.

Insurable risks in Spain

For most crops, the following risks can be insured in Spain: floods, persistent rains, freeze, hail, wind and frost. For some crops, including cereals, other arable crops, fruits and olives, yield losses due to any weather events can be insured in the policies with the broadest coverage. For bovine cattle, farmers can purchase insurance against losses caused by surgical operations, deaths of calves during birth, death at birth, mastitis, BSE, BRS, cattle culling, removal of dead animals, and drought in pastures. In addition, since 2008, foot and mouth disease coverage was included in cattle insurance. Tables 11 and 12 report the available policies and the share of the value of production that can be insured against (coverage).

Table 11. Coverage for winter cereals and arable crops*

OPTION	HAIL	FIRE	FROST	DROUGHT	HEATWAVE	GALE	WIND	RAIN	FLOOD	PERSISTENT RAIN	CLIMATIC HAZARDS	NO GERMINATION	WILD FAUNA	EXCEPTIONAL DAMAGE	PLAGUES & DISEASES
Integral winter cereals	100	100	65	65	65		65	65	65		65	65			65
Multiple peril	100	100							100	100				100	
Multicrop for herbaceous extensive crops	100	100				100			100	100				100	
Yield insurance	100	100	70-50	70-50	70-50	70-50			70-50	70-50	70-50	70-50			

* The numbers reflect the guarantee levels.

Table 12. Coverage for animals

OPTION	LIGHTNING	DROWNING	FIRE DAMAGE	GALE	SNOW	HAIL	HEATWAVE	PANIC	SWINE FEVER	AUJESZKY	AVIAR FLUE AND NEWCASTLE DISEASE	SALMONELLA	FOOT AND MOUTH DISEASE
Laying hens	x	x	x	x	x	x	x				x	x	
Broiler	x	x	x	x	x	x	x	x			x		
Pigs	Dead or slaughtered from any accidental cause, except for epizootias specifically not covered								x	x			x
Bovines for fattening	Dead or slaughtered from any accidental cause, except for epizootias specifically not covered												x

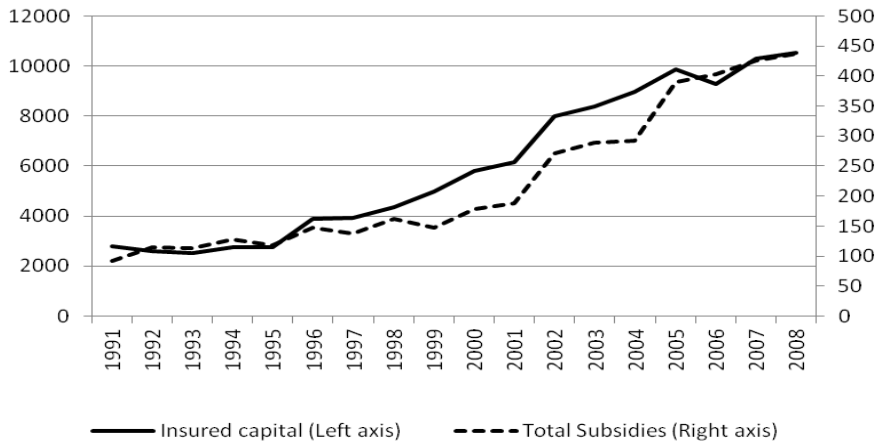
Source: Enesa.

Penetration rates (share of production that is insured with some policy) vary significantly across products and degree of insurance coverage. In general, the newest guarantees exhibit lower rates of penetration. The more mature ones, like those offered for winter cereals and arable crops, have penetration rates above 75%, and others, like those offered for "bananas" or "destruction of dead animals," are above 90%. Other penetration rates are: fruit crops 78%, citrus 51%, vegetables 46%, vineyard 39%, olive trees 14%, milk cows 51%, beef 18% and sheep 8% (Zorrilla, 2010). There is no study that identifies factors to explain the differences in penetration rates.

The Spanish agricultural insurance system has evolved gradually since the Law of Agricultural Insurance was passed in 1978. The number of insurable crops covered has been expanding in a sort of learning-by-doing process, as described by Burgaz and Pérez-Morales (1996). Figure 5 plots the growth of insured capital and farm subsidies from 1991 to 2008. Growth accelerated from the late 1990s to the present, based primarily on the growth of livestock insurance schemes, which now represent almost 50% of sold policies and a third of total liability.

A given hazard is included in the menu of insurable risks when the General Committee of ENESA reviews the results of technical studies and approves it. In many cases, pilot programs are launched for specific provinces or *comarcas*. The menu of policies has grown year after year, although in a few cases policies have been removed from the menu if the demand for them was limited, and technical or actuarial difficulties arose.

Figure 5. Insured capital and Premium subsidies in Spain (1991-2008)
(EUR million)



Source: ENESA (2008).

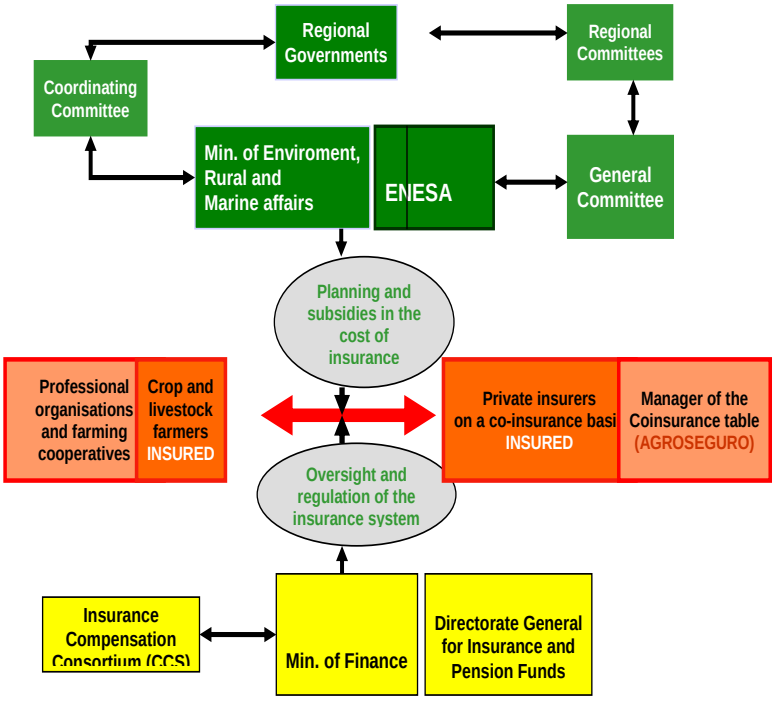
Two factors explain the observed growth of insurance in Spain. The first is related to its institutional balance and regulatory framework. The three-legged system on which these are based involves public administrations (ENESA and CCS from the central government; and regional governments), the private sector (Agroseguro and the insurance companies), and farmers organizations with a clear mandate to ENESA to expand the insurance system to cover all "non-controllable risks" for all farm products to all producers in Span. The second factor is that the central government provides a solid foundation (with the public reinsurer, CCS, and control by the insurance authorities) and finances about 60% of the insurance premia through subsidies.

Institutions participating in the Spanish insurance system

Figure 6 presents the main institutions operating in the Spanish Insurance System. The State Entity for Agricultural Insurance (ENESA) is the main policy decision-making body, but other public and private agencies and organizations participate in the decision-making process.

ENESA is an autonomous body attached to the Ministry of the Environment and Rural and Marine Affairs (MARM), presided by MARM's undersecretary, and the coordinating hub for the daily running of the system. Its main functions are to draft and monitor the Annual Plan of Agricultural Insurance Policies approved by the government, to provide insurance subsidies to farmers and decide on the criteria for different rates of subsidy, to coordinate with the Autonomous Communities (regional governments), to establish the minimum technical conditions and deadlines for subscriptions to insurance policies, to inform farmers on the conditions proposed by Agroseguro, to carry out technical/financial viability studies for the inclusion of new agricultural products and risks and to arbitrate all disputes arising between insurers and the insured. The General Committee that governs ENESA includes representatives from farmer organisations and cooperatives, the Ministries of Economy and Finance (MEH) and the MARM, the regional governments (CCAA) and Agroseguro. The annual plans are drafted jointly by these institutions. The sequence of these plans has determined the evolution of the insurance system.

Figure 6. Institutional setting of the Spanish insurance system



Agroseguro is a private company owned by private insurers who participate in the agricultural insurance scheme. Agroseguro is a single co-insurance group that:

- administers the pool of insurance policies on behalf of the shareholding insurers (processing of insurance policies and insurance claims),
- owns and administers the insurance database,
- does statistical studies and actuarial research, decides on the premium and other conditions of the insurance policies (respecting ENESA's annual plan provisions),
- manages reinsurance not covered by the *Consorcio de Compensación de Seguros* (CSS) with other national or international reinsurance companies, and
- undertakes complementary work for the government such as the assessment of damage not covered by insurance policies, including catastrophic risks.

Agroseguro makes the farmer pay the premium net of the insurance subsidy, and receives from ENESA and the regional governments from the CCAA the compensation for the subsidies deducted from the premia.

Farmer associations and cooperatives participate in the system in two ways. First, as part of the General Committee of ENESA, they convey information on new guarantees that are needed or requested by farmers and participate in the design and planning of the insurance policies. Second, they can act as holders in collective insurance policies on behalf of a group of farmers, disseminate information on insurances amongst farmers, and offer insurance services through mutual insurance companies (Agromutua is the leading example).

In addition to the leading role played by ENESA, the public sector has two other participants in this scheme. The first institution is the Directorate of Insurance and Pensions (which is within the Ministry of Economy and Finance MEH), which provides supervision and the regulatory framework to ensure the actuarial soundness of the system. It regulates the insurance markets, approves participation of insurance companies in Agroseguro, assists ENESA in defining the criteria for subsidy rates, and proposes to the Ministry of Economy and Finance the reinsurance rules with which the Insurance Compensation Consortium (CCS) should operate. The second institution is the Insurance Compensation Consortium (CCS), which is a "public business entity" attached to MEH and acts as a State reinsurer (and not only for agricultural insurance). CSS oversees loss adjustments when claims are declared and gives its advice (not its approval) on new insurance policies developed by ENESA. It is also a stakeholder in Agroseguro.

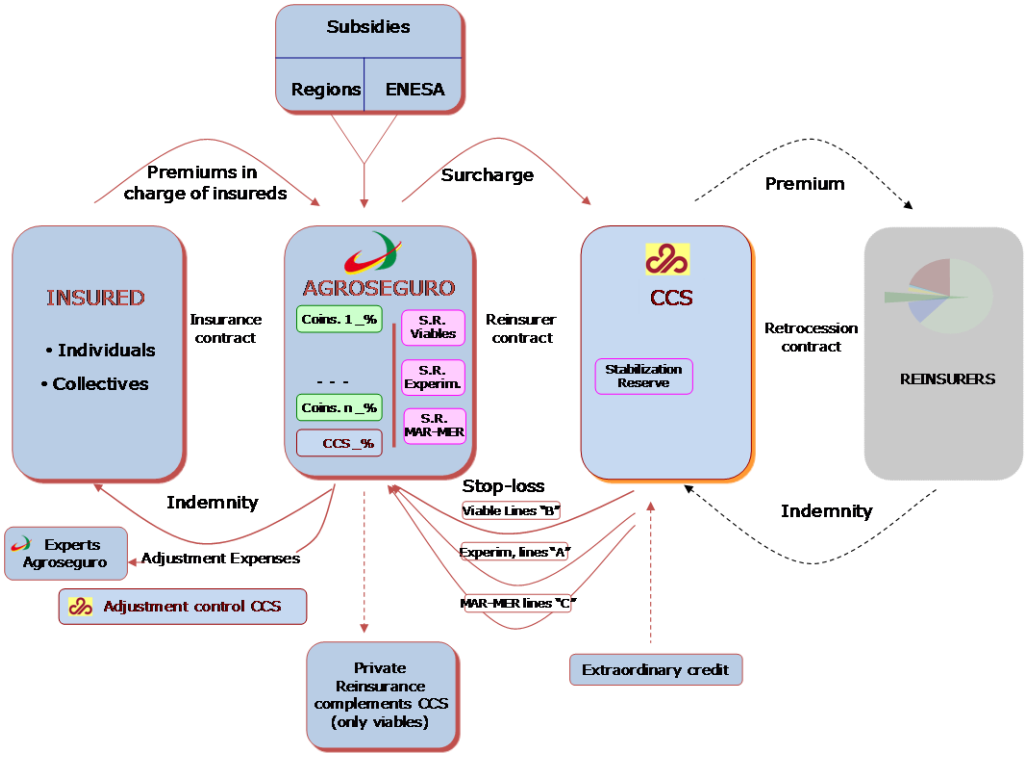
Risk transfer, pooling and sharing

Farmers transfer their risk to insurance companies which are part of the system (Figure 6). The insurance companies pool their risks through Agroseguro that manages them with a single pool of policies. Policies are grouped into three classes: A or "experimental", B or "viable", and C or "Cost of destruction of dead animals (MAR/MER)". The participation of each company in each class is adjusted yearly according to their shares in the sales of corresponding insurance lines.[3] The private companies in Agroseguro can contract reinsurance services for policies grouped in class "B". They also transfer part of the remaining risks in all classes through reinsurance offered by CSS in exchange for a reinsurance premium or "surcharge". CSS assumes the

3. Other parameters are also taken into account, but the share of sales is the main factor.

excesses of indemnities through a "stop loss" mechanism on each of the classes and, in this sense, pools the re-insurance risks into three pools corresponding to classes A, B and C[4]. CSS can also re-insure on the international markets, but has not done so since 2008.

Figure 7. Risk-sharing and risk-transfer schemes in Spanish agricultural insurance



Source: CCS.

Types of insurance policies

The most common agriculture insurance policy in Spain is the multi-risk damage insurance that covers losses caused by well identified risks or events. Reductions of yields due to other causes are not entitled for indemnities. This type of insurance has the advantage of reducing the potential for moral hazard behaviour as compared with individual yield insurance. However, area yield insurance and individual yield insurance for agriculture are also offered by the Spanish system (Box 4). Insurance for livestock production is a multi-risk type of insurance, but index based insurance for pasture and insurance for removing death animals are also offered.

All insurance contracts have a deductible defined either in percentage or in absolute terms. For instance, in 2009 in the case of hail or fire for winter cereals the deductible was 10% of the damage. Indemnities must be paid by insurance companies within 60 days from the expected harvest date of crops and within 40 days from the date of the disaster for livestock. In practice, delays are shorter. In the majority of the insurance

4. These three pools are not fully independent and CCS transfers reserve funds across pools if needed.

lines, there is a *bonus-malus* system that adjusts the premiums to the real exposure of each policy holder.

The loss ratio of insurance is defined as the proportion between indemnities and premiums paid, and for an insurance system to be actuarially sound, the loss ratios should be sufficiently below 100% to pay for the administrative and loss adjustment costs. The annual loss ratios of the Spanish system can be inferred from Figure 10 in Part II. Loss ratios were systematically above 100% from 1980 until the early 1990's. Between 1990 and 2007, the average loss ratio was 96%. Since 1996, more than half of the years had loss ratios below 80%. This improvement in loss ratios implies a more accurate estimation of premiums, most likely due to better information imbedded in longer time series data of different risks.

Garrido *et al.* (2009) use actuarial information to calculate the probability of receiving an indemnity in a given year in four representative "*comarcas*" (small administrative units inside a province) of different Spanish regions. They find that among insured farmers, between 30% and 43% received an indemnity in a given year, with only 10% of farmers receiving an indemnity exceeding 40% of the insured capital.

Box 4. Types of insurance in Spain

Agricultural production

Multi-Risk Damage Insurance. It covers exclusively the specific risks described in the policy conditions. In the Spanish system of agricultural insurance, this type of insurance is considered the first step in protection. It is also the most common insurance policy in Spain.

Yield Insurance, based on geographical area. It guarantees each farmer an average yield, which is established on the basis of a geographical reference. This insurance was introduced in the early 1980s and has gradually been improved with the introduction of *bonus-malus* system which adjusts individual premiums on the basis of the individual farmer yield history record. As a result, the yield insurance based on the individual farm was introduced.

Yield Insurance, based on the individual farm. It guarantees each insured party a personalised yield, established on the basis of the information available on the historic yields obtained on the insured party's farm. However, an event covered by the insurance and affecting the zone beyond the insured farm is needed to trigger the indemnities.

Livestock production

Insurance for livestock farms. It covers damages suffered by animals due to risks included in the insurance policy (adverse weather, accident and diseases). It is equivalent to the agriculture multi-risk type of insurance.

Insurance for removing animals which die on the farm. It is a "provision of services" insurance which offers the possibility of guaranteeing the cost for the removal and destruction of animals that have died on the farm from accidental causes, as provided under the public health conditions established in the legislation in force.

Index-based insurance. It covers the risk of drought in two specific sectors: beekeeping and grazing cattle. The evaluation of the damages is complex and satellite technology is used to define a drought index.

Aquiculture production

Multi-risk damage insurance. It covers the risks listed in the insurance policy.

Forest production

Multi-risk damages insurance. It currently provides only basic coverage because it is in the initial stages of development.

Animal diseases and insurance

Spanish livestock multi-risk insurance covers adverse weather, accident, and diseases for poultry, swine, cattle, equine, sheep and goats. Both epizootic diseases (avian flu, Newcastle, foot and mouth and classical swine fever) and diseases subject to official eradication programmes (Salmonella, Aujeszky, tuberculosis, brucellosis, leukosis, pleuropneumonia and BSE) are covered. Insurance policies pay a disease compensation for slaughtered animals and immobilization. The immobilization indemnity is paid per animal and per week. The indemnity for slaughtered animals is paid in addition to the compensation that is co-financed by the Government and the EU (see animal diseases under the catastrophic risk heading). It is calculated by subtracting the compensation and the salvage value of the animal from an established "market value". An insured farmer should, in theory, receive the full market value of the animal. Premiums are adjusted according to biosecurity measures taken by the farms.

Other market instruments

Other than insurance, there are few market instruments generally used by farmers to manage their risks. Nevertheless, one finds a few specific examples of such instruments.

Mutual funds

Agromutua is part of Agroseguro and sells commercial policies in the same way as other private insurers. Box 5 gives an example of a compensation mutual fund covering potato price risks in the province of Alava. There is no other known mutual fund that deals with agricultural risk management[5].

Box 5. Price Compensation Fund in Alava

The origins of the Compensation Fund of Álava dates to the potato price crisis of 1992. on the request of the producers, the creation of a price protection system was studied and implemented after the 1996 crisis. This was done with the co-operation of the Provincial Government of Álava, and began to function in the 1997-98 season. It is a single fund, but the maximum amount which each farmer can receive from it is based on the amount held in his personal account, and there are no transfers between farmers. Each year, the farmer pays an amount into the fund proportional to the number of hectares he will plant potatoes on. Only seed potatoes and the surface on which they are planted with for the purpose of selling on the open market can be insured; the surface under contract with the processing industry cannot make use of the fund. The Government of Alava province and the regional government of the Basque country contribute with a payment per hectare into each farmer's account. The contributions and compensations are always based on area.

The Fund guarantees a price to the farmer. The market price is understood as the average price at which it is considered that potatoes would have been sold during the season. When the market price falls below the guaranteed price, the farmer is entitled to an indemnity. The indemnity is equal to the guaranteed price minus the year's market price, multiplied by a pre-established yield common to all producers in the province. The indemnity has a maximum limit of 85% of the amount held in the individual farmer's account. The Fund is managed by Caja Rural de Álava (a public savings bank) that also finances the production expenses of its members, using the Fund as a collateral guarantee. An average of 30% of the potato area and the farmers in the province are covered by the Fund. These producers are from a single province in Spain, and have a limited impact on the national potato production.

5. Agromutua is a mutual company, and not a mutual fund, providinges insurance services and specialised in agricultural insurance.

Futures

Future contracts are standardized forward contracts or agreements on the price at delivery time. The contracts are standardized in terms of quantity, quality, time and location for delivery, and they are traded on specific futures markets. There is only one exchange in Spain, the Olive Oil Futures Market, where futures contracts are traded. It was set up in 2004 and has been operating since with an increasing volume and participation mainly of processing companies. Regional governments have contributed to the creation of this market through its supervision and financial participation. In 2009 and 2010, due to depressed olive oil prices, futures trading intensified, as shown by the increase in daily trade, and the average size of the contracts (Table 13).

In 1995, a futures and options market was created in Valencia with contracts for various fresh orange varieties. However, it existed for only a few years as it has failed to attract a sufficient number of contracts to be financially feasible. This was partly due to the fact that there were very few active operators, and a rather heterogeneous and changing set of orange varieties, sub-varieties and supply calendars.

Table 13. Descriptive data of the traded volume in the futures market of olive oil

Year	Average daily trade (EUR 1000)	Average daily trade (tones)	Average size of transaction (tonnes)	Average price EUR/kg
2004	168	72.0	174	2.3
2005	424	129.6	161	3.3
2006	660	208.4	146	3.2
2007	571	236.1	101	2.4
2008	552	238.1	119	2.3
2009	1 066	571.0	121	1.9
2010 (as 25 March)	1 857	995.8	138	1.9

Source: www.mfao.es.

Contract farming

The study by Palinkas and Székely (2008) looked at different sales strategies to manage price and market risks applied by EU farmers. Spanish farmers ranked lowest as compared with farmers in Poland, Germany, Hungary and the Netherlands by the use of marketing and production contracts, but topped the rank by its use of vertical integration. Most farmers in Spain rely on individual sales (43.5%), or sell their product through cooperatives (53 %), and very few use marketing and production contracts (3.5%).

Many sectors have developed "standard contracts", agreed to by the industry and sponsored by the government. These contracts are intended to add transparency to the market, and not necessarily create long-run commercial relationships between farmers and buyers; the content of contracts depends on the interest of the parties, but they seem to play only a limited role in farm risk management in Spain. There exists a wide variety of contractual agreements between growers of fruits and vegetables and wholesalers and distribution companies. There are also contracts in other sectors, such as tobacco, olive oil, dairy and sheep. In the pork and broiler sectors, long-run commercial relationships through vertical integration are common.

Catastrophic risk management

Catastrophic risks as defined in the holistic risk management framework (OECD, 2009) are typically managed via government measures since they are usually beyond the capacity of farmers and markets to manage. Catastrophic risk measures in Spain could be defined as the disaster assistance that goes beyond that which is provided by the insurance system. However insurance is designed to respond not only to "marketable risks", but also to deal with rare but highly damaging events and reduce the need of *ad hoc* assistance. All policy measures implemented by the government of Spain and the regional governments (for each autonomous communities), and particularly the *ad hoc* measures, are subjected to the legal framework and limits established by EU legislation. This includes articles 107 and 108 of the Treaty on the Functioning of the European Union that constrain the aids granted by the member states of the European Union, the subsequent exemption legislation for the *de minimis* aid (Commission Regulation No. 1860/2004) and for State aid to small and medium sized agriculture enterprises (Commission Regulation No 1857/2006), and the Community Guidelines for State Aid in the Agriculture and Forestry Sector (2006/C 319/01).

The following *ad hoc ex post* measures exist in Spain:

- *Ad hoc* direct compensation payments provided by the central government and administered by ENESA.
- Interest and guarantee concessions for loans and extraordinary fiscal measures provided by the central government and coordinated by the SGAPC (Unit for Analysis, Outlook and Coordination), an administrative unit of the Ministry (MARM).
- *Ad hoc* assistance provided by the governments of the Autonomous Communities (regions), consisting of direct compensation payments or interest concessions either as their own regional measures or topping-up of central government measures.

There are two additional important policy measures related to catastrophic events in Spain: irrigation policy addressing water scarcity and drought risk, and contagious animal diseases policies, implemented within the CAP framework.

Ad hoc compensation payments by the central government

ENESA is the agency which deals with overall farmer risks and adverse events, in addition to being in charge of *ad hoc* compensation payments for risks not covered by the insurance system. It has procedures to evaluate the source of hazards and their consequences. Agroseguro usually carries out loss evaluations for the government in the case of catastrophes. The most recent adverse events covered by these measures were floods in the Ebro, fire in the Canary Islands, winds in several regions in 2008, floods on Hierro Island, excessive rains in Murcia, drought in several regions in 2007, and hailstorms, high temperature, frosts and unspecified "adverse climatic conditions" in 2001-06. These are either un-insurable risks or, in most cases, the events occurred before or after the insurance period. Payments per year averaged EUR 6.5 million in the last eight years, with a maximum of EUR 12 million allocated in 2006 due to early frost in the Southern Autonomous Communities (Andalusia, Murcia, Castille-La Mancha).

Only farmers that have contracted insurance policies are eligible for financial aid compensating for losses that are not covered in the contracted policies and that surpass 30% of the average production. Farmers who have suffered losses due to insurable hazards that took place before the contractual period must have contracted insurance

policies the previous season in order to receive compensation. The financial aid is equivalent to an indemnity paid for the adjusted loss with a 20% deductible. When the affected crops can be insured, standard loss adjustment procedures are used to evaluate the losses. Apart from the condition of non-insurability and an individual damage threshold of 30%, there are no defined criteria to determine if an event deserves a compensation measure or not. It is the administrative and political process that determines this decision.

The procedure for these *ad hoc* compensation payments starts at the producer level. After the occurrence of a climatic event, the producer contacts the local offices of the central government (Delegation of the Government). The Delegation compiles the required additional information in collaboration with the regional government and local authorities, and communicates these to the Interior Ministry. The Ministry coordinates with other public bodies and brings to the Council of Ministers a decree for its approval. In the case of measures related to agriculture, ENESA leads the process of defining the compensation measures. Infrastructure damage is the responsibility of other government offices. Once the decree is approved, farmers can apply for compensation. It is not infrequent to have a delay of up to one year between the catastrophic event and the payment.

Extraordinary fiscal measures and credit concessions measures by the central government

The Ministry of Economy and Finance (MEH) is in charge of coordinating the tax system, including for agriculture, while the Ministry of Environment, Rural and Marine Affairs (MARN) coordinates extraordinary measures related to catastrophic events through its unit for Analysis, Forecasting and Coordination (SGAPC). These measures include extraordinary fiscal measures (concerning income, value added or fuel taxes) and credit concessions (interest rates and guarantee concessions). Fiscal measures are taken and implemented by the Ministry of Economy and Finance (MEH) after a proposal from the MARN and interest concessions are implemented through the public bank ICO and loan guarantees through the public company SAECA. The value of the credit concessions by the central government in 2008 was EUR 17.7 million, part of this sum was associated with the events that had occurred in previous years, such as the 2005 drought.

The simplified method for income tax and the value added tax regimes available to farmers has contributed to the increased number of small farmers who file a tax declaration. However, it implies no automatic adjustment of taxes to changes in input costs. As a consequence, the Government is pressured to adjust the parameters of the tax formula whenever there are increases in input prices. It is impossible to disentangle what part of the extraordinary measures serves to compensate for the rigidity of the simplified tax regime of agriculture, but the current system opens the need for negotiating tax adjustments when the economic conditions change and reduces the risk management value for farmers of tax automatic stabilization.

The decision-making process for these extraordinary fiscal measures and credit concessions is case-specific, involving different national or regional bodies and administrations. The final decision is reflected in a decree approved by the Council of Minister. There is no specific criterion to define what constitutes a catastrophic event deserving these extraordinary measures. Table 14 lists the events and measures implemented in 2005-08. The events that triggered the measures are either increases in

input costs (fuel in 2005 and inputs for livestock in 2008) or extreme climatic events (frost and drought in 2005).

Other extraordinary measures that can be implemented include concessions on social security contributions and exemptions from levies on irrigation water. No spending estimate on these measures is available.

Table 14. Extraordinary fiscal measures and credit concession measures, 2005-08

Date of event/ Date of introduction of measure	Event / location	Type of measures	Economic estimation (Million EUR)
2005 to 2008 / Dec 2005	High input prices, particularly fuel	Income tax measures[1]	Per Year: 250
		Value added tax measures[1]	Per Year: 125
		Fuel tax rebates[1]	Per Year: 80
January-March 2005 / February 2005	Frost in several regions (CCAA)	Interest concessions Loan guarantees	Total: 16.6
2005 / June 2005	Drought in several regions (CCAA)	Interest concessions Loan guarantees	Total: 79.5
2007-08 / January 2008	High production costs for livestock	Interest concessions Loan guarantees	Total: 44.4

1. MAPA, SG Planificación económica y coordinación institucional, Unidad de Análisis y Prospectiva, AgrInfo Enfoque n.E3, July 2007. Income tax and VAT concessions are triggered in the context of the simplified tax regime for farmers under which taxes are not adjusted to changes in costs.

Source: MARM (2009).

Ad hoc assistance by the regional governments (CCAA)

The central government is in charge of designing and co-financing the measures implemented in the case of catastrophes and severe climatic events. The seventeen regional governments participate in identifying the producers affected, evaluating losses, and developing and co-financing the relief package. Regional governments also have the authority to implement their own extraordinary relief measures. These can include direct compensation payments or credit concessions. However, the information available to estimate the amounts of such assistance is incomplete.

As an example, the government of Castilla y León, a large agricultural region in the north-center of Spain, provided the following disaster assistance in recent years: drought credit concessions in 2006-10 amounting to EUR 31 million; compensation for losses due to the *topillo* plague in 2008 for EUR 7 million; credit concessions to livestock producers in economic difficulty in 2009 for EUR 26 million (co-financed by MARM); and direct compensation to dairy producers in 2009 for EUR 6.5 million. Decisions on these measures are made on an *ad hoc* basis and it is difficult to distinguish whether they represent disaster assistance or simple support measures.

Drought and irrigation

Drought is a significant risk in Spain; it is also an important policy concern particularly in the context of climate change. Droughts affect both rain-fed and irrigated agriculture. For rain-fed agriculture, insurance policies were developed to offer coverage for the most vulnerable activities, namely winter cereals and extensive livestock production.

With respect to irrigated agriculture, most measures fall within the domain of water policy, which include water allocation mechanisms, water markets, exchange centres and a panoply of technical and institutional measures (see OECD, 2010 for a review of water

management policies in agriculture). Since the late 1990s, a Drought Observatory surveys, monitors and carries out actions to prevent, anticipate and alleviate drought risks. An institutional set-up was created to respond to droughts that affect agriculture, farm holdings, and farm workers.

Spain has a long tradition of public investment in irrigation infrastructure with the objective to facilitate management of rain variability, which is particularly large in some regions of Spain. Irrigated land has significantly increased in the last two decades (OECD, 2008). In the period 2006-08, more than EUR 2 billion was spent on irrigation infrastructure through the EU co-financed rural development programs. In response to increasing environmental and climate change concerns, this investment has been oriented to improving the efficiency of the irrigation system (OECD, 2010; OECD, 2008)).

Animal diseases

The Ministry of Environment, and Rural and Marine Affairs is responsible for running at least three types of programmes for prevention of disease outbreaks. First, it runs the system of "alerts" for outbreaks and updates maps of potential risks of all common and less common diseases. Second, it has developed, in coordination with the Autonomous Communities, an electronic registry of all animals which monitors all movements across Spain and Spanish borders. Finally, it runs campaigns for vaccination, preventive treatment, and other prevention measures.

Animal health policy is perhaps the only area in which the EU has developed a common approach to reducing risks. Unlike other agricultural risks, contagious animal diseases have regional, market and sometimes human health implications. A key strategy for the protection of European livestock and citizens is to intensify border controls and enforce traceability, animal identification and labelling, as shown in the Communication on Animal Health Strategy for 2007-13 (European Commission, 2007). While this evaluation indicates a number of strengths and positive views, there are areas which demand renewed efforts. In particular, this evaluation argues that the co-financing of compensation schemes by the European Union and member states "is loss-dependent, which may distort competition in favour of high-risk areas." Although it "may provide incentives for effective and rapid control measures, it does not seem to provide incentives for prevention". The European Union has financed loss-based compensation for compulsory slaughtering, using the "veterinary fund" and market support instruments for other losses caused by animal diseases. The veterinary fund is financed by contributions from livestock farmers and/or Member States (with varied co-financing across countries). The total budget for veterinary measures under Decision 90/424/EEC peaked at EUR 563 million in 2001 and fell to EUR 220 million in 2005 (European Commission, 2006b). A new Animal Health Strategy (European Commission, 2007) is currently being implemented, but its analysis is beyond the scope of this study.

A synthesis of Government risk management measures and the definition of risk layers boundaries

Agricultural insurance is at the core of the Spanish risk management system and the main risk management instrument going beyond commercially insurable risks (Table 15). Government measures related to insurance are also broader than just subsidies creating incentives to buy insurance. They have created over the years a risk management governance structure that has strong implications for all risk layers and risk management strategies. It has developed insurance policies with wider coverage than in other

countries, and an insurance database with a history of all insured farms which may reduce the informational asymmetries and potential market failures. This has contributed to the creation and expansion of a hybrid insurance market, and although it has not eliminated *ad hoc ex post* assistance, it has limited its scope.

Table 15. Government measures related to farm risk management in Spain

	Market creation	Modifying market incentives	Risk reduction and mitigation (income smoothing)	Coping with risk (consumption smoothing)
Ex ante		• CAP price reform	• Prevention/alert of animal diseases (domestic and border)	• CAP support Single Farm Payment
	• Stable macro and business environment		• R&D of new varieties or breeds	
	• Water markets		• Irrigation policy	
	• Insurance private public partnership • Insurance database • Training (insurance)	• Subsidies to insurance		
Ex post *- triggered ex-post*			• Tax system	• Social security
- decided ex-post			• Interest subsidies & Tax concessions • *Ad hoc* compensation payments • Border measures & compensation in case of diseases	• Disaster relief (beyond agriculture)

The only other quantitatively significant Spanish policy related to risk management is irrigation. It has contributed to the creation of a market for water rights, invested in irrigation infrastructure and, more recently, focused on water efficiency. However, Spanish policies are framed in the context of the EU's Water Framework Directive and the Common Agricultural Policy. Spanish farmers benefit from agricultural price support measures and support for water infrastructure and the reduction of water supply charges, even if these have been scaled back in the last two decades. They also benefit from a set of direct payments, particularly the Single Payment Scheme. The control and compensation for animal diseases is also coordinated in a European Strategy.

The Spanish Insurance Law has been applied as a continous expansion of insurance to all sectors, areas and risks, which has become a key objective of the government's agricultural insurance policy since the early 1990s and has been maintained by all governments in office (Ruiz Zorrilla, 2010). This has had strong implications on the boundaries of the different risk layers. The market layer responds in fact to a hybrid

public-private partnership with private insurance heavily regulated and supported by the Government, and with progressive expansion of its coverage. The risks covered by this insurance include hazards that in other institutional contexts would be considered as non-insurable because of their "catastrophic" nature, due to information failures, or because of a large probability of occurrence (normal risk). In this hybrid and evolving context the boundaires between different risk layers in Spain have been changing over time and there is not a stable and clear deficnition of these boundaries.

Normal risk

The hybrid insurance scheme determines the boundaries of risks that are considered as "*normal*" and therefore not insurable. The *ad hoc* assistance rules in general define a 30% loss as the threshold to trigger some aid following EU guidelines (Commission 2006/C 319/01), but insurance policies often include lower deductibles that determine the risk that must be borne by the farm household as "normal". The *ad hoc* credit concessions and, particularly, the *ad hoc* fiscal concessions blur this boundary of "normal risk" because they are triggered for "non-insurable" risks, in addition to measuring the insurance scheme and the *ad hoc* disaster payments without well defined *ex ante* rules .

There are some risks which could be insured in Spain, but which are largely retained by farmers. For instance, insurance penetration rates amongst olive growers are below 10%, despite the fact that yields vary significantly and yield insurance has been available since 1999. While yield variation in many crops can be insured, low penetration rates imply that farmers tend to retain those risks, and as such they are in the "normal risks" layer. Revenue insurance was offered as pilot programs to potato producers of late varieties in 2003 and 2004. Despite the subsidized premia, less than 3% of the eligible production was insured. This also suggests that price risk is retained at the farm level for a great majority of producers, and most likely pooled with risks from other crops (Garrido *et al.,* 2009). For many agricultural products, the Common Agricultural Policy of the European Union has served to reduce price variability for many years and the remaining price risk has typically been retained at the farm level with relatively little use of market instruments such as futures or contracts.

"Marketable" risk

The system has expanded the hybrid insurance layer that has displaced pure market insurance. It has potentially reduced the catastrophic layer of weather risks that requires government ad hoc assistance to the very low probability large damage extreme. Marketable risks are those that are transferred or pooled through risk management markets. As noted, the main market instrument in Spain is the hybrid insurance system, in partnership with private companies. In addition, most insurance companies offer policies that are neither included in the menu of subsidized insurance policies, nor subjected to the regulatory framework of ENESA. This insurance usually includes machinery, buildings, life, greenhouses and other insurance types. Market tools for price risks such as futures are rarely used by Spanish farmers (Garrido *et al*., 2009) and they fall under "normal" risk.

Catastrophic risk

The inclusion of a risk in a disaster relief program does not always depend on the scope or probability of the damage, but on other circumstances such as, in the case of Spain, the precise date of its occurrence as compared with the calendar for insurance

coverage and subscription. In many cases, such as the severe frost of 2005, the damage was compensated for because it occurred before the insurance guarantee period had begun. Other important catastrophic risks are those associated with animal disease outbreaks; part is compensated by the government and an additional part is insurable by the Spanish system.

The following two sections will analyse the Spanish hybrid insurance system from the perspective of its capacity to reduce transaction costs and improve the efficiency in the transfer of risk in agriculture and from the point of view of the governance of catastrophic risk management.

PART II.

POLICY ISSUES IN THE RISK MANAGEMENT SYSTEM IN SPAIN

3. Contribution of the Spanish insurance system to market efficiency

The insurance system fulfils at least two clear roles on risk management. First, it has enhanced the development of an insurance market, enabling transfer transactions that the private market was not delivering. Second, it is a device to manage catastrophic risks as an alternative to disaster assistance. This chapter focuses on the potential for efficiency gains in the first role, while Chapter 4 will focus on the advantages and disadvantages of the system to deal with catastrophic risk.

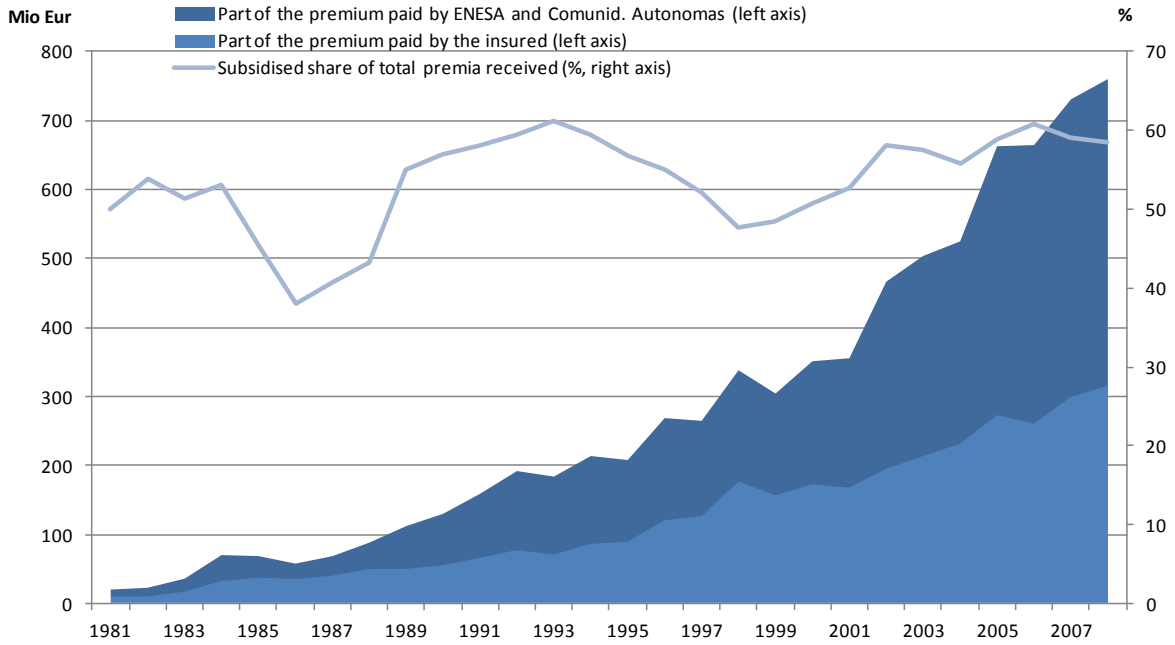
The scale and impacts of insurance subsidies in Spain

The scale of insurance subsidies

Insurance subsidies are a key element of risk management policy in Spain. Figure 8 plots the subsidies granted by both central and regional governments, the net premiums and the ratio of the two. The ratio of subsidies to net premiums has varied significantly in a range between 0.39 (in 1986) and 0.61 (in 1993). The ratio does not show an increasing trend in the last three decades but it has increased in the last decade from 0.47 in 1998 to 0.58 in 2008, due to a certain extent to the expansion of class C policies that have higher subsidy rates. At the same time, the number of policies and total premiums has grown in parallel with premium subsidies, making the system bigger.

Insurance subsidies represent a relatively small but increasing share of the value of agricultural production in Spain. They represented 0.2% in the 1980's, 0.5% in the 1990's, and 0.9% in the last decade, with values above 1.1% since 2005. The mandatory expansion of the system has been gradual but steady, with attention to information collection and experience to make an insurance line "viable." In this sense, it has followed a "learning by doing" path. Given that the *ad hoc* extraordinary payments by ENESA are offered only to insured farmers, they constitute an additional subsidy incentive to buy insurance. Despite this growth, the dimension of the program is modest with respect to the economic size of the sector. The scale of an insurance subsidy program is by nature limited by the maximum value of the premiums, which makes this program unlikely to become disproportionate to the size of the agricultural sector.

Figure 8. Premium (EUR) and the ratio of subsidies to premium



Source: Agroseguro (2008).

The economic impacts of subsidies

Insurance subsidies have economic impacts on aggregate variables (production, farm income variability), on the demand for insurance and on the use of other risk management strategies such as diversification. These economic impacts need to be estimated empirically. There is scant empirical literature on the economic impacts of insurance subsidies. With respect to Spain, there are only three recent studies by Garrido *et al*. (2003), Garrido and Zilberman (2008), and Morales *et al*. (2009).

Garrido *et al*. (2003) studied the production response of crop producers in Spain with econometric estimations based on micro insurance data. Garrido and Zilberman (2008) use the complete insurance records of all farmers (41 660) from seven Spanish *comarcas* and eleven years of data. They computed two measures of individual expected benefits and variance for agricultural insurance returns. Results show that these two variables together with premium subsidies, insurable risks and other farm specific factors explain insurance demand patterns. Morales *et al.* (2007) analyze survey data for five EU countries with questions on risk perceptions and risk management strategies. They fit logit models of insurance demand for more than 1 000 EU farmers, including 204 Spanish ones. They also evaluated the demand for futures and options. Their results show that volatility of prices is not significant in determining insurance demand.

In terms of the aggregate *production effects* (and potential distortions in output markets), according to Garrido *et al*. (2003) and OECD (2005), insurance premia are likely to have small but statistically significant supply effects among Spanish cereal growers, and most likely weaker impacts than area payments. Results show that yield insurance subsidies provide weaker incentives to increase cereal production than subsidies to lower-coverage policies (multi-risk).

There is evidence that the insurance system has an impact on *smoothing aggregate farm income* in the years in which income is mainly affected by weather shocks. This was the case in 2005 when farm income fell by 10%, mainly due to a fall in crop production, and insurance indemnities contributed to reducing this variation. MARM (2006) estimated a reduction of 28% of the income fall. However, these *ex post* estimations do not account for the adjustment of farmers' risk management strategies and, in years in which changes in income are driven by prices and not by yields, the impact would be much smaller**.**

Perhaps the most significant finding in Morales *et al*. (2009) is that "diversification" has a significant and negative effect on insurance demand. This indicates that diversified farmers feel a lesser need, or are less interested, to contract insurance or to hedge futures and options. These results reveal that there is a substitution between insurance and diversification strategies which could be described as a crowding-out effect.

Moral hazard and adverse selection

Moral hazard is a classic problem in agricultural insurance. The Spanish insurance system is based on actual damages estimated by experts in the field, rather than on observed reductions in yields, which reduces the scope for moral hazard. A system of rules to estimate the damages has been developed over the years, with a *bonus malus* adjustment of premiums for specific risks of individual farmers. There is also a sophisticated system of deductibles that supposedly reduce the opportunities for moral hazard, particularly for farmers who remain in the insurance system for long periods of time.

To avoid adverse selection behaviour, the Spanish system obliges the farmer to insure all plots used for the same production and adjusts the premium to the risk of each holding. According to Garrido *et al.* (2003), farmers with greater risk tend to insure more often than those characterized as being less at risk. This effect is even more evident when analyzing the option to switch from fire and hailstorm (F&H) insurance to yield insurance. This seems to point to a certain degree of adverse selection. However, Garrido and Zilberman (2008) show that the variability of insurance returns (variance of the indemnity schemes) have much more influence than loss ratios in the demand for insurance. They conclude that adverse selection is not the primary factor explaining insurance participation among Spanish farmers. This is the first study that uses actual indemnities for a large and diverse set of famers, with 12 years of individual insurance records. However, the estimation does not allow comparison with farmers who have never bought insurance.

Insurance market creation

Demand for insurance

There is strong evidence that insurance subsidies are a main factor behind the increased demand for insurance. Indeed, Garrido and Ziberman find that agricultural insurance expands in Spain due to premium subsidies that help the system to take off. They show that premium subsidies are the most influential factor in tilting the balance in a farmer's decision to purchase an insurance policy. They also find, however, that farmers who have experienced indemnified crop failures require smaller premium subsidies to purchase a policy. As insurance becomes a more common practice, the perceived probability of experiencing an indemnity grows, and with that the level of subsidies that farmers need to decide to buy insurance decreases. There is also evidence that farmers

tend to develop habits regarding their insurance strategies (Medina, 2009; Garrido and Zilberman, 2008) and, once created, there could be scope to reduce the subsidy level while maintaining participation.

In general, farmers are more reluctant to purchase insurance policies that have larger premium to liability ratios. These more expensive policies apply in general to insurance against frequent events of lower intensity (normal risk layer). These results are interpreted by Garrido and Ziberman (2008) as evidence that farmers have lower demand for insurance against these normal risks.

Bielza *et al*. (2009) compare the agricultural insurance systems in several European countries (Table 16). The Spanish system has the highest expenditure on subsidies, followed by Italy. Among the countries that provide premium subsidies, the rate of subsidy ranges from 30 to 68% (with the exception of France with only 2.4%). The penetration rates are not correlated with the rate of subsidy. In fact, Spain is reported to have a penetration rate of 26% as compared to 43% in Germany or 60% in Sweden, neither of these countries offer subsidies. The authors as well as evidence from other sources (Meuwissen *et al*., 2008) argue that the penetration rate is only a partial indicator of the demand for insurance. Penetration rates are calculated as the percentage of the value of production that has some insurance. This indicator does not include the degree of coverage that is typically narrow (or basic) in the countries with high penetration and no subsidies.

Table 16. Agricultural insurance in Europe

Country	Single risk insurance	Combined insurance	Yield insurance	Market penetration (%)	Premium amount (Eur millions)	Insurance subsidies (Eur / %)
Austria	PS	PS	PS	78	52	24 / 46%
Belgium	P	-	-	n.d.	49	0
Czech Republic	PS	PS	-	35	32	7 / 30%
France	P	P	PS	n.d.	211	5 / 2.4%
Germany	P	-	-	43	129.2	0
Greece	P	GC+GS+G	-	(100)	n.d.	n.d.
Hungary	P	P	-	52	43.5	0
Italy	PS	PS	PS	8	271.2	180 / 67%
Netherlands	P	-	-	n.d.	75	0
Portugal	PS	PS	-	22	46.9	32 / 68%
Spain	PS	PS	PS	26	564.7	232 / 41%
Sweden	P	P	-	60	n.d.	0
United Kingdom	P	-	-	7	11.1	0

- : Does not exist; n.d.: No data. PS: Private partially subsidised. P : Private non-subsidised. G: Public non-subsidised. GS: Public partially subsidised; GC: Public compulsory partially subsidised.

Source: Bielza *et al*. (2009), JRC report on Risk management and Agricultural Insurance Schemes in Europe. European Commission, 2009.

Experimental vs viable policies: loss ratios and subsidy rates

In general, the policies inside class B (the so called "viable" policies) are those offered for a number of years, whose premia are considered sufficiently calibrated to known risks, and do not provide coverage of systemic hazards, drought being the most

important one. In contrast, the "experimental policies" in class "A" are those which require further experience and analysis to accumulate a sufficient number of years of actuarial data and for which the CSS charges higher loading factors for re-insurance.

Table 17. Actuarial results for 1980-2008 (in %)*

"Viable" policies (B)			Experimental policies (A)		
	Loss ratios (%)	Subsidy Group 2009		Loss ratios (%)	Subsidy Group 2009
Olives (3.6%)	46.32	II	Fish farms (14.8%)	97.28	II, IV
Citrus (46.6%)	71.60	III, IV	Cherry (27%)	127.02	IV
Multi-peril arable crops (24.6%)	63.52	I, II	Fruit crops (76.32%)	100.91	V
Bovine (18%)	90.82	IV	Vegetables (20.9%)	86.74	IV,V
Banana (100%)	95.65	V	Integral and yield for arable crops (40.05%)	138.10	III,IV
Tobacco (75%)	52.26	II	Integral and yield for vineyard (0.24%)	92.00	V
Tomatoes (42.2%)	158.99	III, V	Yield for olive (5.7%)	126.80	V
Wine grapes (32%)	74,98	II, IV	Cattle (4.21%)	143.20	IV
Other feasible (9.31%)	60.34		Droughts (8.8%)	143.20	IV
Total feasible	79.93		Table grapes (42%)	69.73	IV
			Other experimental (28%)	73.74	
			Total experimental	110.73	
			C. Destruction of dead animals (90%)	87.40	VI

* Penetration rates are reported in parenthesis in the first column.

Source: Garrido *et al.* (2009), based on Agroseguro (2007) and insurance plan 2009.

Nonetheless, several insurance policies have been offered since 1992 and still maintain their "experimental" status. For instance, multi-risk and area yield insurance for winter cereals and the yield insurance for extensive crops (based on past individual records) are considered "experimental". The distinction between the two classes of policies has mainly re-insurance implications due to higher loading factors applied by CCS to experimental policies because they provide coverage against more systemic risks (Table 17). In the period 1980-2008 the average loss ratio of viable policies (B) is 80% as compared with 110% for experimental policies (A). However, loss ratios for some of the viable policies are well above 100% (tomatoes, bananas), while other experimental policies are well below 70% (livestock insurance, table grapes).

The base rate of subsidy to each insurance policy is defined according to six groups of insurance policies from I (lowest rate of subsidy) to VI (highest rate). However, additional percentage points of subsidy are provided according to characteristics of the farmer or type of contract; that is, professional farmer, priority farmers, young farmers (with an additional 2% for female farmers) and territorial contract farmers. An additional subsidy is also provided for collective contracts, renewed contracts and to farmers with risk reduction practices (use of certified seeds, and participation in association of plant and animal health). Finally, each regional government can decide to provide an additional subsidy to specific lines in their own regions. For example, joint insurance policies subscribed by producer associations received the following rates of subsidy in 2009: 20% for group I policies, 38% for II, 41% for III, 46% for IV, 50% for V and 46% for VI.

The insurance lines that are for specific perils and have a long history of data and experience, such as multi-peril herbaceous and olive (*e.g.* hail), are in groups I or II of subsidies, while drought and yield insurance that cover more systemic risks with more likely information failure are in groups IV and V. Recently introduced insurance for the destruction of dead animals is under a special group VI. More policies of groups I, II and III are in class B (viable), and more of IV and V are in class A (experimental). That said, there is a mixture of groups in the two classes and no clear rationale for this grouping. This complex combination of criteria makes it difficult to estimate and evaluate the rate of subsidy of different policies. There is no publicly available technical study explaining the rationale and implications of these subsidy criteria and groups.

Reduction of information asymmetry

A massive database on risk, coverage, indemnities and purchasing strategies has been compiled by ENESA and Agroseguro since 1978. Farmer associations and researchers have limited access to this database, but generally can obtain aggregate results at *Comarca* level for any requested information, except paid indemnities which are recorded by Agroseguro. ENESA has access to records of indemnities upon request. Confidentiality concerns and the *Ley de Protección de Datos* (Law on Data Protection) prevent ENESA and Agroseguro from releasing detailed information on the actuarial and insurance records. The information is not shared with the insurance companies that are part of Agroseguro.

Farmer associations often request access to the databases to check the quality and fairness with which actuarial procedures are used to compute the premia. Sectoral committees regularly discuss the details of the actuarial results and penetration rates of all insurance policies. Claims data are perhaps the most valuable information which can be used jointly by analysts and agents in combination with ENESA's records of insurance uptake. The database was created over many years thanks, to some extent, to the development and functioning of the subsidized insurance system. It is now managed by a single pool of private companies (Agroseguro) that uses it to determine premiums according to its commercial interests.

Good information and assessment on risks can be used with no rivalry by farmers, different levels of government and private companies, while the appropriate legal conditions ensure confidentiality of individual information. Information availability can improve efficiency in risk management and risk management markets. With exception of some studies in recent years by researchers who have had access to micro information, only very aggregated information is publicly available and information in the Agroseguros' database seems to be under-exploited by researchers and other institutions that could provide useful analysis for risk assessment and decision making at the farm, private sector and government levels. Wider access to this database, with the appropriate legal conditions, could potentially reduce information problems and cognitive failures and facilitate the development of a more competitive insurance market.

Public-private partnership and transaction costs

Institutional setting: role of public-private partnerships in agricultural insurance in Spain

The public-private partnership is one of the most prominent features of the Spanish insurance system. The public dimension of the system is reflected in several aspects

beyond the fact that premiums are subsidized. Most products and risks can be insured in the whole country, provided that information is available for actuarially-based policy design and claims adjustment. Insurance companies cannot refuse to offer farmers policies that conform with the policies' criteria. Preferential subsidy rates are offered for young farmers, collective premia, women, and priority farm holdings. The CCS is obliged by law to provide reinsurance to the co-insurance pool of Agroseguro.

Insurance participation is voluntary, although policy rebates and additional subsidy rates are offered to those who renew their policies, and *ad hoc* extraordinary payments by ENESA can only be granted to farmers who have purchased at least one policy. Farmer organizations participate in the review, design and planning of the insurance system and they are important actors in providing collective insurance policies (Figure 9). Collective insurance contracts offered by farmer organizations represent more than 90% of all insurance policies. This is partly due to an additional subsidy of 5% of the premium provided only to collective insurance contracts bought through farmer organizations. Farmer organizations provide additional services to farmers in order to facilitate insurance contracting and claims.

From the commercial and actuarial perspective, policies must be based on actuarial criteria and bonus-malus incentives. Historical records and some other provisions are included in the policies as typical insurance pricing criteria. However, the premium is decided by Agroseguro who is also the single provider of the insurance services in term of evaluation of damage and payment of indemnities. Private companies can only compete to increase their market share by means of their marketing services and not by price or loss adjustment criteria or their insurance services, which are the same for all insurance companies offering policies, including mutual associations. This is frequently the case in co-insurance arrangements and it was fixed by the regulation[6] of the Insurance Law in 1979, which also established the existence of a single co-insurance group.

The role of CCS as public re-insurer of agricultural insurance has evolved over time. In the first stage, 1978-1992, CCS's participation within the co-insurance scheme was always above 30% (50% until 1987). Indemnity payments were very high and loss ratios worsened, requiring extraordinary credit from the Ministry of Agriculture particularly in 1988 (EUR 66 million), in 1992 (EUR 93 million) and in 1995 (EUR 29 million). In 1992, CCS underwrote indemnities to Agroseguro for EUR 160 million. Since the mid-1990's, the CCS has been able to endow the stabilization reserve fund in order to cope with excessive indemnities. Indemnities have been below premiums in most years since the mid-1990s and reinsurance indemnities were triggered only in some years (Figure 10). The year 2000 was the last fiscal year in which special credit from the Ministry was needed to cover excessive indemnities. According to Garrido (2009), the Spanish system required 22 years (1978-2000) to become actuarially sustainable, and given the level of reserves of the system, it now seems unlikely to require extraordinary credit in the medium run.

The operational costs of Agroseguro with respect to the value of the premiums have been reduced gradually over the years (Table 18). This includes the internal administrative costs of the co-insurer, which in recent years was between 3 and 4% of the premiums.

6. Royal Decree 2329/1979.

Figure 9. Insurance contract procedures

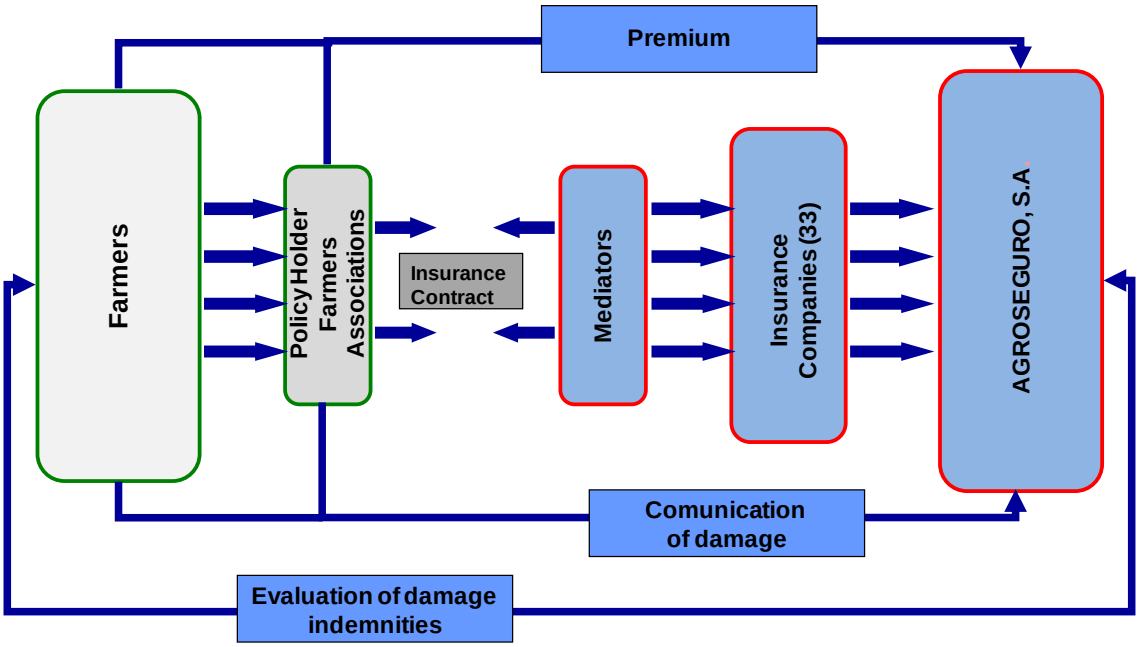
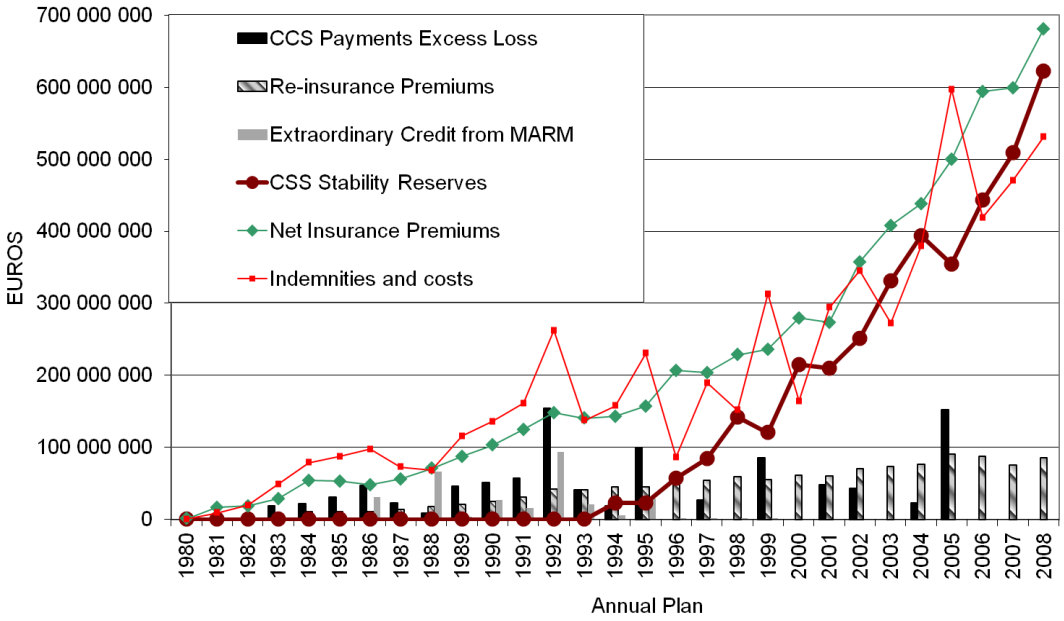


Figure 10. Premia, indemnities and the need for extraordinary credit



Financial flows and administration costs

Table 18. Agroseguro's internal costs *vs* underwritten net premium

	Net premium (mil €)	Internal costs (mil €)	Costs /net premium (%)

1998	228.48	10.18	4.46
1999	235.84	12.20	5.17
2000	280.94	13.55	4.82
2001	273.42	15.13	5.53
2002	357.33	15.93	4.46
2003	408.16	17.41	4.27
2004	438.63	18.77	4.28
2005	499.62	20.29	4.06
2006	594.43	20.88	3.51
2007	598.24	22.40	3.74
2008	680.65	22.86	3.36

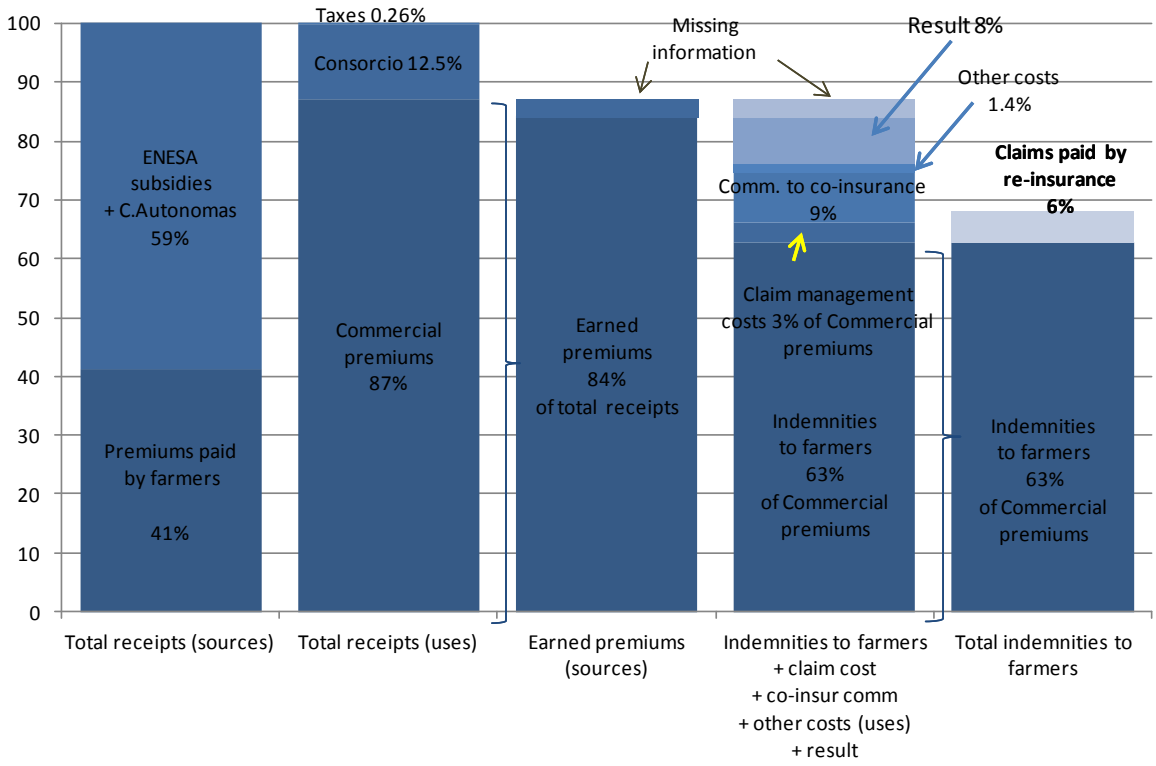
Source: Agroseguro, S.A.

The financial accounts of Agroseguro for 2004-08 show that farmers pay on average 41% of the insurance premiums, the rest being covered by subsidies from ENESA and the regional governments (CCAA) (Figure 11). On average, 12.5% of the total premiums were used to pay for reinsurance and CSS managed this part of the premiums. CSS had to pay indemnities due to excess losses that averaged 6% of the total premiums, even if they were only paid in 2004 and 2005. The difference between re-insurance premiums and indemnities was used to create the CSS stabilisation reserve fund.

Agroseguro managed 87% of the total premiums after spending on re-insurance. How was this money spent by the co-insurer? Claim management and other administrative costs of Agroseguro came to 4% of the premiums. Private companies were paid 9% of the premiums for marketing services to farmers, and they also received 8% of the premiums as profit to remunerate for their share of the risk. Farmers received on average indemnities corresponding to 69% of the total value of premiums. Agroseguro received from CSS on average 6% of total premia as excess loss reinsurance indemnities.

These financial accounts from Agroseguro, corresponding to 2004-08, imply a total average share of overall costs and surcharges on premiums (loading factor) of the agricultural insurance system of 31%. According to Cordier (2009), this number could be proof of the global efficiency of the system. This should be evaluated in comparison with other insurance policies and, in this context, these loading factors do not seem to be out of range.

Figure 11. Agroseguros technical financial accounts, 2004-08
(Share of total premiums)



Source: Agroseguro, Memoria 2001 (2008), Table 7.2.

Competition in insurance markets

The structure of the agricultural insurance market could be inferred from the co-insurance share of each company within Agroseguro (Table 19). These shares are adjusted every year following agricultural insurance market share criteria, and any private company can join. However, due to the co-insurance arrangement, competition among insurers for the agricultural insurance market is limited to the quality of the marketing services since the premium and other conditions of the policy are fixed by the single co-insurance group Agroseguro, which also provides the same insurance services to farmers in terms of processing of claims and payment of indemnities.

Table 19. Shares in the Co-insurance pool of Agroseguro in 2009

	Groups A and B	Group C (MAR and MER)
Company 1	20.05	18.34
Company 2	15.02	11.95
Company 3	11.64	6.08
Company 4	9.84	16.39
CCS*	10.00	10.00
Rest of companies	33.45	37.24

*Consorcio de Compensación de Seguros (Public Reinsurer).
Groups A and B are the respectively the classes of experimental and the feasible policies. Group C includes the "removal and disposal of dead animals".

Competition among firms –particularly for polices that are considered to be viable- could occur if the information on the history of claims was made available to different individual firms or co-insurance groups. They could then provide a differentiated service and improve policy conditions while keeping the potential advantages from co-insurance pooling and the information sharing arrangements. Without this possibility there is no market competition pressure on Agroseguro to improve the efficiency of the insurance conditions and services. The only pressure comes from the financial control by the Insurance and Pensions Directorate of MEH and from the institutional mutual control between ENESA, farmers' organizations, Agroseguro and the private insurers. Regulations and policies need to be balanced between the incentives offered to insurers to work together to create new markets through information sharing and co-insurance and, on the other hand, the need to ensure competition once the market is created.[7]

4. The hybrid insurance system as a device for catastrophic risk policy

The hybrid insurance system has several advantages with respect to *ad hoc* disaster assistance in dealing with catastrophic risk. First, the government needs not to bear the risk in its budget because the risk is transferred to private insurers. Second, the system is transparent and allows damages to be evaluated by experienced experts, while the indemnities are paid very rapidly. Third, farmers financially participate in the scheme and share responsibility for the management of risk. Fourth, the main administrative burden of the system is transferred to insurers. A main challenge is to ensure that the system deters *ex post* assistance and is efficient in defining the boundaries of catastrophic risk.

The insurance system as a device to deter ex post disaster assistance

Scale of ex post disaster assistance in Spain: interest concessions, direct payments and fuel rebates

Despite its objective of protecting farmers from the consequences of catastrophic events, the insurance system was not able to eliminate *ex post* disaster assistance measures. Table 20 presents all these different measures and quantifies those for which information is available in order to measure the scale of the *ex post* assistance. There are two main elements of incomplete information: the exact measures financed by the 17 regional governments for which only partial information is available through the PSE database and through direct information received from the regional government of Castilla y León; and the compensations for compulsory slaughter. Table 20 includes precise expenditure for the Spanish government credit concessions in 2008, but estimates are used for other years.

7. See for instance Commission Regulation (EU) No 267/2010 of 24 March 2010 for the exemption on Article 101 (3) of the Treaty of the European Union on Competition rules for co-insurance and re-insurance pools. This regulation goes beyond agricultural insurance and limits the exemption to agreements with respect to the compilation and distribution of information and joint studies, and to agreements for the pooled coverage of certain types of risk. With regard to the latter, the EU Regulation establishes a maximum three-year exemption period for new risks and market share thresholds for other risks. The pool must have a maximum of 20 to 30% share in any relevant market, Regardless of the details and applicability of this regulation, it illustrates the need for a balance between incentives to make the market exist and incentives for competition among companies through greater efficiency of the services they provide.

The highest numbers in Table 20 correspond to fuel rebates (estimated EUR 80 million per year) and income tax and VAT measures (estimated EUR 375 million per year), which were decided in 2005 and apply in the following years. These estimations were made in 2006 and further estimations of their value have not been made available since. These measures were put in place in response to a demand by farmer associations in a context of high input costs. The tax measures can be triggered because of the simplified tax regime for farmers that the government attempts to adjust accordingly. However, they are extraordinary *ad hoc* measures that, in practice, are difficult to distinguish and disentangle from support measures decided for political economy reasons. The same applies to some of the measures financed by the regional governments, for instance EUR 6.5 million of support to milk producers decided in 2009 by the regional government of Castilla y León.

The remainder of the *ad hoc* payments and credit concessions include a small amount of exceptional payments from ENESA (EUR 10 million in 2008), credit concessions from the Ministry administered by the SGAPC (EUR 43 million in 2008) and measures from regional governments (estimated at EUR 71 million in 2008). With all the caveats on the estimation and missing data, this measures are estimated to add to around EUR 130 million, well below the expenditure on insurance subsidies estimated to be EUR 444 million in 2008 (309 from the Spanish government and EUR 135 million from the regional governments).

Table 20. *Ad hoc* extraordinary payments, tax measures and credit concessions

Mio Eur	Source	2005	2006	2007	2008	2009
Tax measures						
Fuel rebates (SGAPI/ MEH)	5	n.a.*	80.0	n.a.*	n.a.*	n.a.*
Income tax measures (SGAPC/ MEH)	5	n.a.*	250.0	n.a.*	n.a.*	n.a.*
Value added tax measures (SGAPC/ MEH)	5	n.a.*	125.0	n.a.*	n.a.*	n.a.*
Total		n.a.*	**455.0**	n.a.*	n.a.*	n.a.*
Spanish Government						
Exceptional payments (ENESA)	1	5.4	13.0	3.8	9.9	n.a.
Interest concessions (SGAPC-ICO)	2	27.7	27.7	27.7	34.1	8.9
Subsidy of Loan guarantees (SGAPC- SAESA)	2	n.a.	n.a.	n.a.	8.7	n.a.
Compensation for natural disasters (other PSE)	3	23.1	33.6	23.5	13.0	n.a.
Total		**56.3**	**74.3**	**55.0**	**65.8**	**8.9**
Comunidades Autónomas CCAA						
Exceptional payments co-financed with ENESA	1	0.1	12.7	0.7	n.a.	n.a.
Credit concessions Castilla y León	4	n.a.	6.3	6.3	6.3	15.5
Exceptional payments (Castilla y León)	4	n.a.	n.a.	n.a.	6.9	6.5
Andalucía (PSE)	3	n.a.	n.a.	46.2	45.5	n.a.
Castilla La Mancha (PSE)	3	n.a.	n.a.	n.a.	3.5	n.a.
Cantabria (PSE)	3	n.a.	n.a.	9.4	n.a.	n.a.
Galicia (PSE)	3	n.a.	n.a.	1.9	1.8	n.a.
Murcia (PSE)	3	n.a.	n.a.	1.7	n.a.	n.a.
Valencia (PSE)	3	n.a.	n.a.	6.0	2.2	n.a.
Canarias (PSE)	3	n.a.	n.a.	n.a.	4.6	n.a.
Other CCAA (PSE)	3	n.a.	n.a.	0.7	n.a.	n.a.
Total		**0.1**	**19.0**	**72.9**	**70.8**	**22.0**
Compensation for compulsory slaughtering after contagious animal diseases		n.a.	n.a.	n.a.	n.a.	n.a.

n.a.: non available. *: No estimate is available for these years, but the measures decided in 2005 remain.
Sources:
1. ENESA, *Ayudas por daños no cubiertos por los seguros agrarios* (2004-2008), 2008.
2. Ministerio de Medio Ambiente y Medio Rural Y Marino, subdirecion de Relaciones Internacionales y asuntos comunitários, 2010.
3. PSE database for Spain, natural disasters data provided by Spanish national authorities.
4. Junta de Castilla y León, Conjerería de Agricultura y Ganaderia, document prepared for the OECD country visit, 2009.
5. MAPA, SG Planificación económica y coordinación institucional, Unidad de Análisis y Prospectiva, AgrInfo Enfoque n.E3, July 2007. Income tax and VAT measures are triggered in the context of the simplified tax regime for farmers under which taxes are not adjusted to changes in costs. Note that the parameters in the VAT simplified regime attempt to be tax neutral for farmers.

Links between the insurance system and ex post assistance

As was noted earlier, in order to limit the scope of these extraordinary *ex post* measures, farmers in Spain can benefit from them only if they have bought some insurance, and assistance is not provided for events that are insurable. How effective these conditions and the governance institutions around the insurance system are in deterring *ex post* assistance needs a benchmark for comparison. The ideal but unobservable benchmark would be an experimental observation of *ad hoc* payments in Spain in the absence of an insurance system. A feasible alternative would be to compare with other countries that have different systems.

Bielza *et al.* (2009) try to compare the diversity of policy options, risk management instruments and initiatives among EU member states. Almost all of them provide *ad hoc* payments and a smaller percentage have either public or private stabilization funds. *Ad hoc* payments to livestock growers are common in the United Kingdom, Ireland, Belgium, Poland, Germany and Sweden. *Ad hoc* payments to crop farms are mostly related to frost, drought, hail and excessive rainfall. In France and Germany, more than 65% and 30% of the *ad hoc* payments in the last ten years were related to droughts. Total annual *ad hoc* payments in the European Union are about EUR 1 billion (Table 21).

However, Table 21 and Figure 12 deserve some caveats as the information is incomplete. In the case of Spain, the whole set of *ad hoc* measures included in Table 20 amounts for much more than the EUR 3.7 million in Table 21. In the case of the United Kingdom, the main *ad hoc* payments included are compensation for the compulsory slaughter of animals after contagious disease outbreaks. These were very large in 2001-05, but the data on Spain exclude this type of compensation, even if they are likely to be much smaller. The same information seems to be the source of Figure 12. Furthermore, a cross-country comparison of *ex post* or *ex ante* government expenditure for management of catastrophic risk in agriculture can be an indication but not a proof of such trade off, because the underlying risks and political preference for protection after disasters can be different in different countries.

During the past five years, a number of EU members (notably Austria, France, Greece, Italy and Spain) have developed new *ex ante* policies. Others, including United Kingdom, Germany and the Netherlands, rely on *ad hoc* relief and disaster compensation, and have reinforced farmers' training programs for coping with risks. Garrido and Bielza (2008) propose the following variables to represent the policy approach in each European country (Figure 12): (1) *ad hoc* and mutual fund payments expressed as percentage of total agricultural output (including crop and livestock); (2) insurance premiums as a percentage of agricultural output (including crop and livestock premiums). They argue that national policies stand between the two extremes represented by the United Kingdom and Spain: the United Kingdom has relied mostly on *ad hoc* payments while Spain has relied on agricultural insurance. Note that in this analysis, apart from these two countries, most EU countries spent less than 1% of insurance premia, funds and *ad hoc* contributions. The combined expenditure on *ad hoc* payments and insurance in the Czech Republic and Slovenia are among the highest in the European Union. In between these two policy extremes, countries such as France, Italy or Austria are moving in the direction of more insurance. France and Spain have linked the eligibility to *ad hoc* funds to the purchase of agricultural insurance. This will apply to all EU countries from 2010 (Regulation EC, 2006c).

Despite the difficulties in data comparability, this idea of a potential trade-off between insurance subsidies and *ad hoc ex post* payments may still be valid across EU

countries, and it seems to have played a role in containing *ex post* assistance in Spain. Farmers and farmer organizations participate in the insurance scheme and know that this is the main public instrument for disaster risk management in agriculture in Spain. However, the exact numbers to quantify this effect are more complex and further empirical analysis is required. The idea has also attracted attention in other countries. Glauber (2004) discusses the same trade-off between *ex ante* insurance subsidies and *ex post* disaster assistance in the United States. Glauber considers crop insurance as a preferable option because it provides *ex ante* known risk protection, but he argues that despite the expansion of insurance subsidies since 1980, they have failed to replace disaster assistance in the United States.

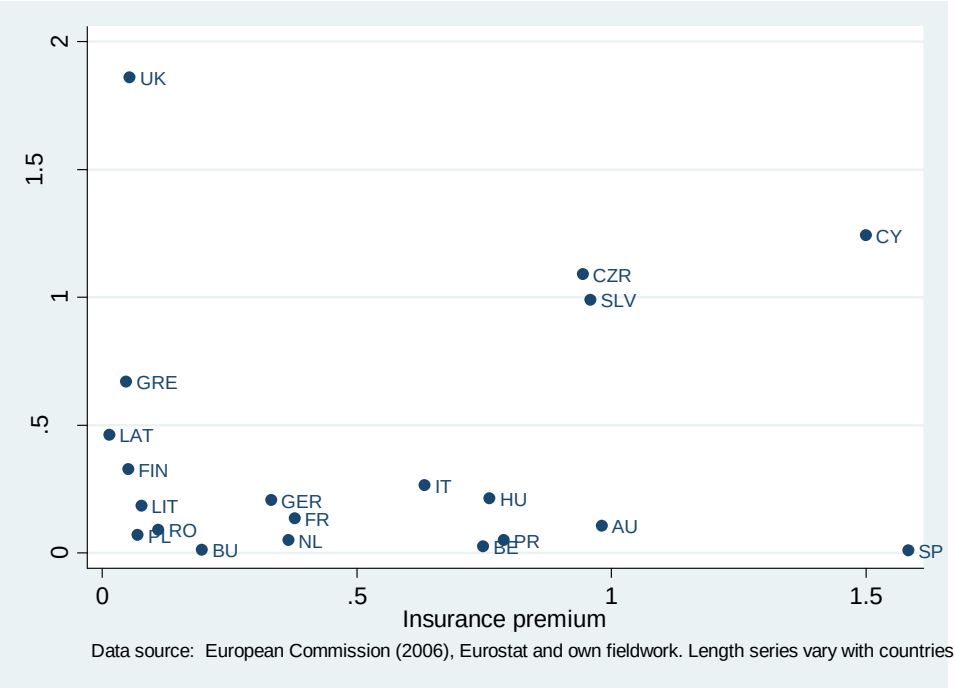
Table 21. *Ad hoc* and Funds payments in recent years in EU countries

Country	Years available	Average payment per year EUR millions	Comments
Austria	1995-2004	5.6	Frost, drought, flood
Belgium	1985-2002	17.2	Livestock dioxin, frost, drought, rain, pests
Czech Republic	1995-2004	36.9	Flood, drought, frost
France [1]	1996-2005	155.6	Drought 67%, frost 19%, rain 13%
Germany	2004-2006	112.3	Flood 2004 more than EUR 240 million; livestock diseases and preventive measures
Greece	1995-2004	70.1	-
Hungary	1999-2002	12.2	Frost, drought
Ireland	1999-2004	66.8	Livestock disease
Italy	2001-2006	113.3	Drought and others not covered by insurance
Netherlands	1998	250	Excessive rain; aid no longer permitted.
Portugal [2]	2001-2010	3	-
Spain	2000-2005	3.7	Frost, drought, rain
Sweden	-	-	Infectious diseases
United Kingdom	2001-2005	379.5	Livestock disease

1. Of this amount, 50% comes from the sector's private contributions, through taxes on agricultural insurances (France) or from levies on the commercialisation of the products (Ireland).
2. Portuguese farmers also contribute to the calamities fund, but the amount refers to Government contributions.

Source: Bielza *et al* (2009).

Figure 12. *Ad hoc* payments *vs*. insurance
(annual payments expressed in % of total agricultural production)



Source: Garrido and Bielza, 2008.

The boundaries of catastrophic risk

In the Spanish insurance system there are catastrophic risks linked to drought, yields, or animal diseases that are covered by policies thanks to premium subsidies. Public expenditure on these insurance subsidies can be stable and budgeted *ex ante*. There is no line or boundary, however, between marketable and non-marketable risk inside the system. The three re-insurance classes or the six subsidy groups do not discriminate between rare but very damaging catastrophic risks on one side, and risks in the middle of the range of probabilities and damages for which viable market insurance is more likely. Due to this lack of discrimination between these two general types of risks, the system has difficulties in offering differentiated treatment in terms of scope of government involvement, level of subsidy, deductibles or reinsurance.

Ad hoc support on top of the insurance system is offered only to farmers who contract insurance and for risks that are not insurable. The insurance system is the benchmark for triggering the extraordinary *ad hoc* measures, which provides additional incentives to buy insurance. The uncertain possibility of payments that complement insurance indemnities may create incentives to limit the responsibility of Agroseguro when calculating the indemnities. The fact that *ad hoc* payments are provided by the insurance agency ENESA may help to discipline the payments that have been limited in recent years despite the lack of a defined triggering mechanism.

The credit concessions provided by the Ministry through the SGAPC are typically subject to the same condition of risks that are not insurable and for farmers who buy insurance. Unlike direct payments, they are not managed by the insurance agency ENESA. The value of these measures is significantly larger than those of ENESA, and

despite the fact that these measures have not been triggered in the most recent years, their financial implications are spread across several years of the credit.

The Spanish government has also used *ad hoc* tax measures. These measures can be quantitatively large and typically affect both normal and catastrophic risk. This type of measure is implemented in the context of a simplified tax method or regime for agriculture that undermines the capacity of the tax system to serve for income smoothing under normal risk events. Furthermore, these measures were triggered in 2005 in connection with "high input prices". This opens the use of "extraordinary measures" for both market risks and climate related risks.

The *ad hoc* measures by the regional governments complement those of the central government. No explicit definition of the boundaries of risks covered by each level of government exists. The central government does not have complete information on regional measures, which reveals there is scope for more coordinated action. But existing evidence does not show a trend to an increase of this *ad hoc* expenditure, and the level of these support measures has remained low in comparison with insurance subsidies.

Animal diseases have special treatment under the indemnities for slaughtered animals. Due to the externalities associated with disease notification, there are compensation payments by the government in the context of the EU strategy on animal health policy. In this case, the insurance is a complementary measure for what is not covered by government compensation so that the insurance covers the less catastrophic part of this risk.

Insurance subsidies in the context of other policies in the European Union

The hybrid insurance system in Spain cannot be isolated from other policy instruments in place, particularly in the context of the EU Common Agricultural Policy. Two main instruments affect the cereal sector for which micro data is available: the intervention price for cereals and the Single Farm Payment (SFP). In order to analyze these policies, a microeconomic model has been calibrated following the methodology in OECD (2010b) and the FADN data used in section 1.4. This model illustrates some comparisons and interactions among different policy instruments. Table 22 summarizes the risk management impact of three different policy measures at the farm level: an increase in the SFP of EUR 11 per hectare; an increase in the intervention price that creates market price support of this same amount; and subsidies to crop yield insurance premiums for the same monetary value.

According to the simulation results, the SFP is the most income transfer efficient measure, with a significant increase in income and welfare. Market price support is much less efficient in transferring income, while insurance subsides is the least transfer efficient policy. These transfer efficiency results are well known as confirmed in other studies (OECD, 2005), but how efficient are these instruments in reducing income risk faced by farmers?

The simulations results in Table 21 show that the SFP reduces the minimum income in the farm by the fixed amount of the transfer to the farmer. It has a relatively small impact in reducing farming risk, but does not crowd out other risk management strategies and can help farmers to manage their financing. The intervention price mechanism, however, has a stronger impact on minimum income due to the truncation of the lower part of the price distribution. But the coefficient of variation of income is hardly improved with market price support because this policy has a strong crowding out effect

on other strategies such as diversification (the diversification index falls by 14%). Once price risk is reduced, the farmer tends to specialize in higher return crops (with higher risk).

Of the three policy measures presented in Table 22, insurance subsidies are the most effective in reducing farm income risk. There are several factors related to the risk profile of the Spanish sample that can explain this strong impact: production risk is systemic across different outputs and, therefore, diversification strategies are not very effective; yield variability is more important than price variability; and there is little natural hedging due to the weak positive correlation between price and yield. The combination of these circumstances makes crop insurance a more effective instrument to reduce farm income risk in Spain. The simulations result increases for minimum incomes is EUR 103 as compared to EUR 9 for price support, and for reductions it is 10% in the CV of income as compared to 2% in the case of the SFP.

The effectiveness of crop insurance to reduce farming risks contrasts with the use of insurance subsidies. Simulation results show very poor performance of insurance subsidies in terms of farm income and certainty equivalent income, which is why farmers do not buy insurance without the subsidy; according to the simulation results, they do not think that the reduction of risk is worth the value of the insurance premium (the welfare gain is much smaller than the premium). This raises the question of efficiency: insurance subsidies seem to be effective in reducing farming risk in Spain, but are they efficient? Is the obtained reduction in farming risk worth its cost in terms of subsidies? The answer is most likely to be affirmative for catastrophic risks for which markets and other tools are most likely to fail.

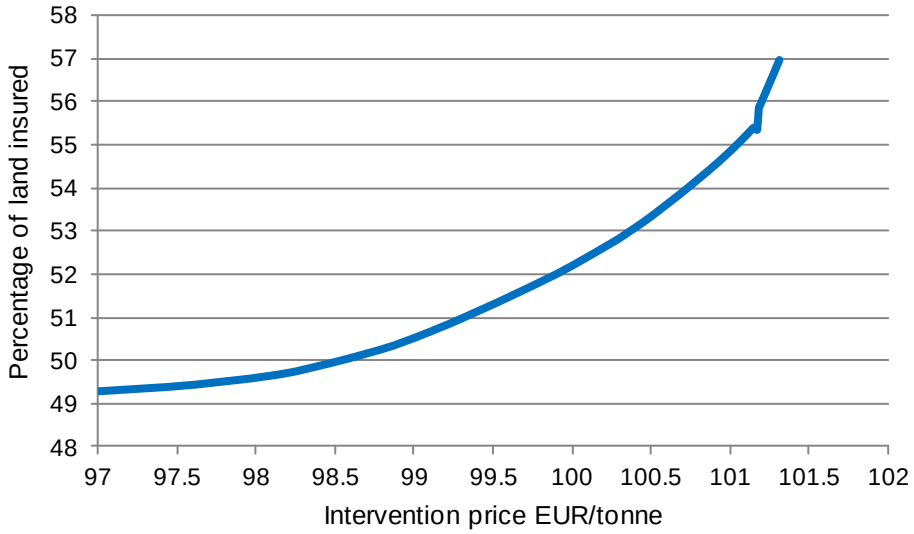
Table 22. Risk management impacts of different policy instruments in Spain

	Certainty equivalent income (change in GBP)			CV of income (percentage change)	Change in diversification index (Initial=100)	Minimum income (change in EUR)
	Overall change	Contributing factors	Change in variability			
Single farm payment	5.38	5.38	0.00	-2.24	0.00	5.35
Cereal price stabilization	2.23	2.26	-0.03	-0.38	-14.10	9.14
Subsidy to crop yield insurance premium	0.32	-0.77	1.10	-9.63	-0.43	102.74

There are significant interactions among the different policy instruments, particularly the intervention price mechanism and the insurance subsidies. Intervention prices truncate 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 mitigate the potential negative correlations between price and yields. These are two important factors that contribute to the effectiveness of crop yield insurance. When the intervention price is reduced, the effectiveness of yield insurance to reduce farm income variability is also reduced and the demand for insurance is likely to shrink as illustrated by the simulation results presented in Figure 13. In the current context in which intervention prices have been reduced over the last twenty years in the European Union, this may have policy implications for the insurance system in Spain. Yield insurance is likely to be less effective and the demand is likely to contract

for the same amount of subsidy because farmers are likely to shift demand towards broader revenue or income based risk management tools.

Figure 13. Response of crop insurance demand when the intervention price is reduced



Source: Micro economic simulations following the methodology in OECD (2010b).

PART III.

POLICY IMPLICATIONS

5. Policy recommendations and concluding remarks

Two features of agricultural risk in Spain have important implications for the risk management system. The first one is greater yield risk as compared with price risk, particularly for those commodities that benefit from CAP market support. The second one is the systemic nature of yield risk that typically affects many crops and farmers at the same time. These characteristics contribute to render insurance a relatively effective risk reducing tool. In this context, Spain has developed a sophisticated hybrid insurance system based on a public-private partnership, premium subsidies and governance rules. The system has always had the support of the main political parties and successive governments, farmer organizations and insurance companies. Insurance covers some catastrophic risks, but it does not fully replace *ad hoc ex post* assistance. 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.

The system is a governance device for agricultural risk management that needs to be considered in conjunction with all other risk related policies and in particular the evolution of the CAP that has reduced market interventions and is now focused on more decoupled direct payments. The main challenge of the Spanish system is to ensure its evolution in response to a changing policy environment while reinforcing its role in disciplining *ex post* disaster assistance. Policy recommendations in this section build on the idea of facilitating the evolution of the system towards more efficient outcomes.

Policy recommendations for Spain

1. ***Develop a broad framework for disaster risk management in agriculture*** that would define the role of all government policies and farmers strategies in the current EU policy context**.** A national agreed frame defining the scope of the responsibility of the government and the policy instruments that could be applied would contribute to the implementation of efficient policies.

    a. *Introduce a definition of a disaster or a catastrophe that is eligible for receiving public support*. This definition should use a set of criteria, including the type of event (for instance, only specified natural events), the size of event for the country or region, and the impact of event on individual farmers. Indicators should be based both on the magnitude of the impacts and on the probability of occurrence. Farmers and the society as a whole should be well

aware of the meaning and implications of this agreement in terms of the scope of government's responsibility for disaster assistance to agriculture.

b. *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 decision. Any disaster *ad hoc* assistance that complements insurance requires good coordination between institutions. The objective of these protocols would be to ensure that a quick response from the government does not compromise a well informed decision that accounts for the costs and benefits of public assistance.

c. Given the Spanish de-centralized form of government, it is important to *clarify the role/s of different levels of government, in particular, central and regional* (autonomous communities) ones and ensure their participation in the decision process. The subsidiarity principle should be applied to define the scope and type of events which are under the responsibility of each level of government and appropriate co-financing provisions creating incentives for cooperation and fiscal responsibility should be included. Improve transparency of the decision process and information sharing on risks and policy measures between levels of government and with the public.

2. ***Allow the insurance system to evolve*** over time. After thirty years of sustained growth the system requires a strategy for the medium term that goes beyond the original idea of a continuous expansion. This needs to be considered in conjunction with other measures and in the context of the reform of the CAP. The latter consisted of shifting away from market price support, which can make instruments based on revenue or income more effective in reducing risk and more attractive for farmers than production insurance.

   a. *Revisit the 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.

   b. *Differentiate between "marketable" and "catastrophic" policy lines or risks.* They could match with a redefinition of group B of "viable" and group A of "experimental" policies based on risk characteristics and information. 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 definition of catastrophic insurance policies should be consistent with the general framework for disaster agricultural risk management.

   c. *Consider a schedule of subsidy reduction for the "marketable" policy lines*. This would be consistent with the evidence that once the system is in place and farmers have bought insurance, there is less need for a subsidy to make farmers buy it.

   d. *Increase competition among private companies* participating in Agroseguro, particularly for the marketable risks, while ensuring that risks are pooled and information is shared through a database. The insurance service could be

directly provided by each insurance company to ensure that there are sufficient incentives for better services and therefore, increased efficiency.

e. *Allow for a broader use and analysis of the insurance database*. Investigate methodologies to discriminate between different lines of insurance that can help to rationalise the insurance subsidy policy. Enhance the assessment of risk and the capitalization of experience, knowledge and information among different agents and insurers.

3. ***Adjust tax policies to facilitate risk management.*** Current tax provisions for farmers simplify the farmer's task in completing tax forms, but this reduces the capacity of the income tax to adjust to situations of very low or negative profits. This necessitates frequent adjustments in taxing parameters ("modules") in different years and locations, which reduces the predictability of the automatic mechanisms of the income tax.

   a. *Make fiscal rules more stable and allow the tax system to perform better in income smoothing*. The current simplified system of modules reduces effectiveness of income tax as an income stabilization tool. The following may be considered: including the costs of production in the estimation of farm income under the modules system that is most used by farmers; and allowing these to be taxed on a moving average of income across years.

   b. *Analyse income tax data* to evaluate and inform about the weaknesses and strengths of the current tax system for farmers. The development of good income tax data is a pre-requisite for the design of well informed income related policies.

4. ***Facilitate the development and use of other risk instruments,*** apart from insurance, such as forward contracting / futures, tax system, savings accounts, off-farm income and diversification, and enhance innovation in risk management tools.

   a. *Expand education and extension programs to farmers beyond insurance, to all kinds of risk management strategies*. Risk management training should encourage farmers to take the responsibility for their risks as part of their farm management strategy.

   b. *Promote risk assessment analysis* for all types of risk, including price, market and income risk. Promote the development of appropriate methodologies, information and databases accessible to farmers, insurers and government to facilitate risk management decision making at all levels.

Policy lessons beyond Spain

1. A ***Public / private partnership can help an insurance market start working*** through demand incentives, institutional arrangements and information sharing and pooling. The partnerships have its main strengths in improving the performance of markets under information related market failures (through information sharing and development of databases), exploiting risk pooling opportunities and stimulating initial market demand from farmers. But the system needs to be able to evolve over time once markets and information databases have been created.

2. A system of insurance ***subsidies can create rents and inefficiencies,*** and there is need to progressively allow for some competition among private companies. Competition needs to be coupled with good governance to facilitate the efficiency and responsiveness of the system. This is particularly the case for marketable risks and related policies.

3. Social acceptance and political stability are important assets for a risk management system because changing policy frameworks impede good risk management decisions at the farm level. *Ex ante* insurance in Spain is well accepted by the society and stakeholders and it has given ***stability to the risk management system*** and has helped to some extent to discipline the scope of disaster aid. However, effectiveness in reducing farming risk in Spain is related to the specific farm risk profile in this country and could not be extrapolated to other countries.

4. Even in a country with the risk profile of Spain, ***public insurance does not automatically deter ad hoc disaster assistance.*** Insurance have proven to be insufficient, and the risk management policy needs to go beyond the insurance system and include information, promotion of other risk management strategies and good governance of disaster assistance claims. ***Insurance cannot be a unique solution to manage all agricultural risks***. A variety of instruments is needed and government policies should promote this variety.

Annex 1.

The OECD team visit for the review of Spain

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Main contact person in Madrid	Maria José PRO (ENESA, MARM), responsible for the questionnaire
Dates of visit	Madrid and Valladolid, 21-23 September 2009
List of institutions and persons visited	Fernando BURGAZ, Director of ENESA, Madrid ENESA, State Agricultural Insurance Body, Madrid Agroseguro, Spanish Association of Combined Agricultural Insurers, Madrid CEIGRAM, Research Center on Agricultural risk management, Madrid Insurance Compensation Consortium (CCS), public re-insurer. Madrid SG of Analysis Perspective and Coordination (SGAPC), MARM, Madrid DG Taxes, MEH, Madrid SG for Plant and Animal Diseases, MARM, Madrid Cooperatives Association, Madrid Small Farmers Union (UPA), Madrid Junta de Castilla y León (Regional government), Valladolid DEIMOS Imaging, private tele-detection company, Valladolid

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