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# Agricultural Insurance Schemes

Maria **Bielza Diaz-Caneja,** Costanza Giulia **Conte,** Christoph **Dittmann**
Francisco Javier **Gallego Pinilla,** Josef **Stroblmair**

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European Commission
Joint Research Centre
Institute for the Protection and Security of the Citizen

**Contact information**
Address: JRC, TP-483 - Via E- Fermi 2749 – 21027 Ispra (VA) - Italy
E-mail: Javier.gallego@jrc.it
Tel.: +39.0332.78.5101
Fax: +39.0332.78.3033

http://ipsc.jrc.ec.europa.eu/
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**The project team:**
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Maria Bielza
Costanza Conte
Josef Stroblmair
Christoph Dittmann

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**Institute for the Protection and Security of Citizens**
Agrifish Unit
MARS-Stat action
Via Fermi 2749
I-21027 Ispra

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# Executive summary

## 1. Introduction

Agricultural producers face a series of risks affecting the income and welfare of their households. These are mainly production risks related to weather conditions, pests and diseases, market conditions, etc. Consequently, the income stability of agricultural stakeholders can be also affected. In recent years the European Union has been considering a possible integration of risk management in the common agricultural policy and is analysing risk and crisis management strategies to provide an improved response to crises in the agricultural sector.

This report reviews the agricultural risk management systems in the EU (candidate countries Turkey and Croatia are also analysed) with a special focus on types of agricultural insurance, although no data could be collected for Malta. The most descriptive part of the study contains a collection of data on the realities and modalities of agricultural insurance in Europe. This information mainly comes from fact sheets filled in by experts or consultants from the different European countries and data from the European Committee of Insurers (CEA). Many of these data were unpublished because there is no obligation for the insurance companies to report to the EU institutions.

## 2. Description of the current situation of agricultural insurance in the EU

The EU has mostly classic insurance schemes (mainly single-risk and combined insurance, but also yield insurance), generally private except in Greece and Cyprus where insurance is public and compulsory. In many countries the market is in the hands of no more than two or three insurance companies. The level of development of agricultural insurance in each country is mainly linked to two decisive factors:

— the needs faced in each country (risk level);
— the economical support given by each Member State to the insurance systems.

The role of governments is analysed for each country. Some do offer or subsidise insurances while others provide aid *ex post* given on an ad hoc basis through compensation schemes, calamity funds or futures markets existing in Europe, which can be partially financed by the agricultural stakeholders on a voluntary or compulsory basis. The different existing risk management tools are presented, analysed and compared in the report. This helps to understand better the evolution of the insurance systems in Europe, since the development of the insurance system depends very strongly on the presence of other risk management tools and on the role of the public sector, in particular ad hoc aid measures.

## 3. Understanding and measuring the level of development of insurance

The report gives an analysis of the volume of insurance and the market penetration or participation rates (in relative terms). Several comparisons are studied and shown through maps to conclude that the percentage of insured area does not give a sufficient measure to understand the importance or development of insurance in a country: it needs to be combined with the cover offered by the insurance schemes and with the market penetration in terms of insured value.

Finally, we can point out that in Europe there is no comprehensive yield insurance without public support. For non-systemic risks, like hail, the private sector offers suitable insurances, but for insurance products offering a wide cover in yield reduction risk, there is a direct relationship between development of the system and public support. The amount of support provided by EU Member States to subsidise insurance premiums varies depending on the country's policy to promote some particular type of cover.

Some technicalities, like reinsurance, triggers and deductibles, are described. Reinsurance is usually done in the international reinsurance market, mainly in the modalities of stop-loss and quota-share reinsurance.

## 4. Regulations, policies, State aid: towards a homogeneous system

The definitions of crisis and disaster eligible for public aid in EU Member States are examined and compared with the 'Community guidelines for State aid in the agriculture sector (2000–06)' (EC, 2000). New Commission guidelines (EC, 2006b) and a new regulation (EC, 2006a) on the application of Articles 87 and 88 of the Treaty were adopted in December 2006. The definitions assumed are strongly shaped by WTO agreements. National experts provided information on the Member States' definitions for disasters and crises which are eligible for aid, as well as the definitions of insurable risks, when they exist. Some countries forbid State aid in the case of crisis or disaster if the risk could have been insured. This is the case for Austria, Greece, Italy, Portugal, Spain, Sweden and Turkey for subsidised insurable risks and for France if insurance has reached a significant diffusion level. The regulation will partially condition State aid to buying some type of insurance from 2010 on.

Most EU Member States follow the Community guidelines for State aid (EC, 2000) to decide when aid can be bestowed aid. We have classified the Member States in four groups according to their observance of the guidelines: some of them incorporate or explicitly mention the guideline definitions in their legislation; others just assume it without explicit mention; a third group have more restrictive definitions than those established in the guidelines, as it is the case for the calamity fund system in France. Lastly, some States have less restrictive definitions than those in the guidelines. These different attitudes of the Member States existed while the guidelines were only ‘advisory’. A few examples of definitions for disaster are shown below.

**(a) EU States with a more restrictive definition:** France: crop losses above a higher threshold: 42 % of the production value of the damaged crop and 14 % of the whole farm gross revenue; also requires that no efficient preventive technique be available. Austria: disaster is defined by the public authorities related to the occasion; no aid for insurable risks. Portugal: damage on crop production of at least 50 % (…) of the yields usually obtained in the region. The Netherlands, Sweden and the UK: no aid is given for climatic risks on crops, only for livestock diseases.

**(b) EU States with a less restrictive definition:** The Czech Republic: more detailed specification of defined risks called as ‘natural disasters’. Hungary: more risks defined as ‘natural disasters’; lower triggers, 15 % or 20 %, applying for some kind of support, like preferential credit or tax and lease reduction and cancellation.

With the coming into force of the 2006 regulation this situation should change towards more homogeneous rules.

# 5. Risk level: geographical analysis

The variability of production and income is far from uniform across the EU: in some regions and sectors they are relatively stable, while in other regions or sectors they are highly unstable. Mapping the variability level has a twofold interest for the assessment of agricultural insurance: better understanding as for which geographical areas and sectors stabilisation is more important, and tuning the extrapolation of the premium rates in a hypothetical EU-wide system. The data required for analysing the variability of climatic risks, yield and income come from several sources:

— meteorological databases and agrometeorological parameters computed by CGMS (crop growth monitoring system), which is the kernel of the JRC yield forecasting system for the EU; CGMS allows an analysis to be made at pan-European level of the status of the crops and on the harvest prospective and in this report it was used to develop climatic risk maps;
— vegetation indexes computed on satellite images;
— Eurostat’s REGIO database on yield of main crops;
— the farm accountancy data network (FADN).

## 6. Agricultural insurance systems in other countries

The agricultural insurance systems existing in the world are reviewed. In Canada, the USA and other non-EU countries, some insurance instruments, such as index insurance, area insurance, whole farm insurance or revenue insurance, have been developed which are not developed in EU. In the United Kingdom there was a private revenue insurance product but it was soon removed from the market.

In Canada and the USA there is yield insurance. In both countries, there is a basic cover for yield insurance which covers only for losses above the 50 % of the average yield (it is called catastrophic cover). It is highly subsidised by the government (almost entirely in the USA — where farmers pay only an administrative fee — and 50 % in Canada).

The USA is currently the only country where revenue and income insurance exists; the report presents it in depth. In Canada there was an income insurance named Gross Revenue Insurance Plan which failed and now there is an income stabilisation programme, which is described in the report.

The Canadian system is mainly led by public insurance agencies, from the provincial governments. It profits from subsidies, both from the federal and the provincial governments, which total EUR 425.5 million and which amount to 66 % of the premiums. Besides yield insurance products similar to those in the USA, it has an important income programme, Canadian agricultural income stabilisation (CAIS), which consists of stabilisation accounts. The stabilisation accounts are individual accounts where farmers put an amount of money every year, which they can withdraw in a year of big losses. They can be based on yields, revenues or other indices.

## 7. Livestock sanitary and risk crises

The report also reviews several studies made in the past few years to analyse the costs and impact of recent epidemic livestock outbreaks in Europe. We discuss the potential of livestock insurance to cover animal diseases and more general animal risks. Livestock epidemics can result in substantial losses for governments, farmers and all the other partakers involved in the livestock production chain. National governments and European institutions generally support the largest part of the direct losses, such as the value of destroyed animals and organisational costs. Consequential losses, such as losses resulting from empty buildings and movement standstills, are almost always completely borne by the farmers themselves if not insured privately. Few private insurance systems exist in Europe to cover the consequential losses due to livestock epidemics (e.g. they exist in Germany, Italy, Sweden, the Netherlands and the United Kingdom). Most general livestock insurance schemes cover death and emergency slaughter because of illness.

The main reason for public concern is that certain diseases can be a large potential hazard for the economy and the health of the population; therefore public reaction is normally covered by legislation and there is less room for private insurance. Besides, forecasting high risks events is very difficult and insurers are reluctant to insure against 'any disease'. Strategies of the public sector are rather focused on efficient risk-reducing behaviour, in particular through preventive measures. It seems possible to build a cost-sharing scheme only for covering losses caused by diseases with low or no externalities ([1]).

## 8. Main figures of crop insurances at country level

Approximately 23 % of crop value was insured in 2004 in the EU-27. Premiums amounted to EUR 1 583 million, i.e. 4 % of the insured value. Spain is generally considered as the country with the most developed systems and accounted for EUR 564 million although only 5.86 million ha were insured, showing relatively low market penetration (26 % of the cultivated area). In Germany, market penetration is higher (7.26 million ha, i.e. 43 % of the cultivated area), and the average amount of premiums accounted for EUR 129 million. This fact can be explained by considering that in Germany the insurance usually covers only a single risk (hail). On the other hand, the high value for Spain can be explained by the higher number of perils covered and the potentially higher risks there.

Total subsidies amounted to EUR 497 million or 32 % of the premiums. Between countries, the amounts of subsidies to the premium are very different. We find the highest subsidy rates in Europe are in Italy and Portugal, for example the 80 % subsidy in Italy for yield insurance. In other countries, as in the UK, there is no subsidy at all.

Average loss ratios — total claims paid by insurance companies during a certain number of years, divided by the total premiums of the same period — range from 60 % to 70 %.

## 9. Feasibility of an EU-wide system of agricultural insurance

We assess the feasibility of several scenarios with different types of insurances: single-risk insurance, yield insurance, index insurance, revenue/income insurance, etc. We consider socioeconomic criteria (related to decisions of the private sector: insurers, reinsurers and farmers) and technical criteria (cost/affordability,

([1]) Externalities are defined as economic consequences for third parties.

asymmetric information, easiness to control). Political criteria are essential, but beyond the scope of this report.

The rough costs estimation of some of them indicates that a 50 % subsidy to the national premiums of all the countries, assuming an insurance demand of 40 %, would be approximately of the order of magnitude of EUR 1 billion for income insurance, EUR 0.5 billion to EUR 0.6 billion for yield insurance on arable crops, EUR 0.23 billion to EUR 0.37 billion for area index insurance for cereals and of EUR 0.20 billion to EUR 0.40 billion for fruits. The calculations were made assuming that the average premium rates would remain in a more developed system equal to current rates. However, these estimations require more in-depth analysis, because this assumption may be too strong.

In the current situation, with very heterogeneous positions of Member States and very different levels of risk, it seems difficult to propose a common homogeneous insurance system, but some types could be of some interest:

— revenue insurance: more expensive, but more efficient as income stabiliser;
— indirect index insurance: cheaper and easier to manage and control, but usually less correlated with farmers' income.

## 10. Alternatives to a common agriculture insurance system

A series of alternatives to a common system have been proposed and analysed; these should be simple to manage by the EU administration and easy to control.

An alternative to a proper EU-wide insurance scheme could be a set of actions to foster national systems by:

— facilitating/subsidising the composition of databases, preferably at farm level, in order to limit to the minimum any malfunctioning due to asymmetric information that leads to adverse selection and, to some extent, moral hazard;
— reinsuring (many agricultural risks are considered non-insurable in most countries because they are too systemic); insurers and reinsurers are not willing to take this type of risk — the situation could change if there is strong public participation in the reinsurance scheme (USA and Spain);
— clarifying the framework (in order to achieve a greater homogeneity of the national systems); this has been partly achieved with the new regulation (EC, 2006a);
— partially subsidising national systems which are within the framework (this could be either insurance models, funds or other risk management tools — in any case, they should be within a common legal framework, establishing some control criteria and a common financing scheme).

# 1. Introduction

## 1.1. Motivation for the study

The economic stability of an entire rural area can be jeopardised by crises caused by different types of natural disasters, from climatic events to livestock or plant diseases. Weather is an important production factor in agriculture, which, unfortunately, can hardly be controlled. In fact, weather risks are a major source of uncertainty for farms. Drought and excess rainfall are responsible for bad harvests all over the world. Besides, it seems that the volatility of temperature and precipitation and the occurrence of extreme weather events have increased in the last decade and are likely to continue increasing due to global climate changes. This leads to destabilisation of farm incomes in particular in countries with strong yield variability. Perhaps the most obvious impact of weather risk is on crop yields, but its relevance is not limited to crop production. The performance of livestock farms, the turnover of processors, the use of chemicals and fertilisers and the demand for many food products also depend on the weather. Hence, large parts of the agribusiness are affected by weather risks. In the European Union (EU) the problem of production risk is even more relevant since price volatility is expected to increase due to recent policy reforms. Governments are not unaware of the importance of these risks. So, besides the private tools producers can use to manage risks, many countries have decided to help the stabilisation of their agriculture by supporting different agricultural risk management schemes. In the EU, there is an ongoing discussion on the role European policy should have regarding agricultural risk management. The European Parliament (EP) amendment is a response to the Commission communication on risks and crisis management in agriculture (COM(2005) 74 final) and the Council conclusions of 17 December 2003 on risk management in agriculture. This study is framed within the context of the ongoing discussion. It was commissioned to the JRC by the Commission's Directorate-General for Agriculture and Rural Development, at the suggestion of the European Parliament. The 2005 communication examined possible options for using modulation funds for risk and crisis management measures. In time they could complete or partially replace Community and Member States' ad hoc emergency measures. The options considered were supporting mutual funds, providing basic cover against income crises and co-financing farmers' insurance premiums against natural disasters. The following text was adopted by the European Parliament (EP): 'Systemic farming risks make it necessary to introduce regulatory mechanisms within the common agricultural policy which can cope with the impact of climatic or biological disasters on farm incomes. Agricultural insurance may be a useful tool for doing so.' The study will be used by the Agriculture and Rural

Development DG to further assess the potential of insurance systems as a tool for risk and crisis management in agriculture.

The aim of the study is to improve the knowledge about climatic and sanitary risks in EU agriculture and to examine the role and the functioning of agricultural insurance as a risk management tool. Weather risk is a major challenge in agricultural policy, and it is important to have a new look at providing suitable information to analyse a possible integration of it in the common agricultural policy (CAP). Price and income risks are also to be considered. Sanitary crises and economic crises caused by the changes of market conditions may also endanger farms' viability. The CAP should enhance appropriate risk and crisis management strategies, providing an improved response to crises in the agricultural sector.

## 1.2. Content of the study

The report starts with the description of main risks and risk management tools in agriculture, followed by a literature review of studies on agricultural insurance systems in Europe. The next chapter looks at the risks, analysing and mapping climatic and income risks in Europe. Moreover, policies and legal frameworks of agricultural risk management are introduced, namely the definitions of crisis and disaster, and the conditions under which public support is allowed for risk mitigation. Then we come to the risk management tools, mainly insurance schemes. First, non-European insurance systems are reviewed; secondly, the core of this study, the main agricultural insurance systems in EU-27 countries plus Turkey and Croatia are presented. After the insurance systems, other relevant risk management tools such as stabilisation funds or types of ad hoc aid are analysed in Chapter 6, and the particularities of livestock sanitary risk management are mentioned in Chapter 7. Finally, the feasibility of an EU-wide insurance system is discussed in Chapter 8. General conclusions and considerations close the report.

## 1.3. Sources and methodology used

The report uses different information sources for its different parts. The analysis and the mapping of risks (Chapter 3) are based mainly on meteorological and agrometeorological data from the crop growth monitoring system (CGMS), which is an important working tool of the MARS-Stat group in the JRC. Other sources of data (yields, income) are Eurostat and the farm accounting data network (FADN).

The information for the report, used in Chapters 4, 5 and 6, is sourced from national experts from all EU-27 countries, except Malta. Information from Croatia and Turkey was added in some cases, as it seemed to have interesting added value to complete the overview of the EU with candidate countries. A fact sheet to fill in was sent to all national experts, requiring a description of the risk management systems in their countries, of the insurance products available, their technicalities, reinsurance systems and some data on insurance demand or market penetration. The fact sheet sent to the national experts is shown in Figure 1.

This study represents a step forward in the insurance literature because of its novelty: such a compilation of information of insurance systems, both public and private, from all the countries in Europe, has never been carried out before. This uniqueness at the same time has a disadvantage: the difficulty to check the quality of the data provided. These data are also extremely complex to evaluate, because of the diversity of cover of the insurance products, because of their natural complexity and because of the differences in their insertion in the political schemes and their consequent impact on subsidies. Besides, in some cases, the data provided were clearly incomplete and lacking information; in most cases (France, the Netherlands, etc.) the missing information is in the hands of private companies that have no motivation or obligation to provide the data.

However, the study was able to profit from some additional information from the insurance companies, made available by the European Committee of Insurers (Comité Européen des Assurances — CEA). This information is used in Chapter 5. As will be ascertained in that chapter, the matching of both sources is not always straightforward.

Regarding the development of the work, it has to be mentioned that it has benefited from the follow up, not only by the Agriculture and Rural Development DG, but also by a small support group, who have had regular meetings with the authors for advisory purposes. This support group is composed of a few experts from different countries and backgrounds (insurance companies, reinsurance companies, consultants, officials for government insurance policy, and farmers unions). However, all inaccuracies and mistakes that may be found are entirely due to the authors.

**Country:**

## 1. Generalities

Some history of the agricultural risk and crisis management policies, programmes and tools.

## 2. General framework

- Definitions of disaster (for the application of Article 92.2 of the Treaty of Rome ([2]))
- General law framework
- Objectives of the existing policies/programmes
- Law barriers: Does the law forbid ad hoc measures or disaster funds to compensate damages that could have been insured?

## 3. Market conditions

- Competition on prices or on quality of services. Is there an independent body that fixes tariffs?
- Competition on quality of services
- Market players: Is there a dominant company?

## 4. General features

Indications of most frequent characteristics: To be detailed in the next paragraph and the technical form of products

- Compulsoriness for the farmer
- Public subsidies (%) and cost for the farmers
- Franchise (%): Is it computed on the total of the farm or per crop?
- Existence and importance of index-based insurances
- Most usual method for determination of losses
- Delay in paying indemnity after event or harvest
- Is there a bonus/*malus* system?
- Is there insurance for income?
- Is there a (significant) market of MPCI (multi-peril crop insurances)?
- Are there any types of insurance available for prices?

## 5. Insurance products available

Description of all the available programmes per crop, per group of crops (as probably defined by the insurance) and per type of animal, including information on:

- number of farms covered
- covered areas (crops, livestock and revenue) and type of risk covered
- cover in value of production

The information in this paragraph is extended in the technical form in annex. It will refer to the most recent year available.

## 6. Cover in the most recent years

This paragraph summarises the information given in the tables by type of product and describes the evolution in the most recent years. The information is partly redundant because of paragraph 5, but this paragraph focuses on the time trend. If possible, figures should be given year by year over a

([2]) 'The following shall be compatible with the common market:

(a) . . .

(b) aid to make good the damage caused by natural disasters or other exceptional occurrences;

. . .'

period of five years or alternatively data can be given for one date around five years before the most recent available.

- Number and percentage of farms covered
- Total area insured by group of crops and percentage
- Total number of animals covered by type of animal and percentage
- Production value covered and percentage
- Total amount of premiums
- Compensation payments to farmers (indemnities)
- Subsidies

## 7. Reinsurance

- Private or public?
- Main reinsurers
- Reinsurance rates

## 8. Alternative risk management tools

- Ad hoc measures (extraordinary disasters): average expenditure in the last 10 years, delay to pay.
- Calamity funds regularly fed. Average expenditure in the last 10 years, delay to pay.
- Mutual funds
- Non-monetary tools

## 9. Changes undergoing the system

### *Annex: Technical form (detail of paragraph 5)*

***One table per product or group of similar products***

**Product covered** (crop type, livestock, income):

**Peril/damage** covered (or multi-peril): Is it insurance on yield? Is there a list of specific perils covered?

**Technicalities**:

Index-based? (Computed on meteorological data, satellite images, etc.)

Can a farmer insure only part of the fields? Yes No

Loss estimation per field or per farm?

Triggers: What is the minimum loss above which the farmer is compensated?

Method to calculate the reimbursement

Compulsory for the farmer? Yes No

Is there a bonus/*malus* system? Yes No

Time from the harvest/damage until payment of indemnity (specify if it is maximum or average)

Geographic detail used by companies to determine tariffs

Franchise (%): Does it coincide with the trigger?

Public involvement (subsidies to premiums, reinsurance, regulations)

Cover in area, number of farms or value (specify and give all values if possible)

Sources

*Source:* Prepared by a working team composed of members of the Agriculture and Rural Development DG and the JRC.

**Figure 1. Model of the fact sheet sent to national experts**

# 2. Literature review of risks and risk management tools in agriculture

## 2.1. Chapter synthesis

The agriculture sector is characterised by high exposure to risk, often but not only, coming from climatic events. Next, we summarise the different types of risk that agriculture faces, which evidence the risk exposure in European agriculture. In the following section, we review the tools available to manage these agricultural risks.

## 2.2. Types of risk

Risks in agriculture fall into two main groups:

1. price risks — because of agriculture trade liberalisation.
2. production risks — because of adverse meteorology or other reasons (rising quality requirements on animals and plants, diseases across borders, etc.). Climate change represents a long-term issue that deserves specific in-depth analysis.

Some risks affecting farmers are common to most businesses, others are unique to farming. The most important risks can be classified as follows (Hardaker et al., 1997).

— *Human or personal risks*: The farm operator can get health problems or even die.

— *Asset risks*: For risks such as theft, fire and other damage or loss, losses are generally covered by insurance or, in the case of calamity, the public disaster aid may help to reduce the outcomes of the losses.

— *Production or yield risk*: Most of the time the weather is responsible, but this also includes risks like plant and animal diseases. Yield risk is measured by yield variability. In turn, yield variability for a given crop differs from region to region, and is determined by the soil type, the climate and the production method. Regarding the livestock sector, the risk is less considerable because weather has less influence.

— *Price risk*: The risk of falling or rising prices after a production modification has been done.

— *Institutional risk*: This is associated with policy changes which intervene with agricultural issues and can have a negative impact on farm revenue.

— *Financial risk*: This depends on the possible increase of interest of a mortgage, insufficient liquidity and loss of equity.

The abovementioned risks can often be interrelated, so one event can create several impacts on other realities. All the categories of risk have an effect on the income of the stakeholder.

Understanding the origin and nature of risk is necessary for developing risk management strategies. As explained in Hardaker et al. (1997), there is a need for information on risk, its cause, its characteristics (distribution, frequency and correlation with one another), its consequences on farm income, and on the capacity of various strategies to reduce income risk. There has been much theoretical research attempting to explain price variability on commodity markets or the use of futures markets and insurance systems.

Researchers are also concerned with understanding producers' behaviour when confronted with risk and developing modelling tools to help farmers make decisions under risk (Barnett, 1999). However, it has been found that farmers' behaviour does not always conform to theory and that there is a need to better understand farmers' attitudes toward risk and the way they adjust their farm operations. Risk perception can vary from farmer to farmer, from sector to sector and from product to product; it depends on the farmer's experience and on his degree of risk aversion.

For instance, in 1997 a survey was carried out in the Dutch livestock sector. It showed that price risk was identified as the highest source of risks, followed by institutional or personal risk. On the other hand, a similar survey was carried out in the USA on other production programmes such as wheat, maize and soybean. In this case producers were more concerned about yield and price risk, while livestock farmers worried mainly over institutional risks (Mewissen, Huirne and Hardaker, 1999a).

## 2.3. Tools for risk management in agriculture

Once the risk has been identified and assessed, various strategies can be used to reduce income risk at the farm household level. Two types of risk management strategies are normally distinguished (EC, 2001):

(a) strategies concerning **on-farm measures**: selection of products with low risk exposure (e.g. benefiting from public intervention), selection of products with short production cycles, diversification of production programmes, vertical integration self-insurance or individual stabilisation accounts;

(b) **risk-sharing strategies**: marketing contracts, production contracts, hedging on futures markets, participation in mutual funds and insurance.

Beside these, there are other alternatives, such as relying on public assistance (disaster or emergency aid) or increasing the share of income from sources outside agriculture.

### 2.3.1. *Diversification*

Diversification of crops and/or livestock production implies that a favourable result in one enterprise may help to cope with a loss in another. Diversification thus reduces the overall risk. However, it is usually associated with a lower average income, because it is not only the most profitable enterprises that are undertaken and also because higher costs are often associated (additional equipment, forgone economies of scale, lack of managerial expertise, etc.).

The diversification of the business activities reflects the reduced dependence of farmers on agriculture as a source of income. Diversification also implies some kind of entrepreneurial activity on behalf of the farmer. There are some activities that are included as diversification within the above definition, such as processing, agro-tourism, sport, recreation (open days of the farms, training, children's birthday parties, social conventions with institutions for voluntary work on the farm).

Diversification also includes off-farm strategies. Off-farm employment reduces dependency on agricultural income; it can be considered as a strategy but also as a need when agricultural incomes can easily be too small to support a whole family. Off-farm employment can also increase the probability of stopping the farming activity.

Another strategy can be to specialise the farm and to start working together with other specialised neighbouring farms, with the aim of building up a cooperative in which the total production cost, the yield and price risk can be shared. The degree of risk exposure can also decrease thanks to the variety of crops. This strategy is not always compatible with the dominant mentality of farmers.

### 2.3.2. *Vertical integration*

A vertically integrated firm retains ownership control of a commodity across two or more levels of activity. Risk reduction is one of the reasons to vertically integrate them. It helps to reduce risks associated with a variation in quantity and quality of inputs (backward integration) or outputs (forward integration). Vertical integration is more common in the livestock sector (integration backward into feed manufacturing) or in the fresh vegetables sector (integration forward into sorting, assembling and packaging) (EC, 2001).

### 2.3.3. *Stabilisation accounts*

Stabilisation accounts are a form of self-insurance. They consist of individual accounts where farmers put an amount of money every year which they can withdraw in a year of big losses. Stabilisation accounts can be based on yield, revenue or other indices.

### 2.3.4. *Marketing and production contracts*

A **marketing contract** is an agreement between a farmer and a buyer to sell a commodity at a certain price before the commodity is ready to be marketed. The farmer retains full responsibility for all production management decisions. The contract can be based on a fixed price, or alternatively depend on the development of the commodity's futures price. The latter type of contract does not eliminate price risk completely. The cost for the farmer results from forgoing the opportunity of achieving a higher price on the open market. Contracting provides the farmer with an opportunity to differentiate his products from mass production and to draw an economic rent from this. Another advantage of these types of contract in the crop sector is related to time management. In fact during the busy harvesting season, farmers do not have enough time to sell the products.

**Production contracts** typically give the contractor (the buyer of the commodity) considerable control over the production process. These contracts normally specify the production inputs to be used, the quality and quantity of the product and the price to be paid to the producer. This kind of contract partially shifts price risk to the processor. On the downside, the farmer depends to a large extent on only one buyer, thus incurring a risk of losing his only outlet following contract termination.

### 2.3.5. *Derivatives contracts*

On-spot or cash-market ([3]) prices are set for goods that are immediately available. Production and marketing contracts, as well as **futures contracts**, add the time dimension to these markets. They allow users to cover their price risk by locking in the price of a commodity they wish to purchase or sell at a future date. Futures market contracts are in this way similar to marketing contracts, but differ from them in three important issues: they are standardised in terms of contract terms and thus they can be more easily traded; they are traded in organised exchanges under rules and regulations; they do not always involve physical delivery of goods at maturity (Larson et al., 1998).

Futures contracts, option contracts and others are called **derivatives**. Derivatives contracts can also be used for risk management in agriculture. Even though in the USA some derivatives contracts have appeared based on weather indices and even derivatives on yields have been proposed (Canter et al., 1996; Jaffee and Russell 1997; Stoppa and Hess, 2003; Turvey, 2001; Skees, 1999) derivatives markets are essentially and often used for the purpose of managing price risks.

Market agents, confronted with price risk which arises mainly from supply and demand imbalance in the market, can use derivatives instruments to control price

([3]) See 'spot market' in the glossary.

(and perhaps yield) risk by transferring it to other individuals who are willing to bear it. The activity of trading derivatives contracts with the objective of reducing or controlling future spot price risk and revenue is called ‘hedging’. Hedging essentially involves taking a position in the derivatives market which can offset any gains or losses made in the physical market, by locking into a fixed price or buying a price floor or price ceiling.

The most popular derivatives contracts are futures, options and swaps. A **futures contract** is an agreement to trade at a specified future time and price a specified commodity or other asset. The principal idea behind futures contracts is to protect the holder against adverse price movements prior to a cash sale or purchase of commodity in the future. Hedging with futures is effective in eliminating price risk, but leads to other risks including basis risk. An **option contract** gives its holder the right, but not the obligation, to buy (call option) or sell (put option) an underlying asset (e.g. wheat) at certain price, known as the strike price, and at a certain point in time, known as the expiration date or the maturity. Finally, a **swap contract** is an agreement whereby a floating price for a commodity is exchanged for a fixed price for the same commodity over a specified period for a defined volume. The floating price is normally the prevailing market (spot) price for the asset and the fixed price is the price which is negotiated and agreed before the initiation of the swap contract (FOA, 2005).

However, derivatives have a number of limitations. They only deal with short- to medium-term risks of market downturns and their use requires considerable investment in know-how and infrastructure.

### *2.3.6. Insurance*

Insurance schemes (private, public or mutual insurance) are another tool used to pool risk. The idea behind insurance is that of risk pooling. Risk pooling involves combining the risks faced by a large number of individuals who contribute through premiums to a common fund which is used to cover the losses incurred by any individual in the pool.

There are examples of totally private insurance in agriculture, covering for example hail damage to crops, fire and theft of farm assets, death and disability of farmers or farm workers. Most other insurance schemes are provided under subsidised governmental schemes because the risks being covered are, in fact, not insurable in the sense that a market determined premium would be too high.

Risks are insurable if certain conditions are fulfilled (Skees, 1997; Skees and Barnett, 1999).

1. The insurer and the insured have the same information as regards the probability of a bad outcome (**symmetric information**). This is normally not the case; the main problems are moral hazard and adverse selection.

2. Risks should be **independent** across insured individuals. If risks are systemic (dependent), special measures have to be taken in order to make insurance solutions viable.
3. Risks must be calculable. In order to fix the premium rates, the insurance company must be able to calculate the chance of loss, the average frequency and the average severity of loss. Actual losses occurring must be determinable and measurable.
4. Premiums must be affordable.

As has been mentioned, insurance systems are difficult to apply because asymmetry in information leads to behaviour that undermines the system. There is **adverse selection** ([4]) when the level of risk in the insured population is higher than the average (i.e. only people with the highest risks will buy insurance).

Moral hazard occurs when the insured has the ability to increase his or her expected indemnity by actions taken after buying the insurance. It means that farmers covered by insurance might adopt riskier practices than otherwise (excessive specialisation, production in risky conditions like inappropriate climate or fragile land). However, there are techniques, well known to insurance companies, which limit such behaviour (OECD, 2001). A few examples of these techniques are:

— deductibles or co-payments (the insured has to bear part of the loss: a fixed amount or a percentage of the total loss);

— no-claim bonuses (see bonus/malus);

— to agree or to specify in the contract precautionary measures to prevent losses, and perform checks to verify whether the insured takes these measures;

— indemnification based on an objective index which cannot be influenced by the insured.

Natural disasters or epidemic diseases cause special problems for insurance. The reasons are as follows. Natural disaster risk within a certain region is a highly correlated risk between the farmers of that region (so it is a systemic risk), and it has a low probability of very high losses. There are several reasons why it is difficult to develop insurance products to cover such risks (Skees, 1997). If reinsurance or State guarantees are not available, the nature of the systemic risks makes it necessary for an insurance company to charge high premiums (which can be unaffordable for many farmers) and to build up substantial capital reserves. Another aspect which makes this specific reality difficult to manage is the scarcity of relevant historical data that could be used to calculate a premium, because of the infrequency of such events. Moreover, if governments provide ad hoc disaster payments, this stifles the development of insurance products.

([4]) See the glossary.

As with natural disasters, epidemic diseases have a systemic character and the data concerning outbreaks are normally rare. In the case of animal diseases, farmers can reduce the chance of an outbreak of a disease by taking appropriate precautionary measures (vaccination, veterinary screening of the herd, etc.). Furthermore, State involvement is important with respect to both legislation and covering **direct losses** ([5]) resulting from outbreaks of animal diseases. As governments normally cover direct losses, other losses which need to be covered are those called **consequential or indirect losses** ([6]), resulting from business interruption (empty buildings) and supply and delivery problems (because of movement restrictions) or repopulation (Meuwissen et al., 1999a; Meuwissen et al., 2001).

Whether private insurance products against epidemic diseases can be developed depends on — as in the case of natural disasters — whether sufficient data is available for calculating premiums and whether sufficient reinsurance capacity or State guarantees are available.

Price risk is an example that is a very systemic, so it is difficult to insure.

**Reinsurance** is important for insurance companies which cover correlated risks and are thus running the risk of having to cover big losses. Without reinsurance, premiums would have to be set at a very high level to build up enough reserves in order to cover potentially high losses.

Two basic schemes for reinsurance dominate.

— *Proportional reinsurance* (*quota share* ([7])):

  Insurer and reinsurer share premiums and risk. The reinsurer assumes, by mutual consent, a fixed percentage of all the insurance policies written by a direct insurer.

  The quota determines how premiums and losses are distributed between direct insurer and reinsurer.

— *Non-proportional reinsurance*:

  (a) Excess of loss: the reinsurer covers up to a certain amount any part of a loss resulting from a single catastrophic event that exceeds an agreed deductible ([8]).

  (b) Stop-loss: the reinsurer covers up to a certain amount any part of a total annual loss that exceeds an agreed deductible.

**Mutual insurance** schemes are a special case. Mutual insurance companies, also called insurance mutuals, are insurance companies totally or at least partially owned by the participants. Currently, insurance mutuals, as non-profit companies, have no

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([5]) This specific aspect of direct losses in the livestock sector is described in detail in Chapter 7, Section 7.2.1.

([6]) Consequential losses are specifically presented in Chapter 7, Section 7.2.2.

([7]) Quota-share provisions specify what percentage of premiums and loss exposure the private company will retain, with the residue being passed on to the reinsurer (see the glossary).

([8]) See the glossary.

shares or shareholders, so they are not on the stock market. Also, differently from insurance share or stock companies, besides the supervisory board they have a delegate committee representing member farmers.

Similar to insurance share companies, insurance mutuals also have to follow insurance legislation (controlled by national insurance/finance supervisory boards, etc.), the insured has a legal title of compensation because of the insurance contract, premiums are calculated on an actuarially basis, while provisions to a mutual fund are often a fixed amount independent of the risk. Reinsurance would be associated to mutual insurance and the existence of supplementations from the participants would be always associated to mutual funds.

Insurance mutuals, as well as mutual funds, share the underlying principles of mutuals: non-profit, cooperation and self-help. This theme has endured for well over 100 years and continues to this day. To understand the origin of insurance mutuals, we shall look at an example in Ontario (Canada) ([9]), although it has been very similar in many European countries. ‘In the beginning, the mutual policyholder was required to sign a premium note agreeing to assume certain liabilities of the company directly proportionate to the policyholder’s limit of protection. The general idea was to get a number of neighbours together for the purpose of sharing fire risk. Typically, buildings and chattels in those buildings were insured. When fire occurred, an assessment of whatever percentage was needed was levied, collected in due course, and paid over to the unfortunate one who had suffered the loss.

As the time passed, mutual companies were urged by regulators to adopt uniform methods to ensure safety of the company and justice to the individual policyholders. This gave rise to the adoption of a plan whereby companies would estimate future losses and cost of operation as a basis for rates. Under this system, levy on the premium note was only made when expenses exceeded the estimated cost for the year.

The premium note was the financial backing of the mutual companies and served as a vital factor in their establishment and development. However, gradually, mutual companies moved away from the assessment system in favour of collecting actuarially calculated premiums in advance, and the premium note was replaced by the creation of mutual guarantee funds and/or access to reinsurance or even coinsurance.’ From this example we can see that the threshold between the small regional mutual scheme and the big mutuals which work in a similar way to the big insurance companies can be controversial.

In the Netherlands, for instance, mutual insurance schemes have been developed for contagious disease outbreaks both in crops (horticulture and potatoes) and livestock (poultry) (Meuwissen et al., 2001).

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([9]) http://www.mutualconnect.com/about_guaranteeFund.asp

### 2.3.7. *Mutual funds* ([10])

Mutual funds (or mutual stabilisation funds) is a term used by the European Commission communication (EC, 2005a). According to the Commission communication (EC, 2005a) and the staff working document (EC,2005b), mutual funds represent a way of sharing risk among groups of producers who want to take their own responsibility for risk management. Mutual funds, established on private initiative, are set up mainly at a sector-specific level, where producers share comparable risks, or take place at regional level. They can be regarded as a specific compensation scheme, although with a limited financial capacity. In the event of a member suffering damage, the loss will be mitigated or even fully offset from the money available in the fund, according to predefined rules. Mutual stabilisation funds are often faced with the problem of limited resources, especially in the fund's early years. In some Member States the capital collected from the participants is supplemented by a public financial contribution.

The advantage of regionally organised mutual funds is that farmers know each other, thus reducing the problems related with moral hazard and adverse selection. The disadvantage of regionally organised mutual funds is the danger that many or even all farmers incur losses at the same time. This could mean for a farmer that he incurs losses and has to contribute to the fund to cover other farmers' losses at the same time. Solutions for this problem are reinsurance or cooperation with mutual schemes in other regions which would cover a share of the loss.

According to the working document on risk management tools (EC, 2001), in the case of a member incurring a loss, the loss will be fully or partially compensated through the collected money already available in the fund and an additional collection among participants. Premiums also have to cover administrative costs and, potentially, reinsurance.

However, as the CEA's position paper (CEA, 2005b) states, in the EC, definition of the legal nature of these institutions is not clear. They could refer to guarantee funds, solidarity funds, or even to insurance mutuals. In fact, the working document (EC, 2001) identifies mutual funds with mutual insurance schemes, and many mutual insurance companies had similar characteristics to those of the mutual funds described above.

However, we will assume for this study that there is a difference between mutual funds and mutual insurance: mutual funds are a private agreement between the parties in which there is no legal title of compensation. Instead, when there is a legal title of compensation offered by some entity, then we can speak about mutual insurance and this entity has to comply with the legal requirements of insurance.

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([10]) See the glossary.

The Commission, in the case of livestock insurance, has recently proposed the setting up of similar funds in Member States, intended to stabilise income in the pig sector. These regulatory funds would be financed by producers and would enable them to stabilise revenue through a system of levies to be collected during periods when their economic situation is satisfactory. In exchange, payments would be made during periods of a difficult market situation (EC, 2001).

### *2.3.8. Public funds*

In public funds, mostly called calamity funds, all aid is given by the national and/or provincial governments under the declaration of catastrophes. The funds are provided every year by the government and are regulated in the case of a yearly reserved budget. The main advantage of the funds over the ad hoc aids is that they avoid big distortions of the government budget. Funds sometimes also receive contributions from the private sector, usually compulsory, in the form of levies to production, levies to premiums, etc.

## 2.4. Definitions of agricultural insurance schemes

Let us list the types of insurance in the agriculture sector from the point of view of the risks covered.

**Single-risk insurance**
Single-risk insurance covers against one peril or risk, or even two but of a non-systemic nature (most often hail, or hail and fire).

**Combined (peril) insurance**
Combined insurance means a combination of several risks covered (two or more risks, mostly with hail as basic cover). In some countries this type of insurance is also referred to as multi-risk insurance.

**Yield insurance**
Yield insurance guarantees the main risks affecting production. So, in the case of crops, the main risks comprise those affecting the yield (e.g. drought). Premiums can be calculated from individual historic yield or from regional average yield when individual yield records are not available. Losses (and premiums) can be calculated either by quantifying the losses due to each individual risk separately, or as the difference between the guaranteed yield and the insured yield. In some countries (e.g. the USA) this type is also called combined or multi-peril insurance.

**Price insurance**

This covers an insured amount of production against price decreases below a certain threshold. Price should be transparent and, to avoid moral hazard and adverse selection problems, loss assessment should be based on a price that cannot be influenced by the insured (futures price, spot market price). If losses resulting from a loss of quality are excluded from cover, price insurance provides less protection for the farmer. However, including loss of quality may involve significant moral hazard problems, as quality depends to a certain extent on management decisions (Meuwissen et al., 1999b).

**Revenue insurance**

Revenue insurance combines yield and price risks cover in a single insurance product. It can be product specific or whole farm. It has the potential advantage of being cheaper than insuring price and yield independently, as the risk of a bad outcome is smaller (low yields may be compensated by high prices and the contrary). In order to offer revenue insurance, an insurance company must be able to determine the joint probability distribution of price and yield risks.

**Whole-farm insurance**

This type consists of a combination of guarantees for the different agricultural products on a farm. Depending on the cover of the guarantees, it can be whole-farm yield insurance or whole-farm revenue insurance.

**Income insurance**

Income insurance covers the income, so it covers yield and price risks, as well as the costs of production. Usually this type of insurance is not product specific but covers whole-farm income.

Income insurance is potentially more attractive to farmers than other forms of insurance (e.g. yield, price), because it deals with losses affecting farmers' welfare more directly (Meuwissen 2000). It could be based for instance on net farm income of family workers (farm revenue, including subsidies, minus variable costs, taxes, depreciation, rent, interest and compensation of employees).

Insurance of individual income risks poses considerable problems of moral hazard and adverse selection. Potential losses occur not only by accident but depend to a large extent on how well a farmer manages his business. A farmer in fact can easily manipulate certain elements influencing his income (e.g. compensation of employees, operating costs and inventories). Due to these two factors it is quite hard for an insurance company to have access to trustworthy data to calculate the right premium.

**Index insurance**

Index-based insurance products are an alternative form of insurance that make payments based not on measures of farm yields, but rather on indexes measured by government agencies or other third parties. Unlike most insurance where independent risk is a precondition, the precondition for index insurance to work best for the individual farmer is correlated risk.

— **Area yield index insurance:** Indemnities are computed from the decrease of the average yield in an area, where the area is some unit of geographical aggregation larger than the farm.

— **Area revenue index insurance:** Indemnities are computed from the decrease on the product of the average yields and prices in an area.

— **Indirect index insurance:** Indirect index insurance reports to those indices of yields or vegetation computed from weather-based indices, satellite images and others.

Index insurance products have several advantages. From one side, given that the indemnities and the premiums do not depend on the individual risk of the insured group, they do not present adverse selection problems. As the single farmer cannot influence the outcome that results in payments, there are no moral hazard problems. So, index insurance can sometimes offer superior risk protection when compared to traditional yield insurance because deductibles ([11]) are not needed. Additionally, it has low administrative costs (it does not require inspections of individual farms). From another point of view, it has a standardised and transparent structure, so that policies can be sold in various denominations as simple certificates with a structure that is uniform across essential indices. Their availability and negotiability allows them to be easily traded in derivatives markets. The risk can thus be spread among a wider variety of parties. In this context, it can have a reinsurance function as a mechanism to reinsure insurance company portfolios of farm-level insurance policies. Also, banking entities could use such contracts to manage farmers' correlated risk. Consecutively, the bank should be able to work with the individual to help manage the residual risk or basis risk (e.g. loans).

The main disadvantage of index insurance is probably the basis risk ([11]): When the correlation between the insured losses and the index is not enough, 'basis risk' becomes too severe, and index insurance is not an effective risk management tool. A careful design of the index insurance policy (cover period, trigger, measurement site, etc.) can help to reduce basis risk. Selling the index insurance for example to a collective group can pass the issue of basis risk to a local group that can cover it through mutual insurance. Another disadvantage is the need for the index to be precisely modelled (with the consequent need of sufficient historical data), to have

([11]) See the glossary.

good statistical properties, being objectively and accurately measured, and then to be made broadly available in a well-timed way. The last disadvantage is the absolute need of a strong reinsurance given that, in most cases, insurance companies do not have the financial resources to offer index insurance without adequate and affordable reinsurance (Skees, 1997; Black et al., 1999, mentioned by Stoppa 2004).

## 2.5. Literature survey: studies on agricultural insurance in Europe

This chapter offers a list of the main documents dealing with agricultural risk insurance systems in European countries. Some information from these documents has been used in the elaboration of this study, together with information from the countries' experts.

**Cost-sharing schemes for epidemic livestock diseases (Civic Consulting, 2006)** (see also Chapter 7.3)

This is a working paper for the expert workshop on options for harmonised cost-sharing schemes for epidemic livestock diseases, held in Brussels on 17 March 2006, analysing four alternatives for cost-sharing schemes:

— continuation of the current system of expenditure in the veterinary field;
— financing costs of disease control through ad hoc measures in the case of a disease outbreak;
— setting up a unified cost-sharing scheme at the European level; and
— defining a unified Community framework for national or regional cost-sharing schemes.

The paper supports the last option on the basis of the following set of criteria:

— categorisation of animal diseases (impact on public health, animal health or economic impact);
— incentive compatibility: the effort should be mainly focused on prevention;
— balancing costs and responsibilities;
— prevention of competition distortion;
— compatibility with EU financial instruments and ongoing initiatives; and
— harmonisation and flexibility of implementation.

Some of the main characteristics of the proposed harmonised framework would be:

— the obligation of Member States to introduce a cost-sharing scheme;
— the objective of transferring animal health risk from farmers to a cost-sharing scheme;
— that the responsibility should cover only certain diseases.

**Risks and crisis management in agriculture, University of Naples (2005)**

This study (Cafiero et al., 2005), carried out for the European Parliament in 2005, provides comments on the three options considered by the communication of the Commission to the Council (EC, 2005a). The report is very critical with the first option (public participation on the insurance premium paid by farms and on the reinsurance scheme), obviously in contrast with the position of insurance companies. When commenting on the possibility of a common agricultural policy that would subsidise agricultural insurances, one of the points criticised in this report is that a substantial amount of the subsidies would be given in fact to the insurance companies, instead of finishing in the farmers' pockets. This statement deserves further analysis by comparing countries where such subsidies exist and countries where alternative tools are dominant (e.g. calamity funds or ad hoc help for catastrophic events).

Information is given about insurance in the following countries:

— countries with public intervention: Greece, Spain, France and Italy;
— countries with private insurance systems: Germany and the United Kingdom;
— non-EU countries: Australia, Canada and the United States of America.

**FOA agricultural report (2005)**

This study, carried out by Alizadeh and Nomikos (2005), was commissioned by the Futures and Options Association. Even if it focuses on the potential of the futures markets to help farmers manage increasing price risks, it considers and reviews all kinds of risk management strategies used by farmers, including crop insurance.

Its superficial comparison of the use of insurance across the EU Member States is based on the risk management report (EC 2001) and Meuwissen et al. (2003). It raises the question of the efficiency, equity and WTO consistency of the insurance programmes, according to Bascou (2003).

**Communication from the Commission to the Council (EC, 2005a) and Commission staff working document (EC, 2005b)**

This communication considers what additional measures the CAP could introduce to support farmers, in respect of risk and crisis management, but in such a way that they entail no additional expenditure (a small percentage of the modulation funds can be used for this purpose under some restrictions). The main novelties of the communication to the Council could be summarised as follows.

(a) It encourages the inclusion of risk management training to farmers in rural development programmes.

(b) It suggests that the potential of three options be assessed:

— the possibility of public contribution to the cost of the premiums, under some conditions, although this support would come from the funds assigned to the second pillar within the CAP; as an alternative to supporting the premiums, it mentions that in addition to the formula of co-insurance arrangements between insurance companies, governments could participate in co-reinsurance schemes;

— temporary and digressive support for the administrative operations necessary for developing mutual funds;
— income stabilisation payments or liquidity support payments against income crises.

The communication is accompanied by a Commission staff working document which makes a synthesis of the risks and crises in agriculture and the instruments available to EU agriculture to manage them (but it does not enter into the details of each country's system).

**Analysis of the farm risk management tools in the Walloon Region (2005)**

This study was carried out by Harmignie et al. (2005) from the université catholique de Louvain. It contains the European communication from the Commission in March 2005 and the conclusions from the European Economic and Social Committee (2005). It reviews the insurance and calamities systems in Belgium, France, Luxembourg, Spain and, to a lesser extent, Germany.

Its objective was to propose adequate agricultural risk management instruments for the Walloon Region. The main proposals are: price risk management systems, such as price information systems and others; mutual funds and a fund for the sanitary livestock crises; and lastly, even though a greater cooperation between the public sector and the insurance companies is proposed, the climatic risks of the main crops in Belgium do not seem to require combined or yield insurance development (even though crop risks should be the subject of further research).

**Informe final del Proyecto 'Gestión del Riesgo Agropecuario en América Latina y el Caribe' (ENESA-BID, 2004)**

This is the final report of the 'Management of agricultural and livestock risk in Latin-America and the Caribbean area' project. The project explores the possibilities for the development of agricultural insurance systems in Latin-American and Caribbean countries. It reviews the experiences in agricultural insurance in Europe and North America. There are data from:

— EU Member States: Belgium, Denmark, Ireland, Greece, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal and Sweden (the insurance data source is Forteza del Rey, V., 2002);
— North-American countries: Canada and the United States of America;
— Latin-American and Caribbean countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Panama, Paraguay and Venezuela.

**'La Gestione del Rischio in Agricoltura: Strumenti e Politiche' (A. Stoppa, 2004)**

'La Gestione del Rischio in Agricoltura: Strumenti e Politiche', is a collection of articles made by the Forum Internazionale dell'Agricoltura e dell'Alimentazione ([12]), directed by Andrea Stoppa. It forms a scientific review on risk management in agriculture.

A paper by C. Moreddu ([13]) (also OECD, 2001 ([14])) describes risk characteristics and the instruments to manage risk and discusses the role of economic policies at a European level in the OECD countries. It examines the opportunity to drive public resources towards the support of risk management activity; and it describes the various income risk strategies used by farm households.

Another interesting contribution to this literature survey is by Skees and Hartell (2004; mentioned by Stoppa, 2004). Their paper analyses some interesting innovations based on the development of index insurance contracts.

Next, this review brings into focus the existent realities in some countries like Canada, France, Spain and the USA. All over Europe there is a strong interest to study the growing importance of political instruments to face out this systemic risk reality.

Then, special focus is put on Italian agricultural risk management. This main and last part of the book is dedicated to the outcomes of a congress organised by Coldiretti ([15]) in March 2004 on the topic 'Risk management in the agricultural sector: new regulations and opportunities for farmers'. The attention in this chapter is especially dedicated to the Italian situation, trying to compare it with the most developed international experiences; this inspires a discussion forum on the future insurance market in the Italian agricultural scene in which actors of the demanding and offering sides discuss and confront on the new legal regulations.

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([12]) The Forum Internazionale dell'Agricoltura e dell'Alimentazione is promoted by the Coldiretti National Confederation. The forum includes many different initiatives run by experts, researchers and institutional representatives of the sector. They focus their work on topics like economics and agricultural policy, environment and territory protection, and food quality and security.

([13]) Catherine Moreddu is Senior Economist at the Organisation for Economic Cooperation and Development, Direction for Nutrition, Agriculture and Fisheries, Paris.

([14]) The paper constitutes part of the material of the 'Income risk management in agriculture' workshop, 'Approaches to income risk management in OECD countries' (Part I, pp. 17–63), organised by the OECD, Paris (2001).

([15]) Coldiretti is an Italian organisation well established in the country. It is constituted of 18 regional federations and 98 provincial federations, and 765 offices are spread throughout the territory. Its strong presence makes Coldiretti the main agricultural organisation at a national level, and one of the most important on the European scene.

**Agricultural policies in OECD countries — Monitoring and evaluation (OECD, 2003)**

This is the 16th edition in a series on agricultural and related policies in OECD countries, following the request by the OECD Council at ministry level to monitor annually the implementation of the principles for agricultural policy reform adopted in 1987. Part II of the report presents detailed information on policy developments in individual member countries (and for the Member States of the European Union). There is some information about insurance in the following countries:

— EU Member States: Spain, France, Hungary, the Netherlands and Slovakia;
— non-EU countries: Canada, the United States of America and South Korea.

**Risk management tools for EU agriculture — with a special focus on insurance (EC, 2001)**

The conclusions of this study do not look at a direct involvement of the EU in risk management systems, but rather propose that the EU has an accompanying or framing role.

— Regarding price risks, it shows potential interest in promoting the development of futures and options markets.
— Regarding production risks, it is considered that insurance systems are to be developed by the Member States on a bottom-up approach. Co-insurance and reinsurance can be developed at the European level by private companies, under a common legal framework, but reinsurance could also be provided by the EU;
— Anti-cyclical income support would be interesting to apply but it has some caveats or cons.

There is information about the following countries:

— EU countries: Spain, Germany, Greece, France, Italy and Austria, as well as Portugal (in the synopsis table only) and ;
— non-EU countries: Canada, Japan and the United States of America.

**Risk management in agriculture: a discussion document prepared by the Economics and Statistics Group of the Ministry of Agriculture, Fisheries and Food (MAFF, 2001)**

An overview of risks and risk management instruments in agriculture

There is a little information on the agricultural systems in the following countries:

— EU Member States: Spain, France, Italy, the Netherlands, Sweden and the United Kingdom;
— non-EU country: the United States of America.

**OECD workshop book *Income risk management in agriculture*, Paris (OECD, 2001)**

Various risks affect the income and the welfare of farm households. A large number of strategies are available to deal specifically with income risk. They exist against a general background of widespread government intervention that modifies the risks faced by farmers. In the context of agricultural policy reform, a challenge for policymakers is to better define the role of public policy versus market-based mechanisms to deal with income risk in agriculture. The OECD workshop examined the various strategies used by farm households, in particular those attracting renewed interest such as diversification of income sources, vertical coordination, hedging on futures markets, insurance cover and public safety nets. It allowed participants from member countries' governments and private industries to share their experience.

One of the main conclusions was that farmers, as managers, have primary responsibility for risk management and that the optimal mix of tools and instruments depends on specific conditions. Government intervention in risk management, coming as a response to an identified market failure, should be in line with general reform principles shared by OECD ministers for agriculture; these include increasing the market orientation of agriculture and addressing legitimate domestic interests in ways that do not distort production and trade.

**Income insurance in European agriculture (Meuwissen et al., 1999b)**

The central questions studied by this report are whether there might be a case for farm income insurance in Europe in the future, and under what conditions and in what form might such an income insurance scheme be feasible. The report explores a number of issues such as insurance cover, loss assessment, multi-year versus single-year insurance contracts, mandatory versus voluntary participation, etc. Feasibility is tested with a Monte Carlo simulation using panel data from six Member States. The investigation also includes a description of the agricultural sector in Europe and a review of current experiences on income insurance in other countries. There is information about insurance in the following countries:

— EU Member States: Spain, France, Italy, the Netherlands and Sweden;

— non-EU countries: Australia, Canada and the United States of America.

Some of the main conclusions are that, if a form of income insurance is introduced in Europe, the following recommendations should apply.

— Gross revenue insurance should only be considered for crop, and not for livestock, commodities.

— Insurance should start with true market commodities, i.e. commodities for which no price support is available.

- If governments provide reinsurance (at zero costs, at fully commercial rates, or as a combination of these two options), they should only reinsure part of the risks underwritten by insurers.
- Before wide introduction, first some pilot tests should be carried out, to test the interest of farmers in insurance schemes that cover systemic risks such as floods, droughts and epidemic diseases, as well as the interest of insurance companies in setting up (mutual insurance funds for) such schemes. In setting up such pilot tests it is crucial, for later implementation, that governments are involved to no more than the necessary minimum extent, using transparent rules for such aspects as stop losses, i.e. from the beginning there should be no asymmetric information between insurers and governments.

**Régimen comunitario de seguro agrícola (CES, 1993)**

This study contains wide information, both on calamities/disaster aid and on insurance, for Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, the Netherlands, Portugal and the United Kingdom.

From this study, the European Economic and Social Committee (EESC) issued a series of proposals to the Commission.

- There should be a common definition of agricultural calamity, but it should be left to the individual States to fix the parameters to characterise it. Also, the funding of ad hoc forms of aid should be shared among the individual countries and the Community.
- National insurance plans should be maintained as they are, and the governments should be allowed to subsidise them.
- There should be a common insurance plan, which would be additional to the national plans and would be applied by the insurance companies in each country. Insurance would be subscribed to on a voluntary basis, and there should be a public institution in each country to take care of the plan's application in that country. This plan would have subsidies, shared on a 50:50 basis by the national government and by the EC.
- Active prevention measures should be carried out within the framework of the schemes for 'improving the efficiency of agricultural structures' (Council Regulation (EEC) No 2328/91).

**Income stabilisation**

This is an FP6 (Research DG) STRIP (specifically targeted research or innovation project), whose full title is 'Design and economic impact of risk management tools for European agriculture'. This project started in mid-2005 under the short title 'Income stabilisation' and has several potential overlaps with and complementary aspects to the Agriculture and Rural Development DG–JRC administrative arrangement for the same project. Contacts have been established and several meetings scheduled to ensure synergy between both projects.

The income stabilisation project, with seven partners from five countries, is coordinated by the University of Wageningen. It is articulated in seven work packages (additional to WP 1, management). Work Package 4, led by the Universidad Politécnica de Madrid, is particularly close to the Agriculture and Rural Development DG–JRC administrative arrangement, although there are major differences: the Agriculture and Rural Development DG–JRC administrative arrangement is more specifically focused on the EU-25+ and on insurance schemes, rather than generic risk management strategies.

Another target of this project is exploring methods to map the variability of yield that can endanger a suitable farm income. Some preliminary maps are included in this report.

# 3. Production and income variability of EU agriculture

## 3.1. Chapter synthesis

Agricultural producers face a series of risks affecting the income and welfare of their households. These are mainly production risks related to weather conditions, climate change, pests and diseases, technological change and income variability due to decreases of production or price variability, etc. This chapter focuses on time variability of crop yield, production, or farmers' incomes from the point of view of insurance. Heterogeneity across regions is not addressed, but a coarse picture of the spatial behaviour of variability along time is given. Variability due to trend is eliminated as much as possible to concentrate on the difference between the actual yield (or production or income) in each year and the yield expected considering only the trend. This difference can be positive or negative (higher or lower yield than the trend). We only study the negative differences (yield reduction) that are of interest for insurance purposes, and more specifically the negative differences of a certain magnitude. For the frequent case of insurances with straight deductible, we are only interested in yield reductions higher than the deductible (e.g. 10 %, 20 % and 30 %).

We also consider the negative time variability of some meteorological parameters or agrometeorological indicators strongly linked with yield reduction, such as drought, frost, or excessive rain at harvest time.

All the analyses made in this chapter should be considered as preliminary studies. The variability of yield or income is quantified for average values in large regions or major types of farm; while the parameter of interest is the average value of the variability at farm level (the variability of the average is very different to the average of the variability). The link between agrometeorological indicators and observed yield reduction still needs to be quantified.

## 3.2. Concepts and scale

Climatic events and epizootic outbreaks introduce variability both in the agricultural production and in the income of farmers. This variability is far from uniform across the EU: in some regions and sectors, production and income are relatively stable, while in other regions or sectors they are highly unstable. Mapping the variability level has a twofold interest for the assessment of agricultural insurance: better understanding of which are the areas and sectors for which stabilisation is more important and for tuning the extrapolation of the premium rates in a hypothetical EU-wide system. The data required to analyse these phenomena come in part from statistical sources, mainly from Eurostat, but other sources are also important, in particular the farm accountancy data network (FADN). Meteorological databases and agrometeorological models also provide tools to improve analysis of the variability.

The variability of the farm situation can be analysed from different points of view.

— Specific risks: We consider here some meteorological risks: risk of drought, excessive rainfall at harvest time and frost. Drought is quantified as a function of the relative soil moisture estimated by the model growth crop monitoring system (CGMS) (Micale and Genovese, 2004; Lazar and Genovese, 2004). Excessive rainfall is quantified using interpolated meteo data (CGMS level 1), but the period of reference for each crop is computed on CGMS. Risk of frost is computed at this stage on interpolated meteo data with a rather coarse criterion.

— Variability of yield: The risk is computed as the expected value of $\max\left[0,\left(\frac{g(Z_{ti})-Z_{ti}}{g_{ti}}-d\right)\right]$ where $Z_{ti}$ is the yield in year *t*, $g(Z_{ti})$ is the trend (expected yield in average meteorological conditions), and *d* is a straight insurance deductible.

— Variability of farm income (e.g. by farm type, size) is defined in a similar way.

In the previous definition of yield reduction risk we did not define the sub-index $i$. This sub-index can refer to a single farm, a field, a region, a class of farms, or a geographic unit such as a cell of 50 × 50 km or a polygon of a soil map. Depending on the meaning of $i$ we will be considering a different scale for the indicators. Scale of risk indicators is a delicate issue for the quantification and mapping of variability. It can be considered at two different stages: for the assessment of risk or for the presentation of results. An example can illustrate the difference. Consider the probability that the yield of wheat is more than 20 % below the normal yield (long-term trend). The concept can be applied at a farm scale if we consider a farm (selected at random for example); we estimate somehow the probability of the yield reduction for that farm and we average this probability for a given set of farms, for example all the farms in a region. In this case we compute the indicator at the farm level and map the results at the scale of the region. Results are different if we first consider the average yield of the region and then we estimate the probability of a yield reduction of more than 20 %. In this case the concept is applied at regional level.

For the purpose of insurance, risk indicators should be computed at the scale of the farm, but at this stage we do not have suitable data for this purpose. Therefore we will apply the concepts at a coarser scale: regions, farm types, size categories or physical geographic units. The question of downscaling data for the computation of risk indicators at farm scale can be tackled, but is beyond the scope of this study.

For the following maps and comparisons, indices have been computed at a coarse level. It is expected that the geographic comparison of a risk index computed at a coarse scale corresponds approximately to the comparison at a farm scale. For example if the probability of a yield reduction above 20 % is higher in region A than in region B, it can be expected that the average probability of such a reduction for the farms will be higher in region A than in region B, although this is not mathematically sure. Data aggregation in time series usually has a smoothing effect. The result is that risk indicators computed from aggregated data, as they are in the following maps, generally underestimate the level of risk.

## 3.3. Specific risks

For all the maps in this section we use the crop growth monitoring system (CGMS). CGMS is the kernel of the EC agrometeorological system (MARS crop yield forecasting system), that finds its legal basis in Decision No 1445/2000/EC of the European Parliament and of the Council for the period 1999–2003. This co-decision was recently renewed to cover the period 2004–07 (Ref. PE/CONS 3661/1/03, OJ L 309, 26.11.2003) and again in the FP6/JRC multiannual working programme (Action 1121: MARS-Stat period 2002–06) for the related R & D activities. The mission of the 'system' is to provide timely, consistent and reliable analysis at pan-European level on the status of the crops and on the harvest prospective. The information and the derived forecasts are used at CAP decision-maker level especially to fill crop balance sheet estimates. For instance, in 2003 the system contributed to assessing the effect of the severe summer drought on European crop production. The system started R & D in the late 1980s (Genovese, 1998) and became fully operational in 1999.

Today the system is organised around three internal 'infrastructures', namely a meteorological monitoring infrastructure (the main database covers the observed interpolated meteorological data since 1975), a vegetation monitoring infrastructure (the main database covers the vegetation indicators based on low resolution satellite data since 1989), agrometeorological infrastructure (the main databases cover crop parameters, crop calendars and phenology). The databases are exploited to run a main crop growth simulation model (CGMS-Wofost) and a pasture model (CGMS-Lingra). The analyses consist of the integration of all of the information gathered in order to deduce on the short-term climate effects on crop behaviour. Crop indicators are generated and used as predictors in statistical analyses to forecast crop yields.

The parameters simulated are aggregated at different NUTS levels and sometimes a re-calibration is needed, based on observed data. This can be explained by the fact that the model assumes as constant or as not influencing biotic and a-biotic limiting factors, such as pests and diseases, and micronutrient deficiencies. This explains why for instance a simulated storage organ cannot be used as it is, to explain plant yield. The quality of the re-calibration versus observed time series of yields is, of

course, dependent as well on the quality of the reference data. Besides this, a time series analysis is often necessary because of the presence of trend factors in inter-annual yield variations. This can be linked mainly to technological factors (more efficient agriculture, best variety selection).
Further than model improvement linked to the enlargement to new EU Member States, the main directions of R & D are the creation of an agro-phenology network at European level, the setting up of a complete pasture monitoring system, the introduction of ensembles weather forecasts into the system (Ensemble FP6-IP ([16])); the creation of a model–modular approach and the integration with other ecological modelling and DBs at European level for CAP scenarios creation and analysis (Seamless FP6-IP ([17])). A recent independent study showed that the system in terms of crop yield predictions is performing well and that the evolution of the system in recent years has resulted in fewer prediction errors.

### *3.3.1. Drought*

The parameter selected to map the risk of drought is the relative soil moisture (RSM) estimated by CGMS using meteorological data interpolated in a 50 km grid focusing the estimation on the lowest altitude quartile in the cell, in which the highest share of agriculture is supposed to be concentrated. RSM integrates the information on rainfall, soil water capacity and needs of the plant, taking into account the phonological calendar, the temperature and the global radiation.
If CGMS estimates for a given crop a value of 0 for the RSM, this indicates a considerable water stress for that crop; if this happens during the development stages of growth, flowering or grain filling, this corresponds to a serious drought situation. The impact of a drought situation is not the same in all the development stages of the crop. We have made a first rough split before/after flowering starts. After the start of flowering (until shortly before maturity), a drought event is considered to be twice as serious as before flowering. When the grains (or other storage organs) have been filled and the plant is close to maturity, dry soil is no longer considered a source of damage.
The severe drought index in Figure 2 reports the proportion of situations (decades) of serious drought for wheat on the total decades in the period 1975–2006. Few areas have a significant risk of severe drought measured with this parameter and those that do are generally concentrated in southern Europe. Some spots also appear in central and northern Europe, mainly in coastal areas; they might be due to computational artefacts in the meteorological data interpolation. Since the drought indices refer to non-irrigated agriculture, for some crops like sugar beet and potatoes, threshold

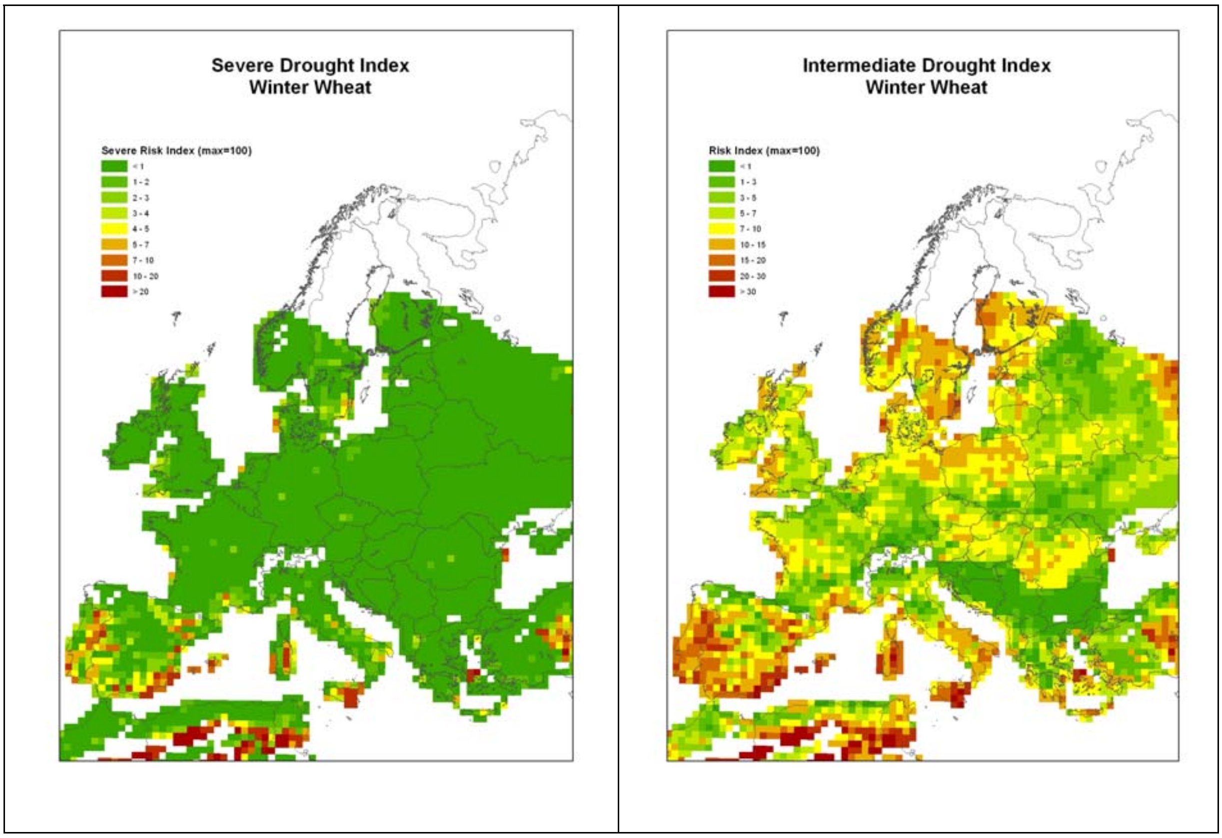
([16]) http://ensembles-eu.metoffice.com/meetings/CoP13_Bali07/flyer.pdf

([17]) http://www.seamless-ip.org/

parameters have been introduced to exclude areas where these crops are cultivated only under irrigation. A certain number of anomalies in these maps show that fine-tuning of parameters still needs to be improved.

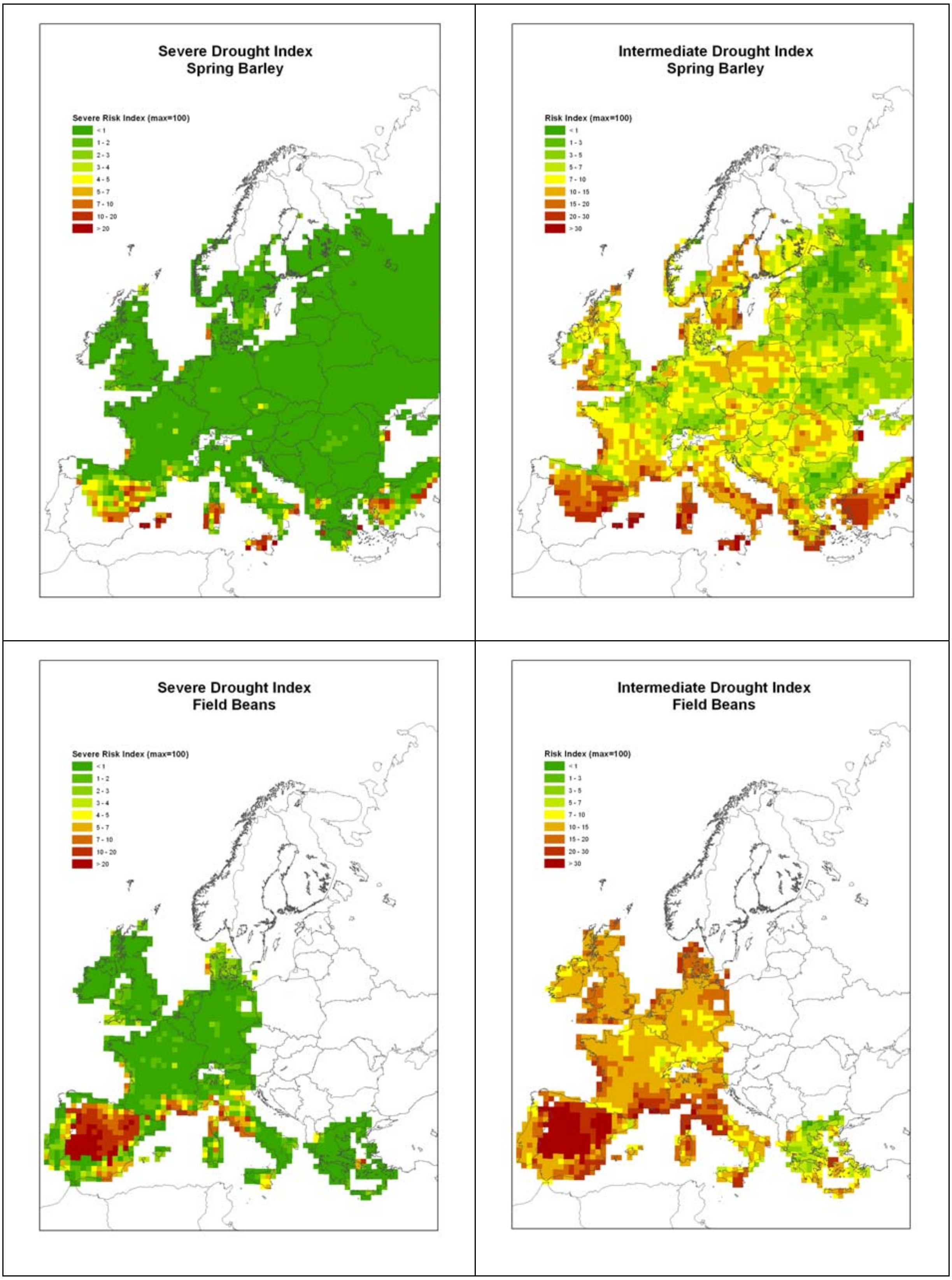
An alternative drought indicator has been defined considering an intermediate drought situation when the RSM < 10 % or the RSM < ½ min. (40 %, the long-term average RSM for that time of the year). This means for example that a RSM of 15 % in an area where the long-term average is more than 30 % will be considered an intermediate drought situation, but a RSM of 25 % in an area where the long-term average is more than 50 % will not be considered drought at all. This indicator seems better modulated and shows again most serious risks, but significant wheat growing areas appear to have drought problems in the area of northern Poland, eastern Germany, the Baltic countries and Scandinavia, probably due to soils with relatively low water retention potential (post-glacial soils, consisting of gravel, loose sands and loamy sands).

For spring barley, the geographic patterns of risk indicators are similar but slightly shifted northwards (Figure 3).



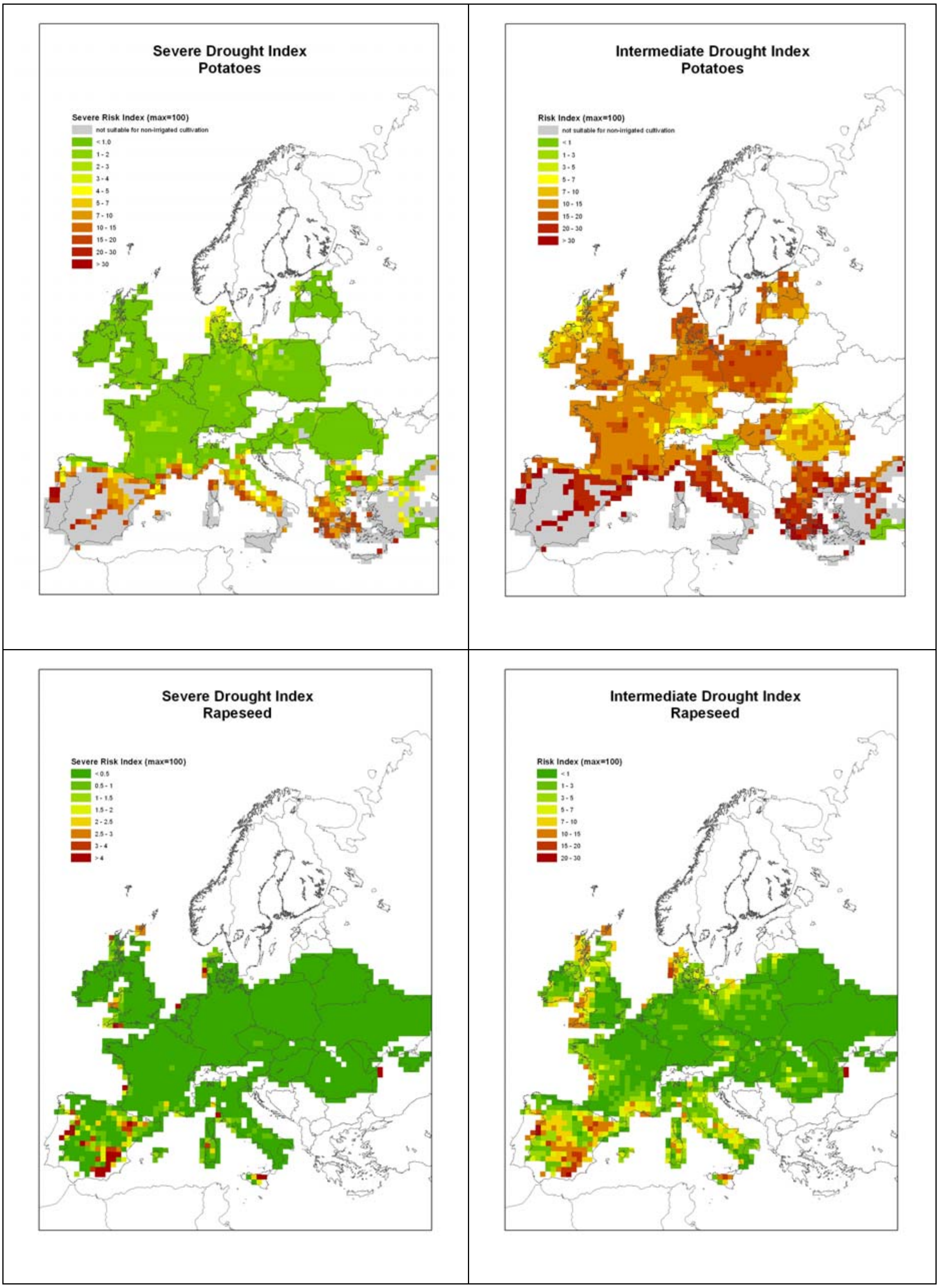

*Source:* Authors' elaboration with MARS data.

**Figure 2. Common winter wheat: percentage of dekades in crop development period of serious drought (left) and index combining severe and intermediate drought situation (right); RMS estimated with CGMS meteorological data 1975–2006**



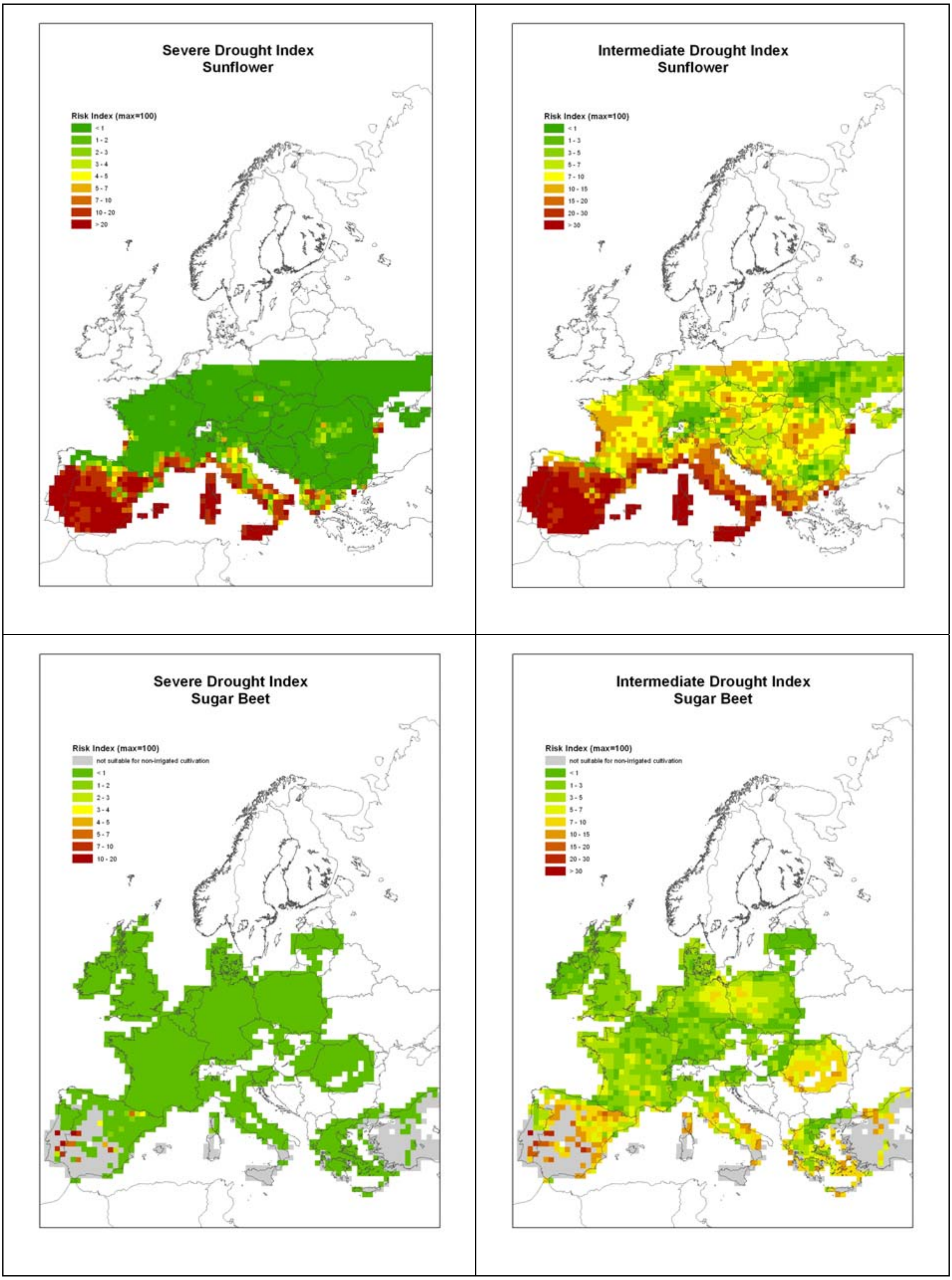

*Source:* Authors' elaboration with MARS data.

**Figure 3. Drought risk indexes for spring barley and field beans**




*Source:* Authors' elaboration with MARS data.

**Figure 4. Drought risk indexes for potatoes and rapeseed**




*Source:* Authors' elaboration with MARS data.

**Figure 5. Drought risk indexes for sunflower and sugar beet**

### 3.3.2. Excessive rain at harvest time

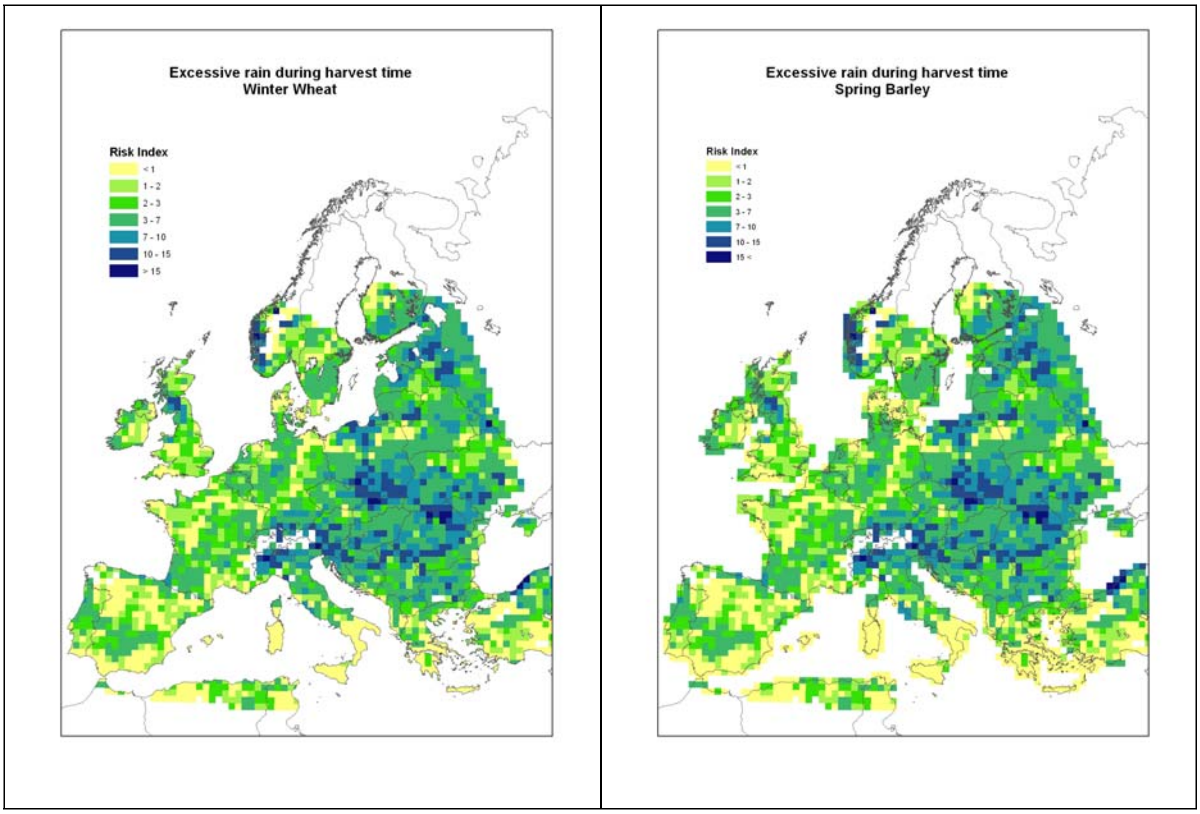
We use meteorological data interpolated in the CGMS 50 km grid. Meteorological data are estimated for the lowest altitude quartile in the cell, in which the highest share of agriculture is supposed to be. For each cell *c* and each year *t*, we consider for each crop the rainfall in the decade of maturity $r_{1,t,c}$, the decade before $r_{0,t,c}$ and the decade after $r_{2,t,c}$.

$$r_{t,c} = r_{0,t,c} + r_{1,t,c} + r_{2,t,c}$$

We consider that rainfall is harmful if it is higher than the local long-term average $\bar{r}_c$ by more than 40 mm. In any case only $r_{t,c} > 80$ mm are considered potentially harmful. The following pages represent maps of an indicator of damage per year due to excessive rain at harvest time computed through:

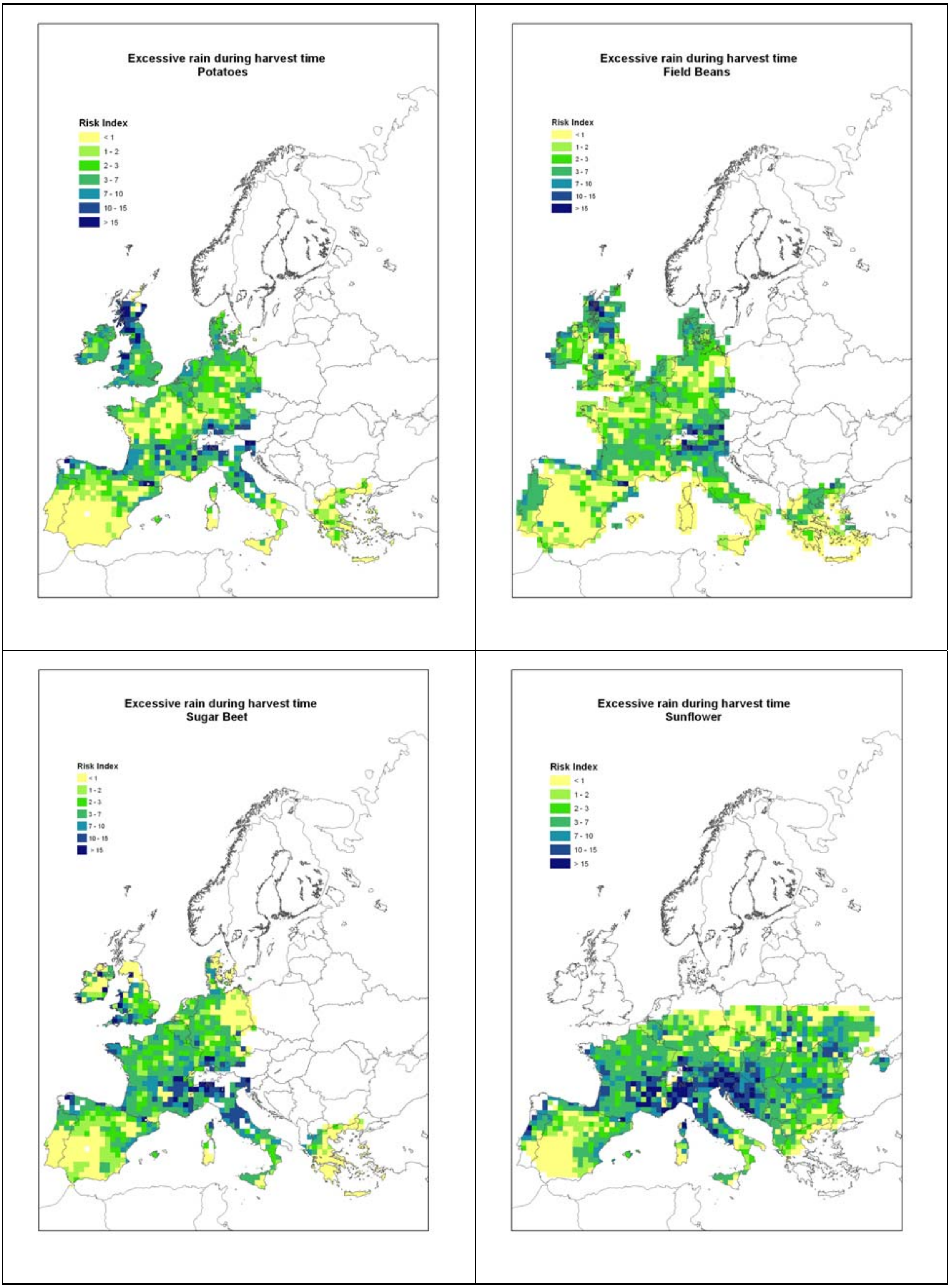
$$yr_{t,c} = \begin{cases} 0 & if\ r_{t,c} \le 80\ or\ r_{t,c} \le 40 + \bar{r}_c \\ else & r_{t,c} - \max(80\ ,\ 40 + \bar{r}_c) \end{cases}$$

The long-term risk indicator will be $y\bar{r}_c$. This indicator still needs to be validated. It is based on agrometeorologist expert knowledge and we use it at this stage to get a general view of the risk. The following figures depict the regional distribution of the risk index based on excessive rain events during harvest time.



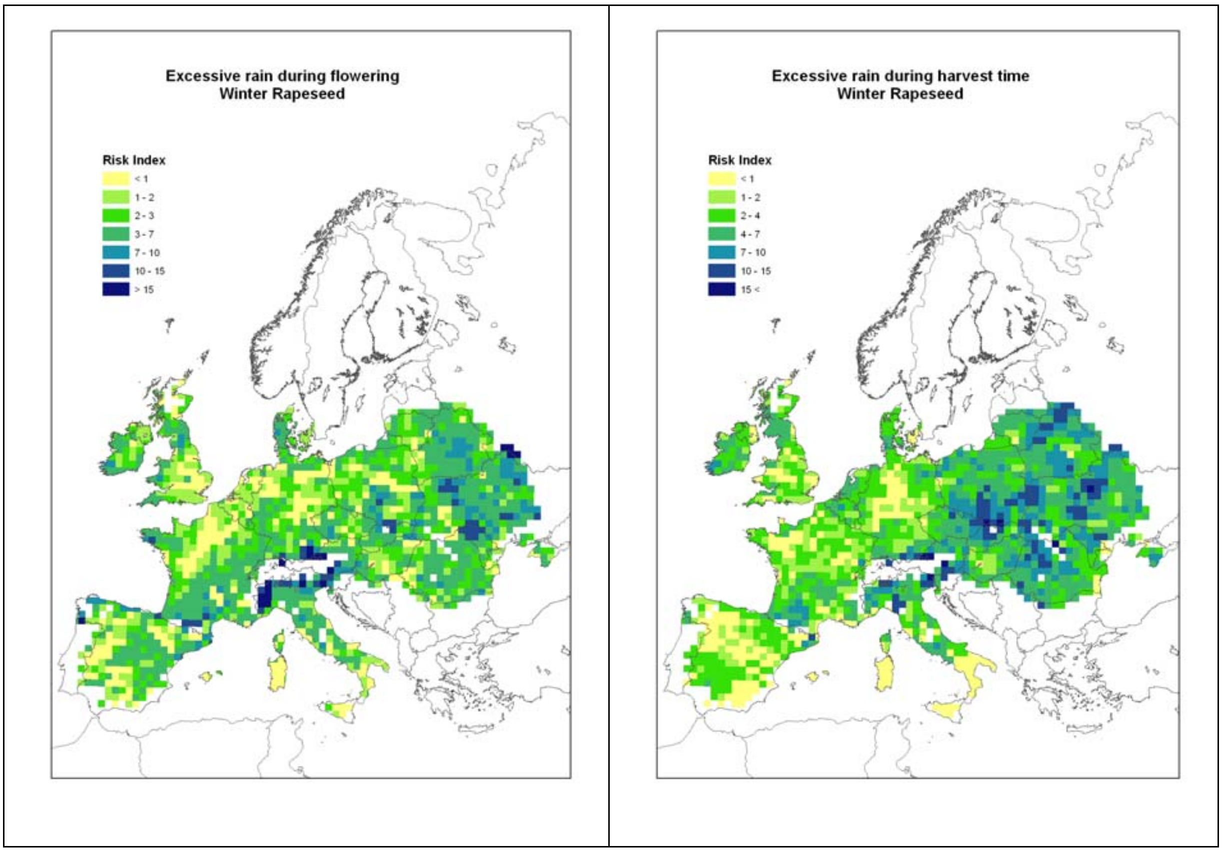

*Source:* Authors' elaboration with MARS data.

**Figure 6. Risk index based on excessive rain events at harvest time; computed for winter wheat and spring barley**




*Source:* Authors' elaboration with MARS data.

**Figure 7. Risk index based on excessive rain events at harvest time; computed for potatoes, field beans, sugar beet and sunflower**



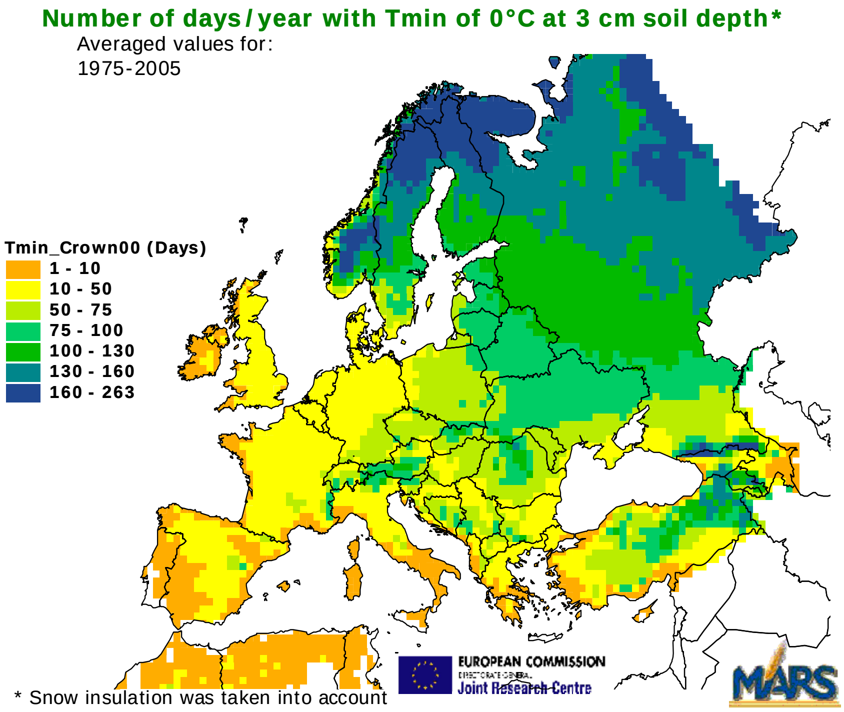

*Source:* Authors' elaboration with MARS data.

**Figure 8. Risk index based on excessive rain events during flowering and harvest; time computed for winter rapeseed**

### 3.3.3. Frost

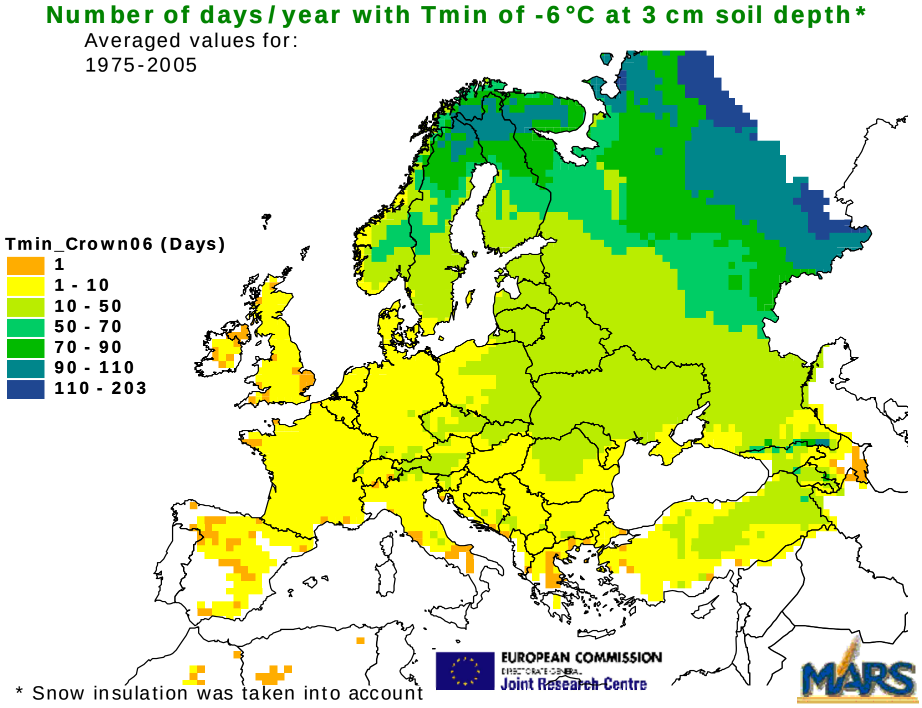
Extreme cold in winter can substantially damage crops. The level of damage obviously depends on the minimum temperatures, but should not be assessed by a straight mapping of minimum temperatures as reported by meteorological observatories (temperature of the air at 2 m above the ground). It requires some elaboration taking into account the recent thermal history (last days) and the protective effect of snow. A progressive lowering of temperatures is less harmful than an abrupt frost, because the plant has the time to protect itself by a physiologic process knows as hardening. The following maps give an idea of the potential damage by low temperatures, but they still need some elaboration and validation for a more synthetic risk index.

A temperature of 0 ºC at 3 cm soil depth (crown level) does not represent menace for the main winter crops but implies the stop of the growth; temperatures between – 6 ºC and – 9 ºC at 3 cm soil depth (crown level) may affect the unhardened sensitive winter cereals (like winter barley or durum wheat). Temperatures between – 9 ºC and – 12 ºC at 3 cm soil depth may affect medium hardened sensitive winter cereals (like winter barley or durum wheat) or unhardened winter wheat crops. Temperatures between – 12 ºC and – 15 ºC at 3 cm soil depth may reduce drastically the plant population of sensitive winter cereals (like winter barley or durum wheat) or even affect medium-hardened winter wheat crops. At temperatures between – 15 ºC and – 18 ºC at 3 cm soil depth, winter crops like winter barley or durum wheat have a very low chance of survival and serious damage is expected for winter wheat (depending on the cultivar and the hardening index). Below – 18 ºC at 3 cm soil depth, winter wheat crops are subject to severe to lethal damage (spring re-sowing may be necessary in most cases) although some cultivars of rye are able to resist to – 21 ºC.



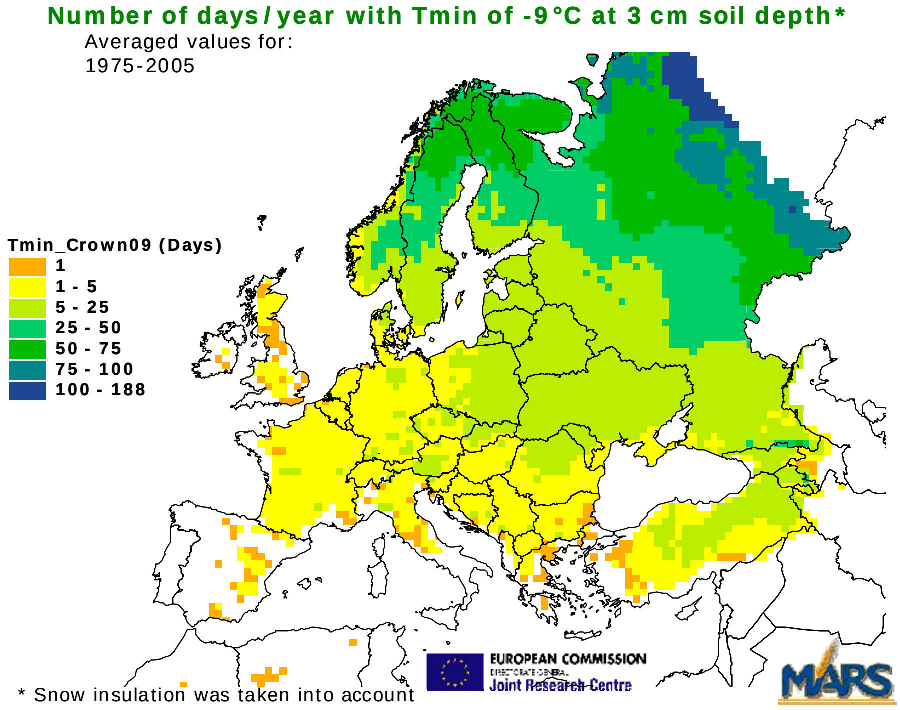

*Source:* Authors' elaboration with MARS data.

**Figure 9. Long-term average of the number of days/year of frost at crown level**



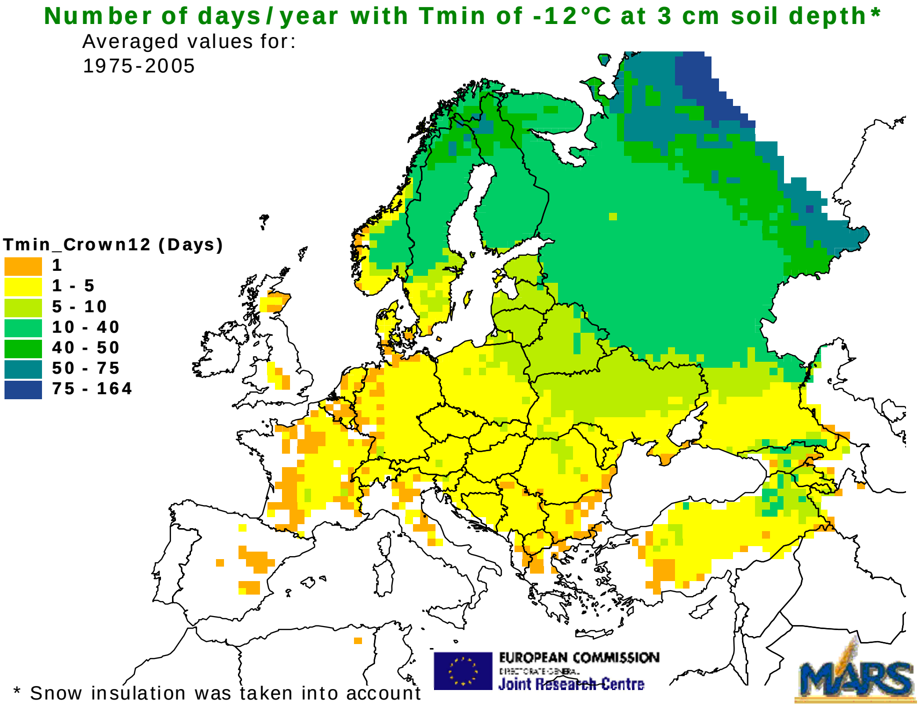

*Source:* Authors' elaboration with MARS data.

**Figure 10. Long-term average of the number of days/year of frost below – 6 ºC at crown level**



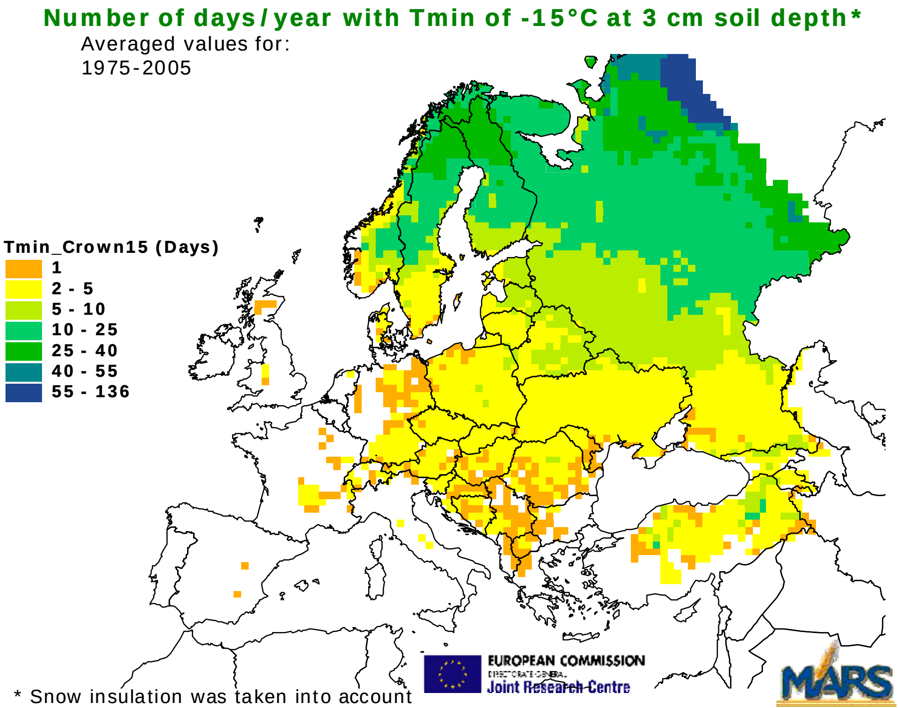

*Source:* Authors' elaboration with MARS data.

**Figure 11. Long-term average of the number of days/year of frost below – 9 ºC at crown level**



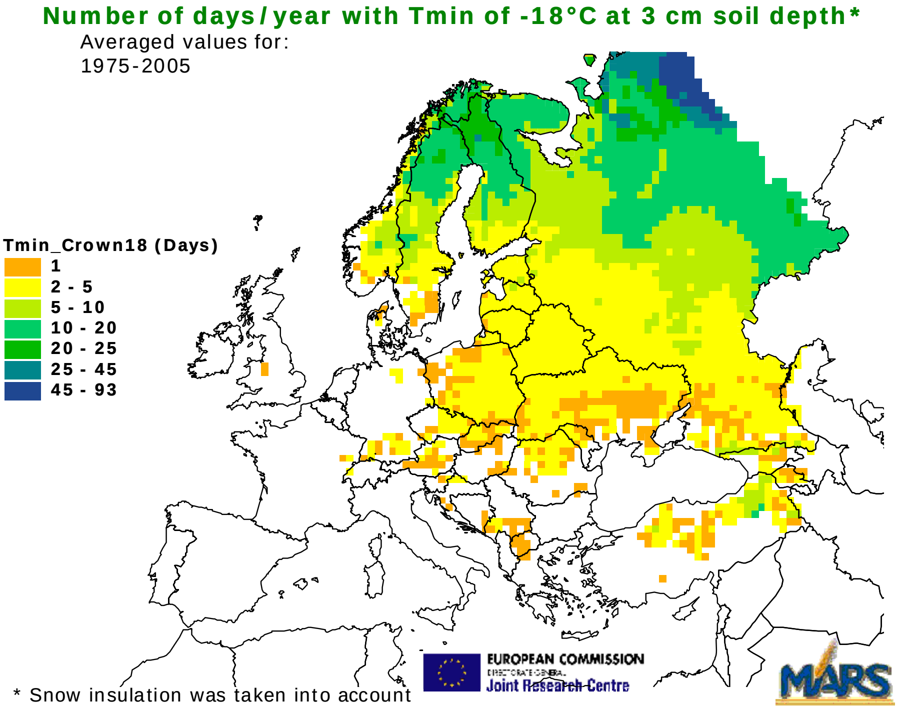

*Source:* Authors' elaboration with MARS data.

**Figure 12. Long-term average of the number of days/year of frost below – 12 ºC at crown level**



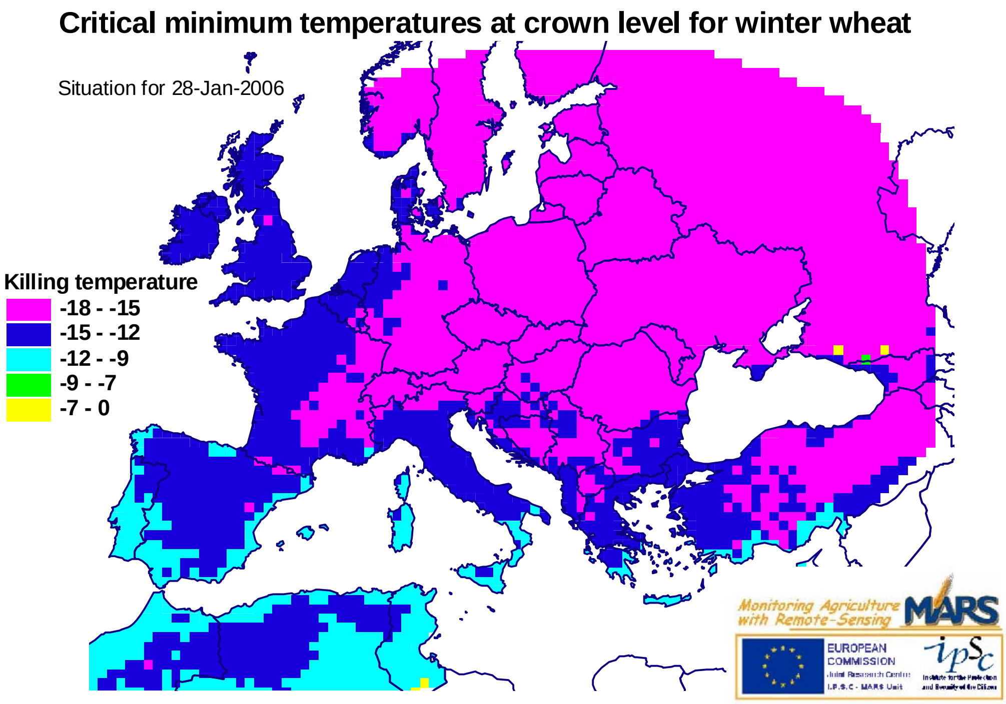

*Source:* Authors' elaboration with MARS data.

**Figure 13. Long-term average of the number of days/year of frost below – 15 ºC at crown level**




*Source:* Authors' elaboration with MARS data.

**Figure 14. Long-term average of the number of days/year of frost below – 18 ºC at crown level**




*Source:* Authors' elaboration with MARS data.

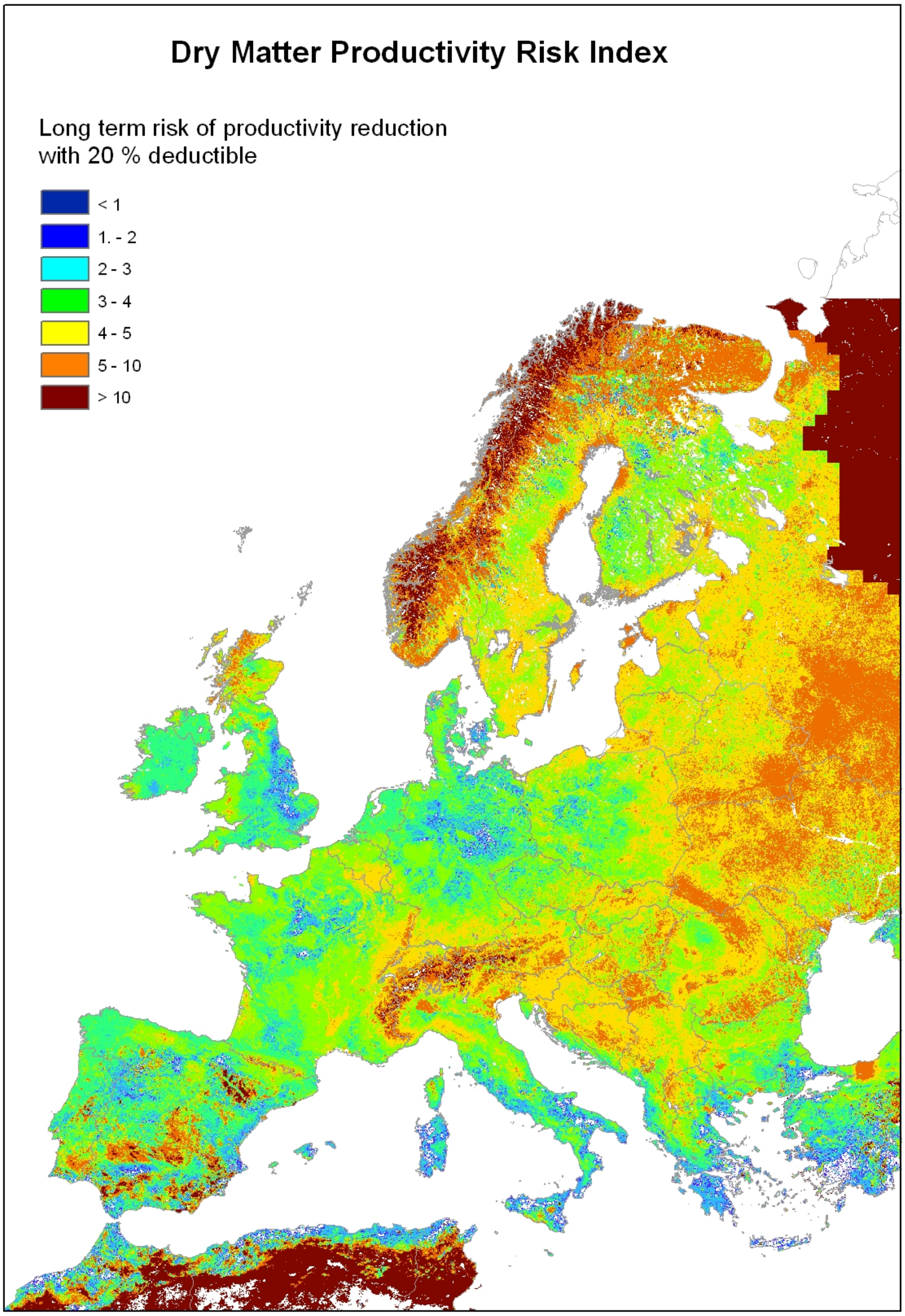
**Figure 15. Critical minimum temperatures at crown level for winter wheat**

An estimation of the daily level of resistance of winter wheat may be derived from the hardening index (integrating the thermal history of the crop since emergence). This calculus better reflects the physiological status of the crop. Quality of the crop calendars used in simulation is very important. In case of uncertainty of sowing/emergence date, the run of some alternative scenarios may be necessary.
Direct frost damage represents only a part (even if it is considered the most important) of winter kill. Further developments for simulation other aspects of winter kill like ice encasement are considered in MARS-STAT (simulation of crop height may be a necessary step).

### *3.3.4. Pasture and fodder: productivity reduction risk*

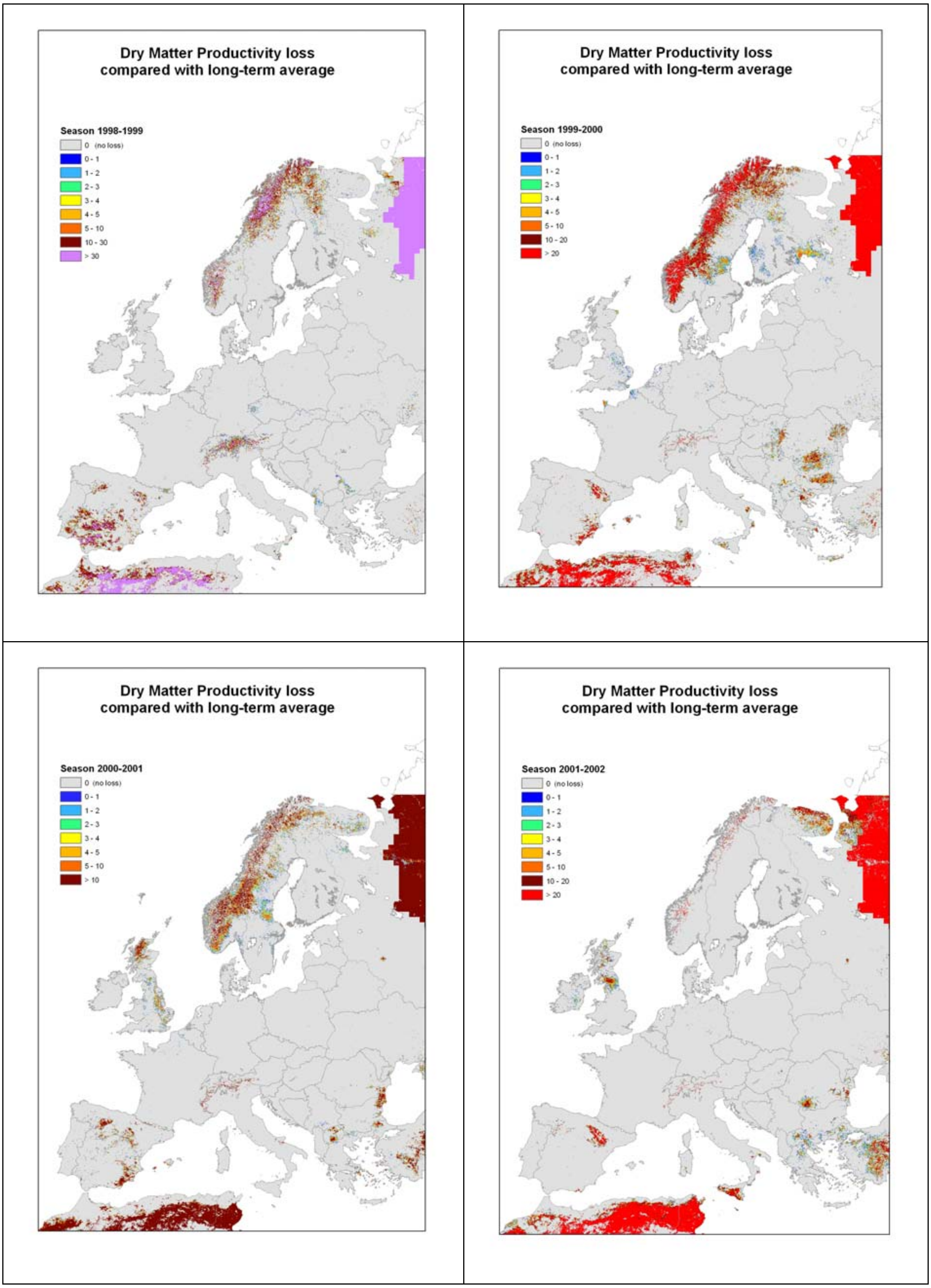
Evaluating the productivity reduction of pasture and fodder presents a specific difficulty for insurance schemes as opposed to annual field crops such as cereals or oilseeds. In the case of annual field crops, the evaluation of damage can be made with one visit to the field just before the harvest time. In the case of pasture and fodder, grass is consumed by animals in a continuous way or has several cuts during the year, at irregular dates. On the other hand, there are seldom reliable statistical data on pasture productivity. This makes it very difficult to assess, on the field, damage to pastures and fodder.
An alternative approach to overcome this difficulty is provided by vegetation indexes from satellite images. We have used the so-called 'dry matter productivity index', computed from the spot-vegetation sensor with 1 km resolution. This type of sensor has the advantage of a high repetitiveness (daily), compared with other types of image that can have a finer spatial resolution but for which it becomes very difficult to obtain a high number of images throughout the year.
Insurance products based on indirect indexes computed on satellite images are already operational in Spain. The currently used system in Spain is based on the normalised difference vegetation index (NDVI) computed on NOAA-AVHRR images, but we believe spot-vegetation images are preferable for this purpose because of a better geometric co-registration of the images, even if the time series are shorter than for NOAA-AVHRR.
The map in Figure 16 corresponds to the expected payment that an insurance company would have to make under the hypothesis of an indirect area index insurance policy defined on the basis of these images with a straight deductible of 20 %. The premium rate would be computed consequently.
The losses (above the 20 % deductible) in each year are mapped in Figure 17 and Figure 18. These maps illustrate how strongly systemic this type of risk is. On the other hand it can also be seen that most of the average loss above the deductible is due to the losses in the past year; this means that there is a level of uncertainty in the estimation of the long-term risk because of the short time series (8 years). A longer time series is theoretically possible by inter-calibration of NOAA-AVHRR, but the

reliability of the inter-annual comparisons is not as good as with a complete series of spot-vegetation images. In terms of insurance this means that the insurance companies should probably use slightly higher premium rates.



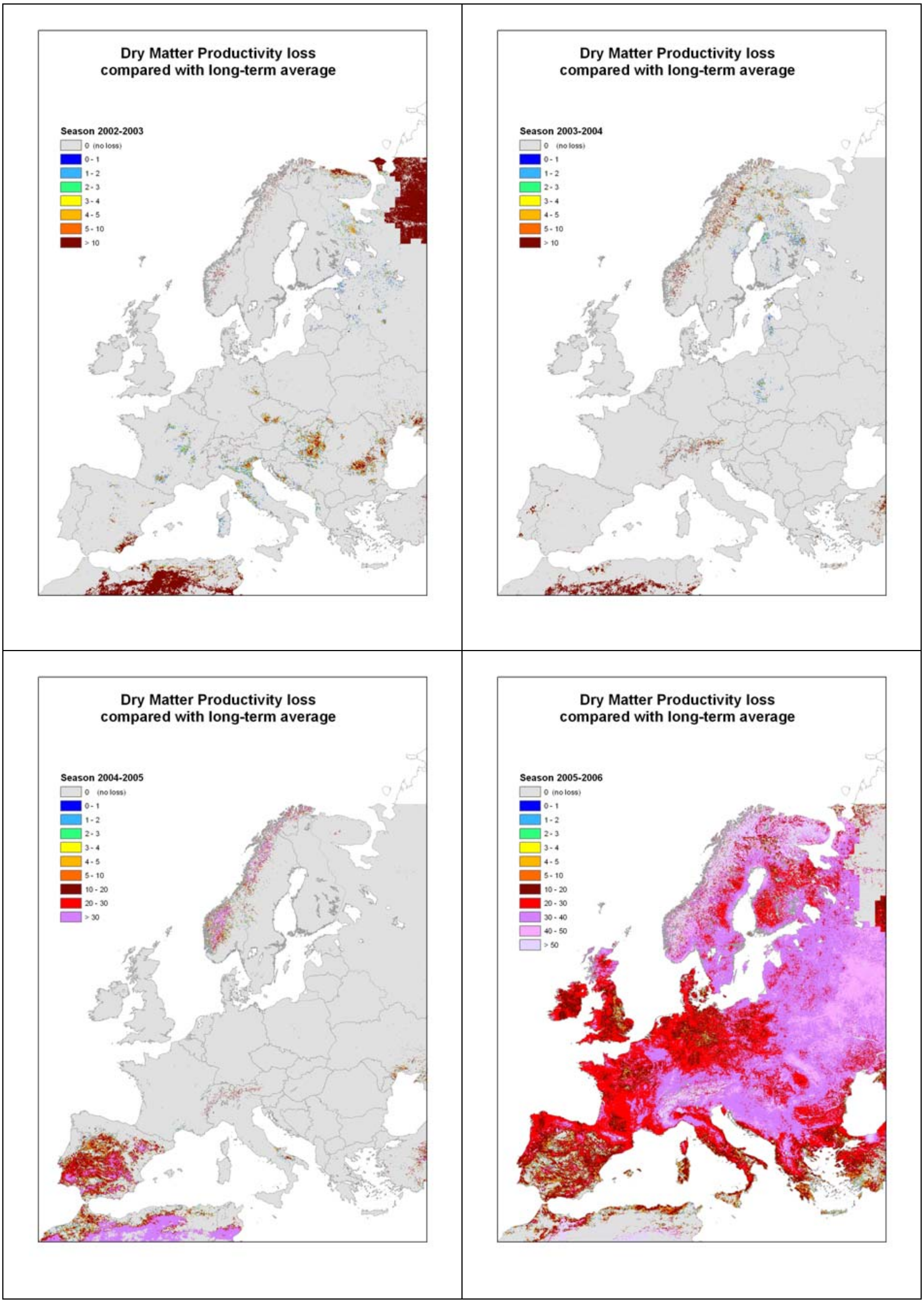

*Source:* Authors' elaboration with MARS data.

**Figure 16. Risk index map for pasture and fodder, computed on spot-vegetation satellite images**




*Source:* Authors' elaboration with MARS data.

**Figure 17. Yearly dry matter loss index from spot vegetation (1998–2002)**




*Source:* Authors' elaboration with MARS data.

**Figure 18. Yearly dry matter loss index from spot vegetation (2002–06)**

### *3.3.5. The impact of climate change on agricultural risk*

Climate change introduces a major factor of uncertainty in meteorological risks for agriculture. Some climate change models (sourced from the IPCC Fourth Assessment Report, WPII, 2007) support the conjecture that extreme meteorological events will become more frequent. There is a general perception that the frequency of extreme events (floods, hurricanes, heat waves, severe droughts) is increasing with the ongoing climate change. This can be due to an effective increase of extreme events, but the perception can be also influenced by the higher rate of information we have about disasters happening anywhere in the world. The increased amount of high-value property in areas at risk (of flood, for example) can also have an influence on the frequency of disasters. An objective assessment of the possible increase of extreme events requires a systematic analysis of long series of meteorological observations, but the availability and homogeneity of such observations is very limited.

Many studies report partial evidence of this increase for specific types of extreme events and partial geographical areas; a large number of references and a general view on this issue can be found in the IPCC report, WG I, Chapter 3.8 (Trenberth et al., 2007). General conclusions on trends to increasing variability have been difficult to reach in the recent past (Frich et al., 2002). Some studies report non-significant results; for example Scherrer et al. (2005) study the temperatures in central Europe and do not find a significant trend for the variability. Only recently have there been more concluding general analyses, reported by Trenberth et al. (2007). This section of the IPCC report focuses mainly on 'moderately extreme events', defined as the observations above percentile 90 or below percentile 10 for the reference period 1961–90 (percentiles 95 or 99 are sometimes used for precipitation). The reason for that choice is to improve the robustness of the conclusions that are strongly method-dependent when proper extremes are studied (Zhang et al., 2004).

Alexander et al. (2006) have conducted interesting studies on a global gridded temperature and precipitation database (Caesar et al., 2006). Besides confirming the significant increase of the maximum and minimum temperatures (stronger for minima), Alexander et al. reach an additional conclusion of high interest for agricultural insurance: they find a general increase of the contribution of strong precipitations to the total yearly rainfall; this increase is significant for more than half of the emerged land. The concentration of precipitation in stronger events with shorter duration is physically explained by the combined effect of increased evaporation and moisture-holding capacity of the atmosphere, both due to warming (Trenberth et al., 2003). Coherent results are found at a finer scale for many extra-tropical regions (Groisman et al., 2005), and, with a more detailed analysis, for the USA (Groisman et al., 2004) and for Europe (Klein Tank and Können, 2003). For the Mediterranean area, where the climatologic vulnerability is high, several studies find an increasing trend towards more intense precipitations in spite of a decreasing total precipitation (Alpert et al., 2002; Maheras et al., 2004, Brunetti et al., 2004). If this trend is confirmed in the future, we will have a twofold increase of risk for agriculture: more heavy rains and more drought periods.

The global amount of precipitation does not seem to have a clear, statistically significant, trend, but most studies suggest a small negative trend for the period 1951–2005, larger for some regions, like the Sahel and western Africa, while there seems to be a positive trend in northern Europe (Trenberth et al., 2007, pages 255–256). A significant trend towards drought has been found by Dai et al. (2004) in most of the northern hemisphere, and in particular in most of Eurasia, using the Palmer drought severity index (PDSI). This index (Heim, 2002) only requires temperature and precipitation to compute potential evapotranspiration (PET) with the method of Thornthwaite (1948), and is therefore easier to compute for areas with limited amount of data than the more reliable, but more complex, PET computation with the method of Penman (1948).

Conclusions are more difficult to reach for wind events and few studies tackle this issue; Salinger et al. (2005) have shown, for wind extremes in the southern part of New Zealand, a significant increasing trend over the last 40 years, but Smits et al. (2005) found a decline in strong wind events in the Netherlands over the same period.

The scientific community does not consider this risk increase as sufficiently proven with systematically acquired data at global level.

Some scenario analysis can be carried out on the basis of climatic scenarios that are being built in the framework of the Ensembles (Sources) project (integrated project of FP6). At this stage only some exploratory analysis can be carried out on this topic.

## 3.4. Crop yield variability

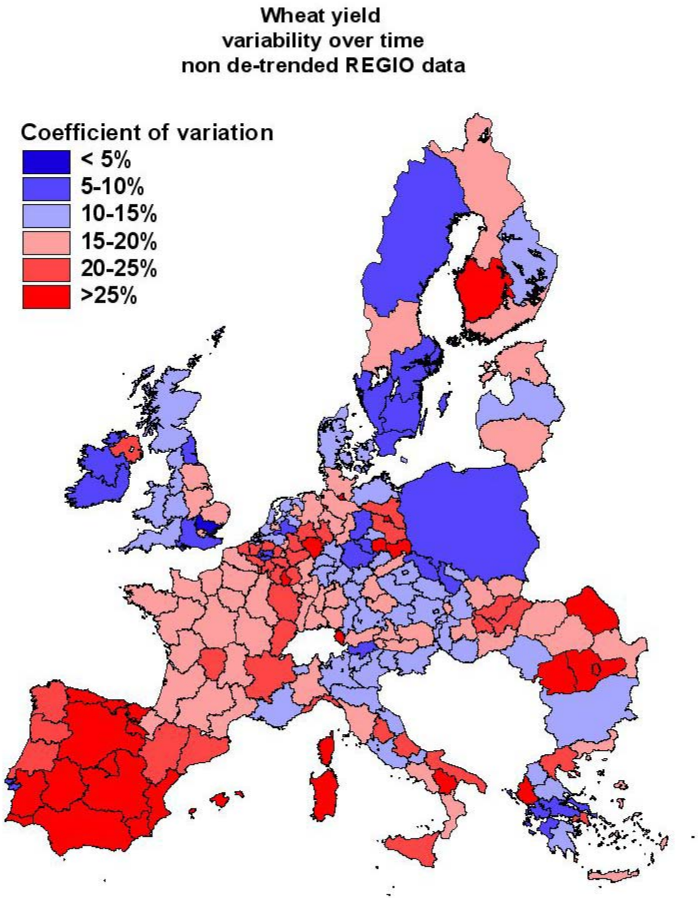
We consider now different possible indicators for crop yield variability. For discussion of the most suitable indicators, we take the example of wheat. We use the statistical yield data per year for the smallest regions for which data are available in the Eurostat REGIO database.

### *3.4.1. Standard deviation of regional yields*

A first simple way to measure variability is to compute the standard deviation of the historical statistical yields. A first attempt can be given by a map of the standard deviation along time. Figure 19 represents the coefficient of variation for the historical yield data for wheat (standard deviation/average yield).

$$std(y) = \sqrt{\frac{1}{n-1}\sum_t \left(y_t - \bar{y}\right)^2} \; .$$

Data are available for most countries and therefore represented at NUTS 2 level. In the case of missing data, the level NUTS 1 is represented, or NUTS 0 (Member States) if NUTS 1 data are also missing.

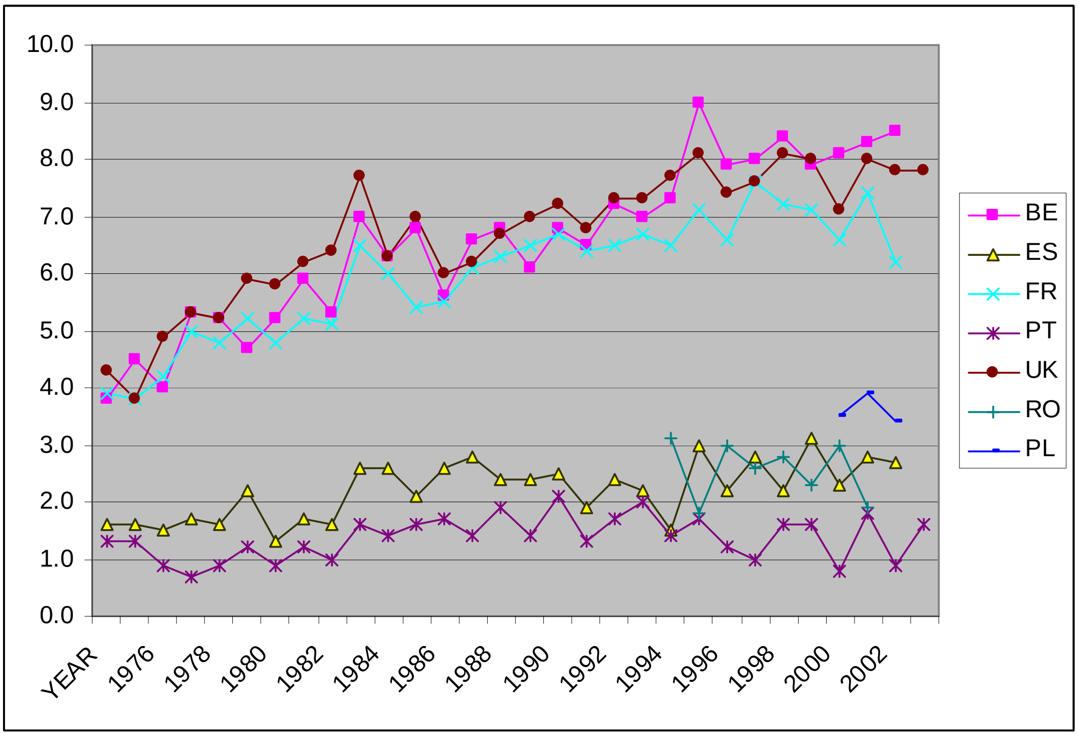



*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 19. Coefficient of variation (standard deviation/mean) of the wheat yield data**

This map in Figure 19 gives some information that is coherent with common knowledge, such as a high variability in the Iberian Peninsula and a lower variability in most of central Europe, but the information in it is strongly distorted for several reasons.

- The contribution that the technological trend has on the variability (Figure 20 illustrates this point): in France or Belgium there is a strong tendency to the increase of yields. Therefore the standard deviation is high because the first and last values ($y_{1975}$ or $y_{2004}$ for example) are far from the average $\bar{y}$, but each $y$ is not that far from the expected value for that year.
- There is an insufficient number of observations. This happens for example for Poland.




*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 20. Some time series of yield data of wheat**

Figure 20 shows the evolution of average wheat yields in time. We can differentiate two groups of countries: Spain, Portugal and Romania with lower yields; and Belgium, France and the United Kingdom with much higher yields. This second group also shows an important trend upwards from 1976 to 2002.

### *3.4.2. Measuring the risk by comparing the statistical yield with the average yield of the previous years*

A possible way of computing the variability of yield is to compare the yield in a given year with the yield that could be expected on the basis of the previous years. A rough estimation of the expected yield can be given by the average of the observed yield in the previous years. For example, considering a four-year moving average, we can obtain an indicator of 'yield anomaly' for year $t$ as the difference $r_t$ between the observed yield in year $t$ and the average yield of the previous years:

$$r_t = y_t - y_t^0 = y_t - \frac{1}{4}\left(y_{t-1} + y_{t-2} + y_{t-3} + y_{t-4}\right).$$

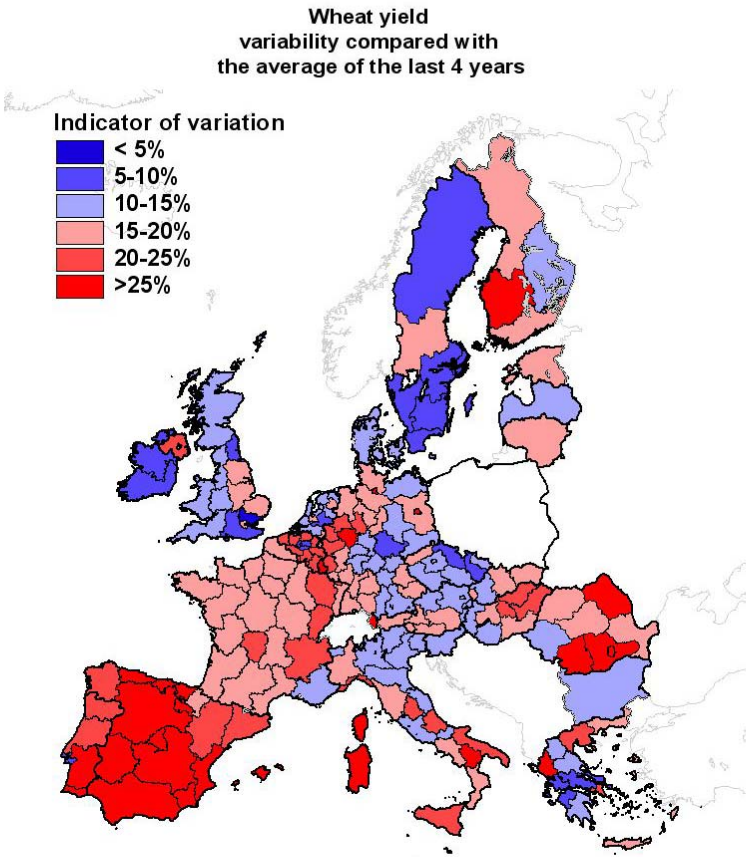
The average $y_t^0$ is an approximation of the 'expected average yield in year t'. We can get a yield variability indicator as the standard deviation of $r_t$. This method needs some improvement to take into account two points.

— A period of four years is too short to compute a long-term average that can be interpreted as 'expected yield under normal conditions'; series of four successive good or bad years are not too rare and can have a serious impact on this type of indicator.

— There is usually a technological trend, i.e. the expected yield in normal conditions in year *t* is higher than the expected average yield in normal conditions in the four previous years.

If the time series are very short, the risk indicators are not reliable. We have set a minimum threshold of 10 years of data to consider valid the parameter for our calculations.

## Measuring the risk with the standard deviation




*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 21. Relative variability of wheat yield evolution compared with the average of the previous four years**

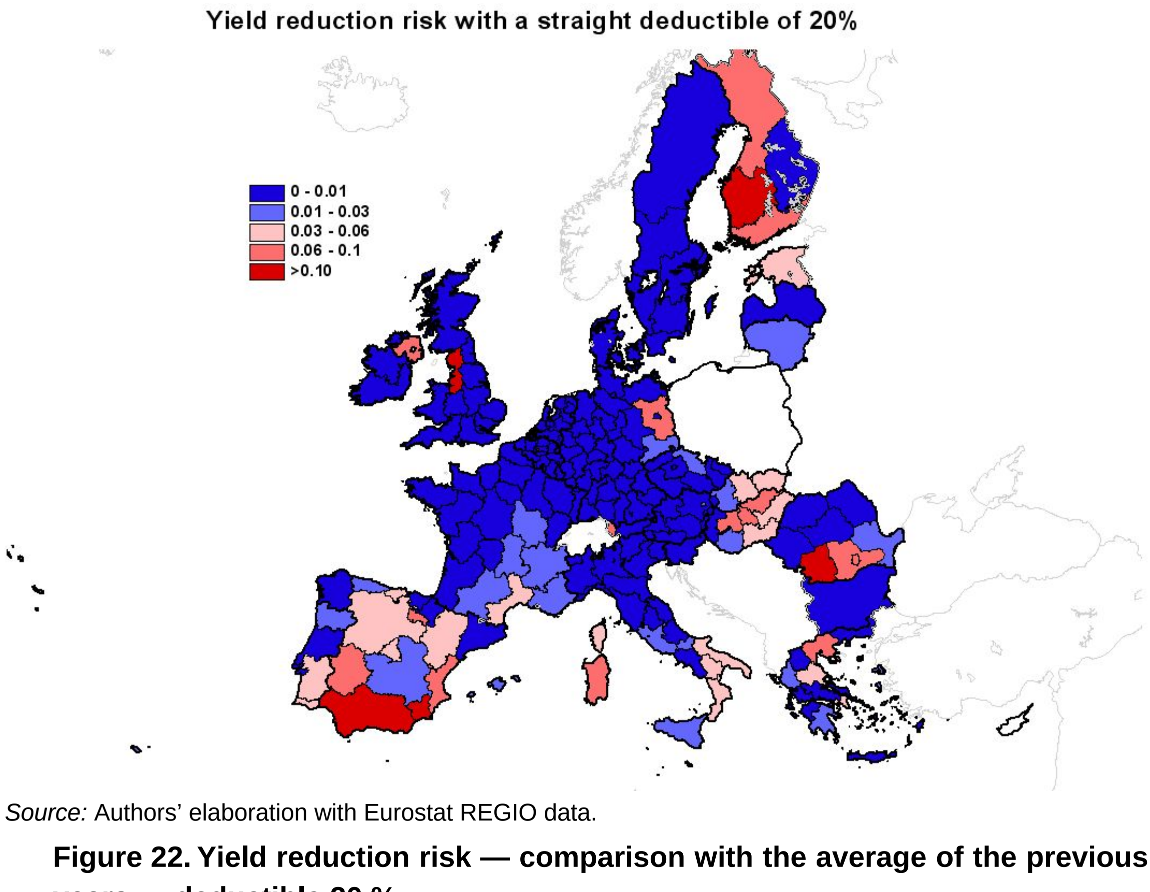
We can get a yield variability indicator as the standard deviation of $r_t$. Figure 21 gives an example of representation of $std\ dev(r_t)$ for the particular case of wheat. The picture does not really correspond to the risk of yield reduction of wheat; some regions give surprising results: the low variability in some Mediterranean regions (in Greece for example) is difficult to understand. The high variability in central European areas is due to a non-linear technical trend rather than to a risk of yield reduction. On the other hand, the geographic level is too coarse, especially in countries where NUTS 2 regions are large. Even when long enough series are available at NUTS 2 level, the situation in each region can be very heterogeneous due to the differences in soils.

## Measuring the risk of negative outcomes applying a deductible

When an indicator $r_i$ of yield anomaly from statistical data has been identified as acceptable, the standard deviation $std\ dev(r_t)$ can be acceptable as an indicator of the variability, but it is not a good measure of the risk of yield reduction, in particular from the point of view of insurance. A better indicator is the negative outcome, loss or due indemnity, i.e. defining an indicator $s_t$ that corresponds to the compensation that an insurance company should pay under a hypothetical insurance. The trigger of the loss most often used is the expected yield for the region with a straight deductible $d$ (10 % or 20 % for example):

$$if \begin{cases} r_t < d & then \quad s_t = 0 \\ r_t \geq d & then \quad s_t = r_t - d \end{cases}.$$

The average of $s_t$ would be the expectation of payment that an insurance company would pay under such a hypothetical type of insurance.




*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 22. Yield reduction risk — comparison with the average of the previous four years — deductible 20 %**

If we apply this function to the anomaly indicator $r_t$ defined in the previous paragraph, we get a more sensible picture of the yield reduction risk for wheat (Figure 22). However, some regions highlighted as strongly variable, due to only one abnormal year, such as North West, Ulster (minor producers) or Brandenburg (more important). This suggests that the method needs some improvement.

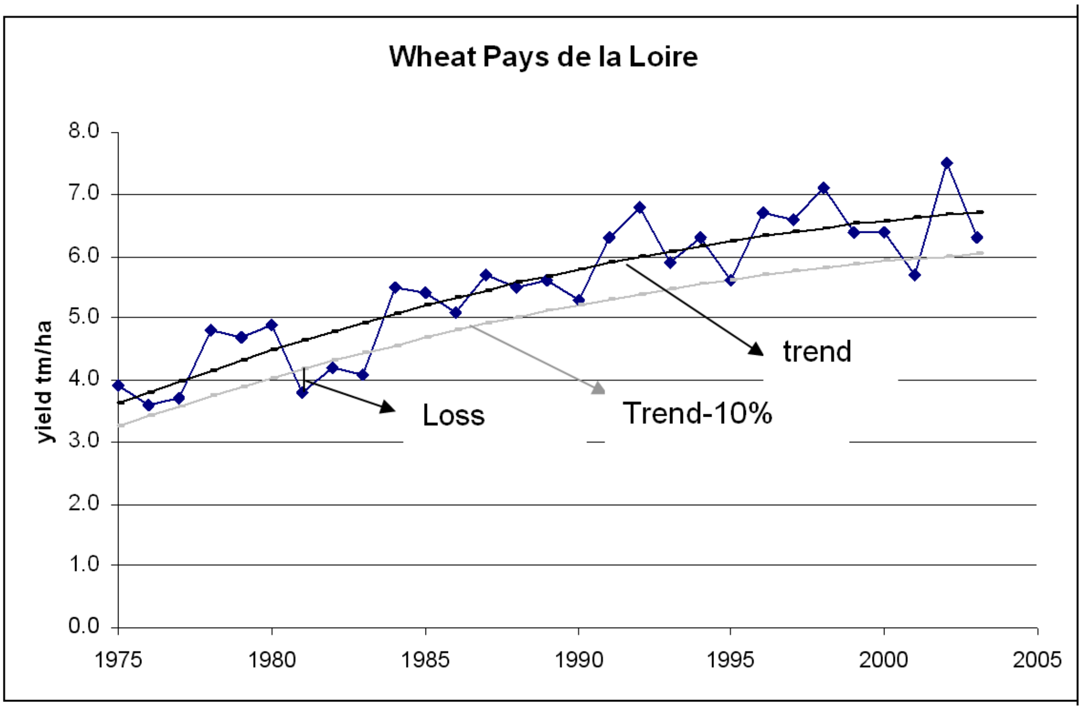
### *3.4.3. Measuring the yield anomalies by comparison with the yield*

Computing the 'expected yield' as the average yield of the last four years is far from being an optimal solution for the reasons mentioned above: it ignores the technical trend and can be affected by the presence of one or two very good or very bad harvests in the four previous years. A better option is to define the 'expected yield' through a trend adjusted taking into account all the available information. We have estimated the trend on the time series in each region with a quadratic stepwise regression with two restrictions: we assume that the trend is growing or constant and its slope is constant or decreasing. We obtain this with the following rules.

— If none of the time terms is significant or the regression-adjusted trend is decreasing, the average yield is accepted as trend.

— If the linear term is significant and the quadratic is not significant or has a positive sign, we take a linear trend.

— If the quadratic trend goes down before the end of the series, we keep it constant after the maximum value.



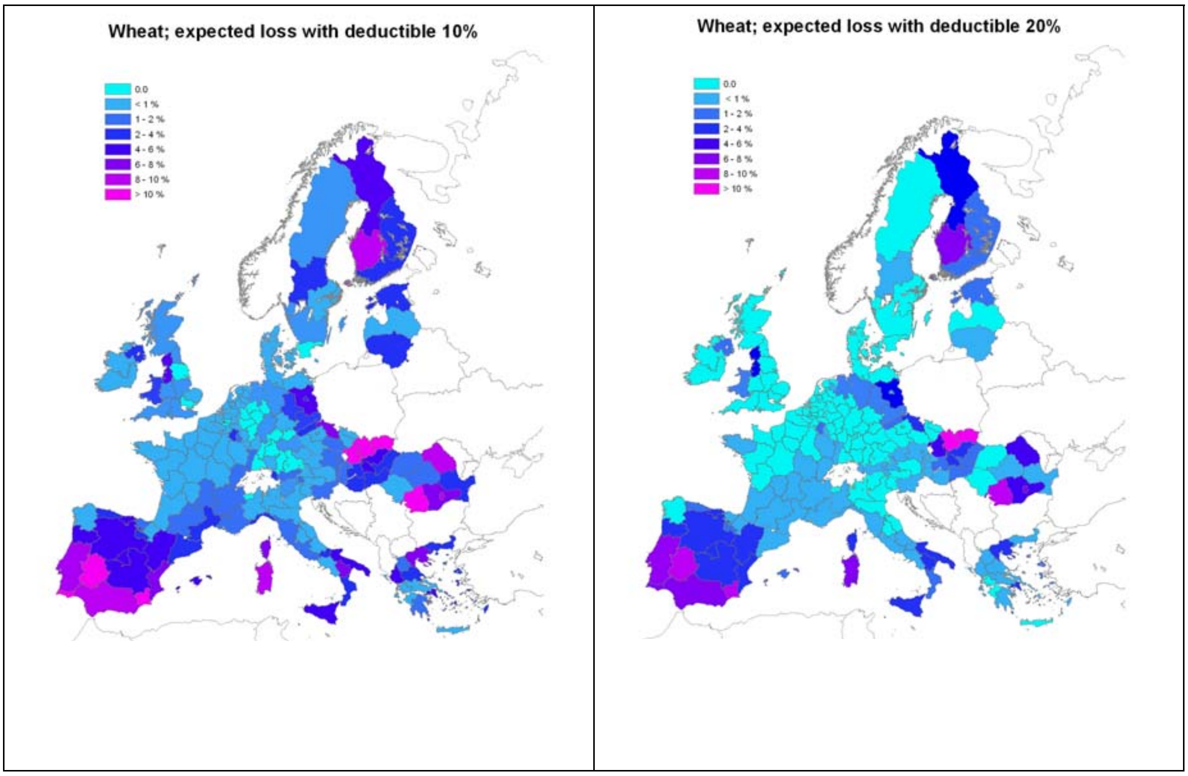

*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 23. Illustration of the computation of a yield loss indicator with a quadratic trend and a deductible**

Figure 23 illustrates this for wheat in the Loire Region (France). The black curve indicates the adjusted quadratic trend, which is growing and with a decreasing slope. The grey curve below represents the trend affected by a 10% deductible. The values below this second trend are those which would trigger an indemnity, equal to the difference between these values and the corresponding value of the grey trend curve.

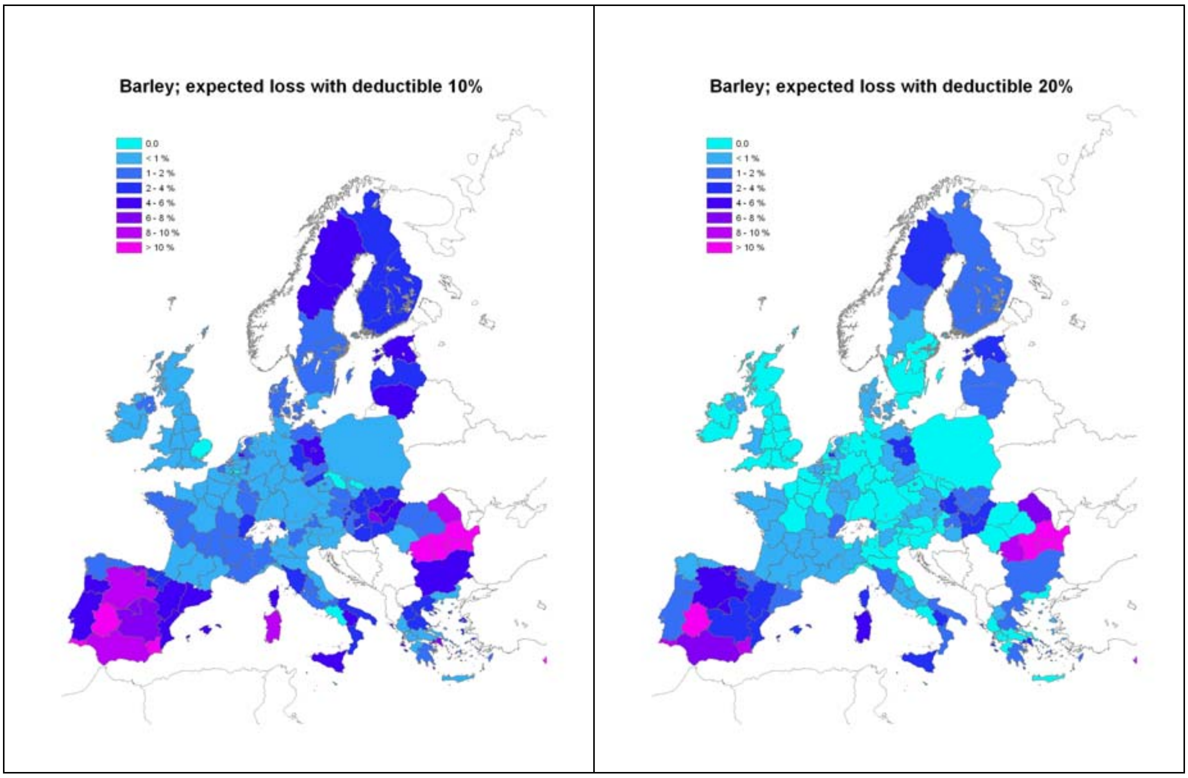
The risk maps reported below (Figures 24 to 28) are more coherent, although there is still one major limitation due to the smoothing effect of working with regional averages, especially for major production areas in each crop. A smooth behaviour of the regional average yield does not mean that all farms in that region share the homogeneity. These maps correspond rather to the level of systemic risk in each region.

Figure 24 reports the risk indicators obtained for the yield of wheat (common and durum wheat together). Poland is missing due to insufficient data and Bulgaria is missing due to a few likely wrong data in the Eurostat REGIO files used for this exercise. The most risky regions are the southern half of the Iberian Peninsula, Slovakia, a large part of Romania (Sud and Nord-Est) and a few regions in Italy (Sardinia, Basilicata) and Greece (Central Macedonia). The risk appears low in most of central Europe, at least for the EU-15 part, the Czech Republic and Hungary.




*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 24. Yield loss risk map for wheat with a quadratic trend**



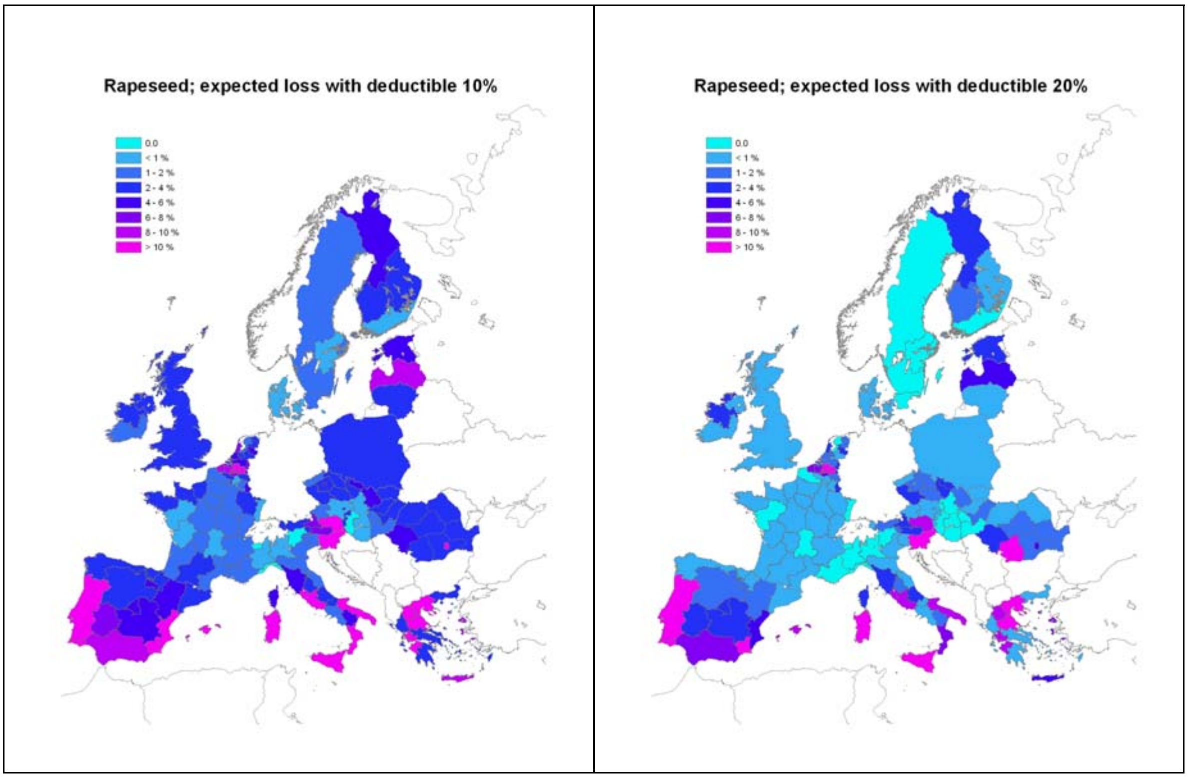

*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 25. Yield loss risk map for barley with a quadratic trend**

The pattern of risk level for barley (Figure 25) has a similar behaviour, with risk levels slightly higher than for wheat, which may be because barley is often cultivated in poorer soils than wheat. High risks are concentrated in Romania (Sud, Sud-Est regions); the same situation is evident in western Spain (Extremadura).

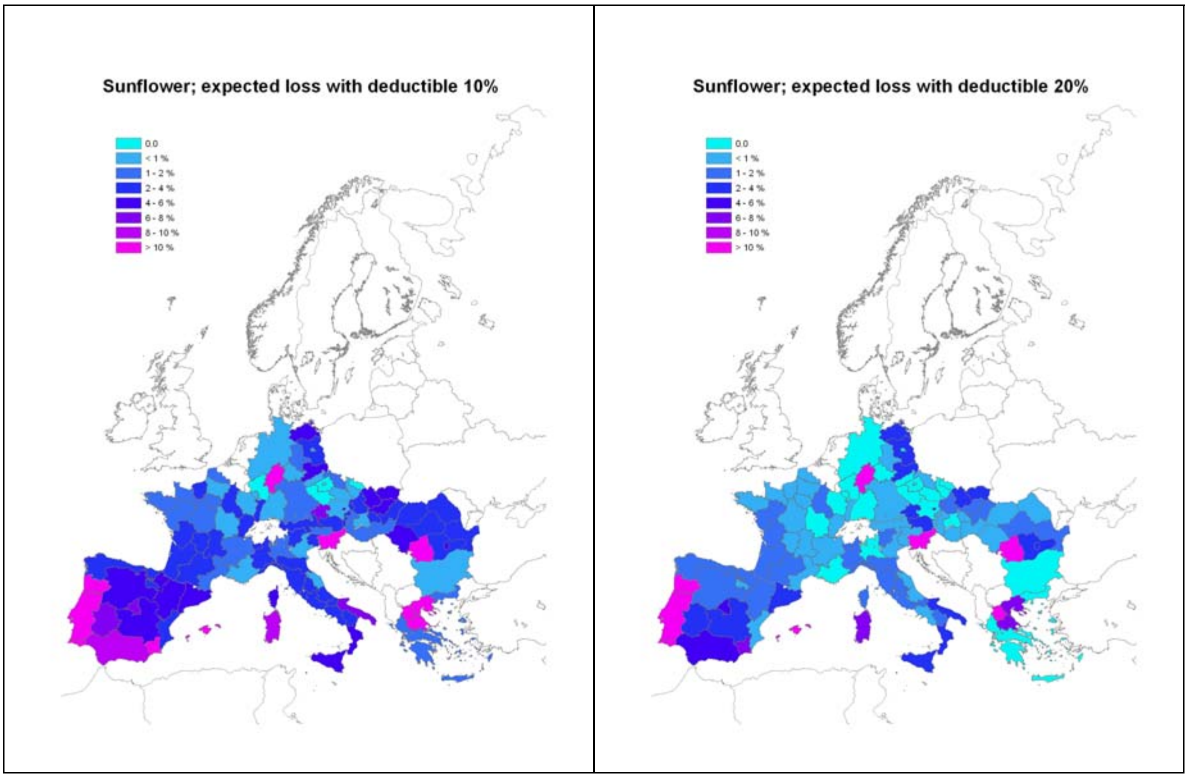
Figure 26 reports the risk indicators obtained for the yield of rapeseed. The most risky regions are also in this case mainly the Mediterranean regions: Portugal, Spain (Comunidad Valenciana, Andalucía), Slovenia, a large part of southern Italy and its islands, a few regions of Greece (Thessaly, Central Macedonia), the region of Gelderland in the Netherlands and the Styria in Austria.

Figure 27 shows the risk indicators obtained for the yield of sunflower. Higher risk is recorded in Portugal, Greece (Thessaly, Continental Greece), Romania (Sud-Vest), Germany (Detmold) and also Slovenia. The risk appears low in most of central Europe, at least for the EU-15 part, the Czech Republic and Hungary. Northern and central regions seem not to be exposed to high risk.



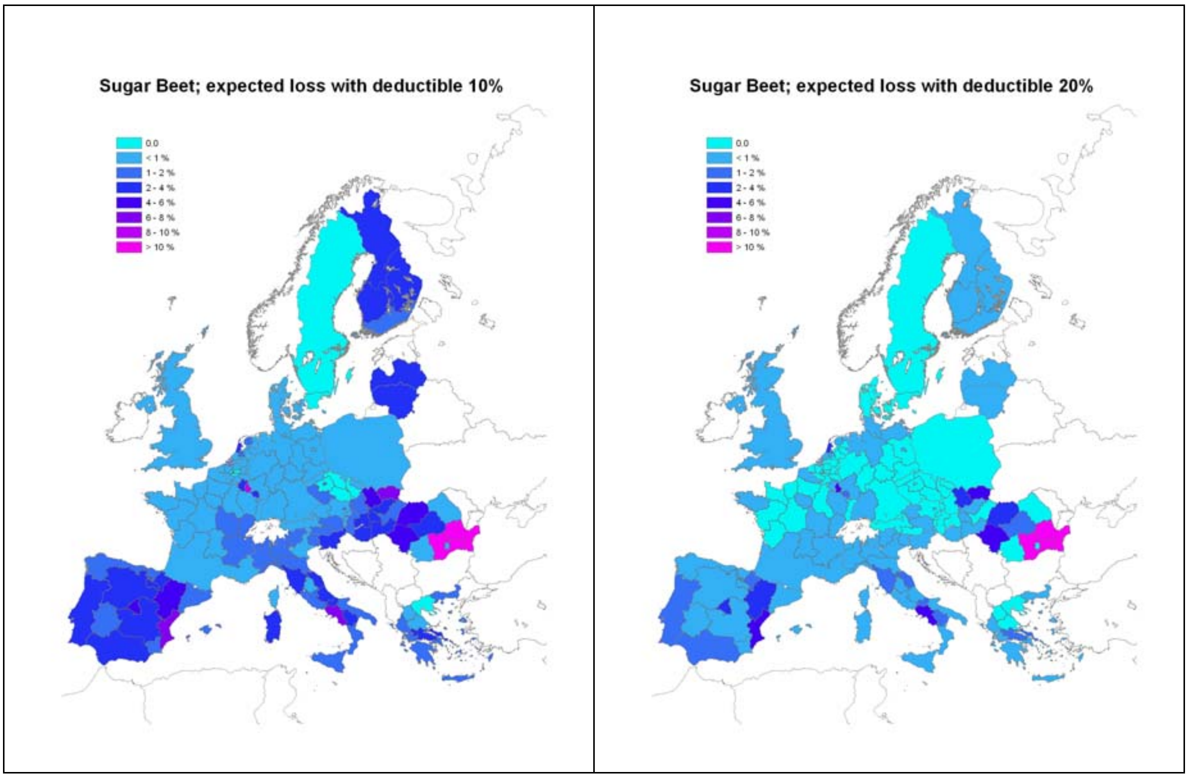

*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 26. Yield loss risk map for rapeseed with a quadratic trend**




*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 27. Yield loss risk map for sunflower with a quadratic trend**




*Source:* Authors' elaboration with Eurostat REGIO data.

**Figure 28. Yield loss risk map for sugar beet with a quadratic trend**

Figure 28 analyses the risk indicators obtained for the yield of sugar beet. High risk seems to be concentrated only in Romania (Sud and Sud-Est). This crop's yield has a moderate level of risk in the rest of Europe.

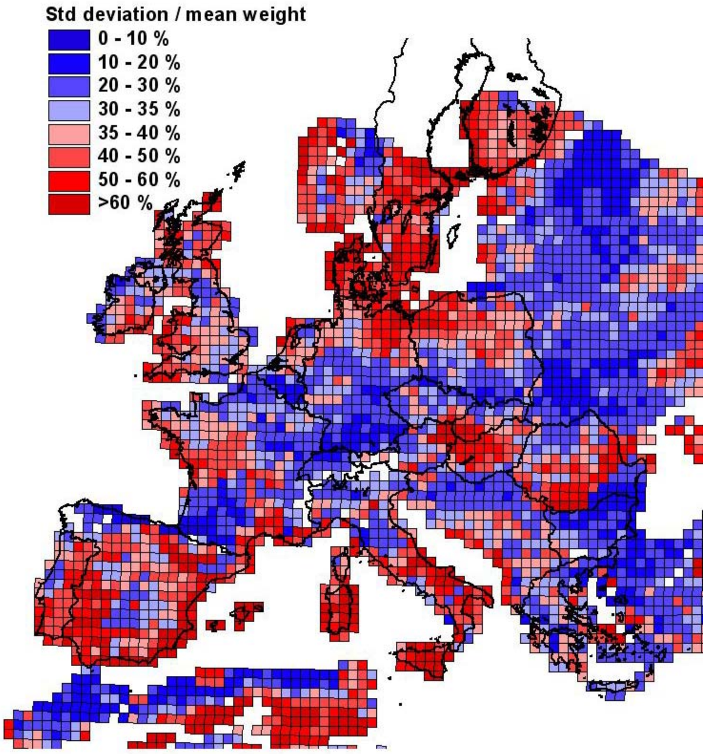
## 3.5. The use of agrometeorological models

A possible way of mapping the variability of potential yield can be provided by agrometeorological models, in particular by crop growth monitoring system (CGMS), used by the MARS Stat group for the yield (for further details see Section 3.3). The agrometeorological model does not provide direct estimates or forecasts directly for yield, because it does not integrate the technological development, which can be strongly variable both in time and space.

Among the parameters estimated by CGMS, the closest to the yield is the so-called 'water limited storage organs weight'. It is weaker than the yield data, because it is a model output instead of observed data, but has some advantages.

The resolution is better than the available yield data and it should make a difference, to some extent, between zones with better/worse soil inside a NUTS 2 region.

A similar map can be produced for smaller geographical units, the elementary monitoring units (EMU), i.e. the intersection of the 50 km grid cells with soil monitoring units (SMU).




*Source:* Authors' elaboration with MARS data.

**Figure 29. CGMS model for wheat: risk index on the water limited storage organ weight**

We can downscale the yield $y_{t,k}$ for region (or country) *k* using as co-variable $z_{t,e}$ the WLSOW (water limited storage organs weight) computed from CGMS in EMU *e*. We assume that the yield inside a region *k* varies proportionally to the WLSOW.

$$\hat{y}_{t,e} = B_{t,k}\, z_{t,e} .$$

The average of the downscaled yield in a region has to coincide with the statistical yield:

$$\frac{\sum_{e \subset k} \hat{y}_{t,e}\, a_{t,e}}{\sum_{e \subset k} a_{t,e}} = y_k .$$

Where $a_{t,e}$ is the area of the crop in EMU *e* for year *t*.

There are no suitable data for $a_{t,e}$. The best approximation we can get at the moment comes from the downscaled grid product of the CAPRI project (Kempen et al., 2005; Köble et al., 2005). This grid represents estimates of crop area for 1 km$^2$ cells combining the point survey LUCAS, Corine land cover and soil information. However, this product is only available for 2001. Therefore we should use the same weighting $a_e$ for any year.

The formula above leads to $B_{t,k} = \dfrac{y_{t,k} \sum_{e \subset k} a_e}{\sum_{e \subset k} z_{t,e}\, a_e}$ .

From the downscaled yield a new yield risk indicator can be computed that should be closer to reality because it takes more into account the local variability:

$$\hat{y}_t \geq \hat{y}_t^0 \qquad \hat{s}_t = 0$$
$$\hat{y}_t < \hat{y}_t^0 \qquad \hat{s}_t = \hat{y}_t - \hat{y}_t^0$$

## 3.6. Income variability

The farm accountancy data network (FADN) is the main source of data for the analysis of farmers' income. Let us first review the main characteristics of the FADN (sometimes known by its French name Réseau d'Information Comptable Agricole (RICA)).

### *3.6.1. The FADN*

The FADN was launched in 1965. It is an annual survey carried out by the Member States of the EU. The network collects every year accountancy data from a sample of the agricultural holdings in the EU. Derived from national surveys, the FADN provides harmonised micro-economic data, i.e. the bookkeeping principles are the same in all countries. Holdings are selected to take part in the survey on the basis of sampling plans established at the level of each region in the Union. The survey does not cover all the agricultural holdings in the Union but only those which due to their size could be considered commercial. The method applied aims to provide representative data along three dimensions: region, economic size and type of farming.

The aim of the network is to gather accountancy data from farms for the determination of incomes and business analysis of agricultural holdings. Currently, the annual sample covers approximately 80 000 holdings. They represent a population of about 5 000 000 farms in the 25 Member States, which cover approximately 90 % of the total utilised agricultural area (UAA) and account for more than 90 % of the total agricultural production of the Union. The information collected, for each sample farm, concerns approximately 1 000 variables and is transmitted by national liaison agencies. These variables described in a farm return refer to:

— physical and structural data, such as location, crop areas, livestock numbers and labour force; and

— economic and financial data, such as the value of production of the different crops, stocks, sales and purchases, production costs, assets, liabilities, production quotas and subsidies, including those connected with the application of CAP measures.

All individual data relating to individual farms received by the Commission are highly confidential. Only aggregated results for groups of farms are published at a level of aggregation from which information relating to individual farms cannot be discerned.

To ensure that this sample reflects the heterogeneity of farming, before sampling the farms the field of observation is stratified according to three criteria: region, economic size and type of farming. A certain number of farms are selected in each stratum and an individual weight is applied to each farm in the sample, this corresponding to the number of farms in the three-way stratification cell of the field of observations divided by the number of farms in the corresponding cell in the sample. This weighting system is used in the calculation of standard results and generally also for the estimations in specific studies.

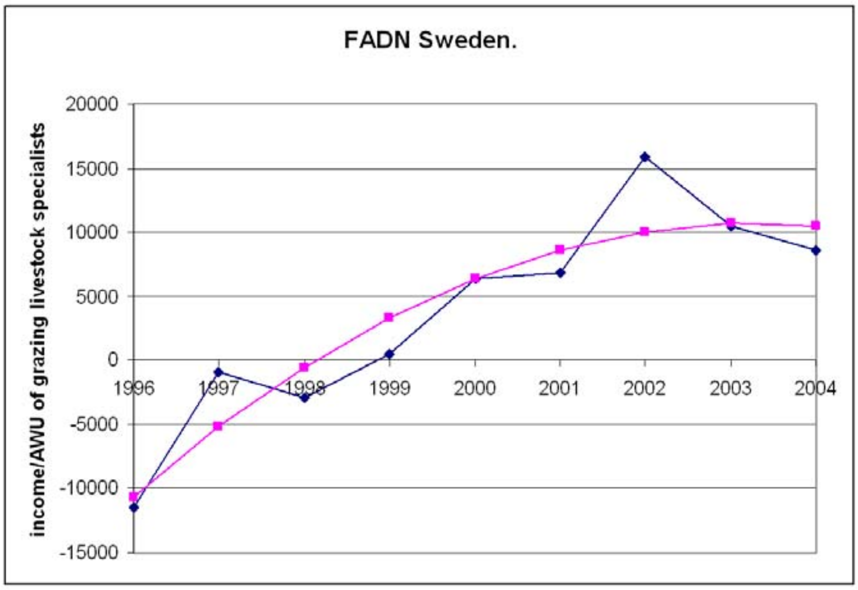
The standard results are a set of statistics, calculated from the farm returns, which are periodically produced and published by the Commission. They describe in considerable detail the economic situation of farmers by different groups. The FADN survey covers the entire range of agricultural activities on farms. It also collects data on non-agricultural farming activities (such as tourism and forestry).

The FADN provides in fact a unique source of data to analyse the income of farmers making the difference between different types of farms, size of the holding and regions. The data would a priori allow simulating to a certain extent what would have happened without insurance; in particular the costs of insurance premiums are collected for each farm of the sample. Unfortunately the compensation received by farmers in case of crisis is insufficiently detailed for a proper analysis. We shall come later to this point (Section 3.6.33.6.33.6.3).

### *3.6.2. Income reduction risk*

We have computed the income risks from FADN data as the average loss in percentage. These risks-percentages are shown in different maps. The data are shown for the so-called ‘FADN regions’ (in general NUTS 0, NUTS 1 or NUTS 2 regions, depending on the country). They have been calculated considering the time series of average income/annual work unit (AWU) for each major farm type or farm size category. A trend is estimated on the basis of this time series. Any income average below the trend by more than a deductible of 10 % is considered a significant loss.

The trend on the time series in each region has been estimated with a quadratic stepwise regression in the same way as has been done with yields in the previous section. So, we assumed that the trend is growing or constant and its slope is constant or decreasing.




*Source:* Authors' elaboration with FADN data.

**Figure 30. Example of abnormal effect in the adjustment of a quadratic trend**

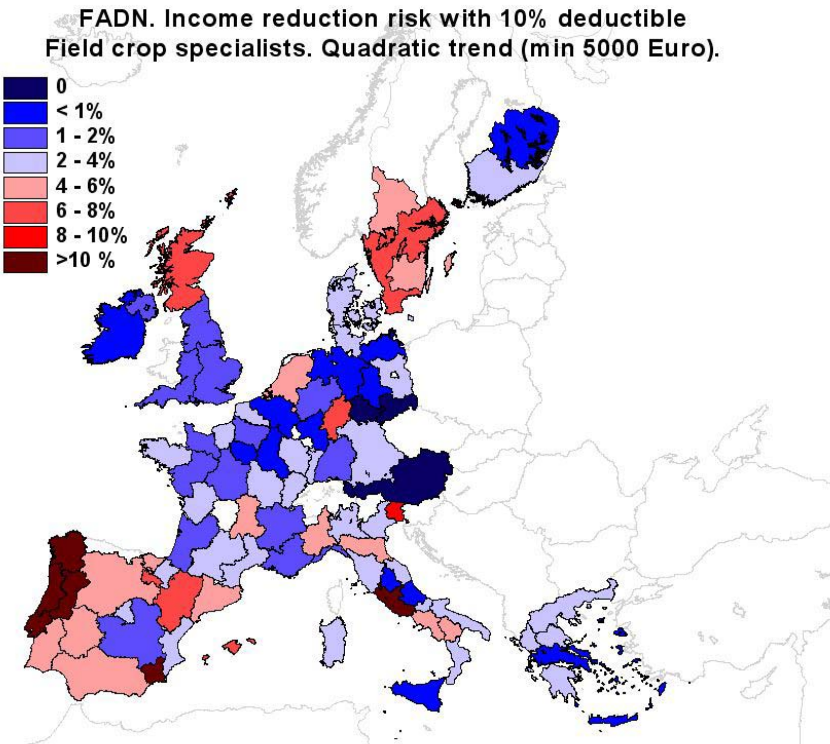
In Figure 30 we show an example of how a quadratic trend is adjusted to the income data. This example applies to grazing livestock farms in Sweden. The example is quite exceptional, because during the first years of the time series there were anomalous income values. These negative income/AWU values were due to the BSE crisis. This fact produces a very strong positive slope on the trend. However, given the characteristics of our quadratic trend, which is assumed to be growing or constant with a slope constant or decreasing, the average yield which issues from this trend is not strongly affected by this anomaly.

Next we show two sets of maps. The first set (Figure 31 to Figure 39) shows the income risk per farm specialisation and the second set (Figure 40 to Figure 45) shows the income risk per farm size. The maps in the first set show the variability of income for different types of farms:

— field crops (general cropping),
— horticulture (vegetables and flowers),
— wine specialists,
— other permanent crops (mainly fruit trees),
— mixed crops,
— milk production,
— grazing livestock (equidae, bovine animals, sheep, goats),
— granivores (pigs, poultry).

Types of farming are defined in terms of the relative importance of the different enterprises on the farm. Relative importance is itself measured quantitatively as a proportion of each enterprise's standard gross margin (SGM) ([18]) to the farms' total SGM.

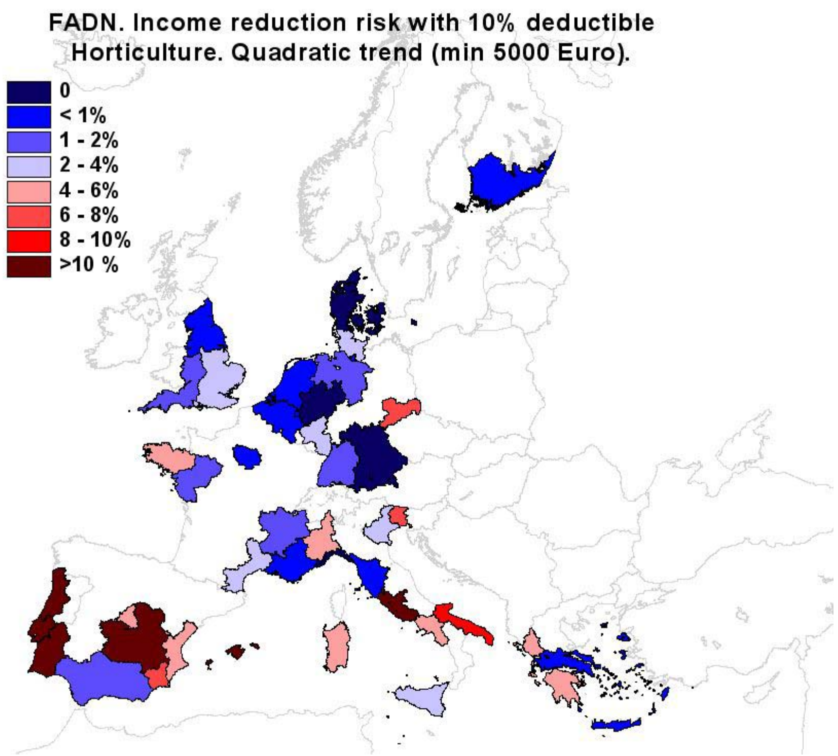
We can see from these maps that there is not a clear correlation with the yield maps (Figure 24 to Figure 28). For example, in Figure 31 we can find the higher risk levels in Galicia (north-west of Spain), in northern and central Portugal, the south-east of Spain and Lazio (the Rome region in Italy). And this is followed by Aragon in the north-east of Spain, Scotland and the south of Sweden. However, if we look at wheat and barley yields risks (Figure 24 and Figure 25), we only find similar risk levels in Murcia. Rapeseed yields in Figure 26 can be a little bit more correlated, given that Portugal and the Rome region also show high risks. However, the same risk levels can be found in many other Italian regions, and in Greece, etc.




*Source:* Authors' elaboration with FADN data.

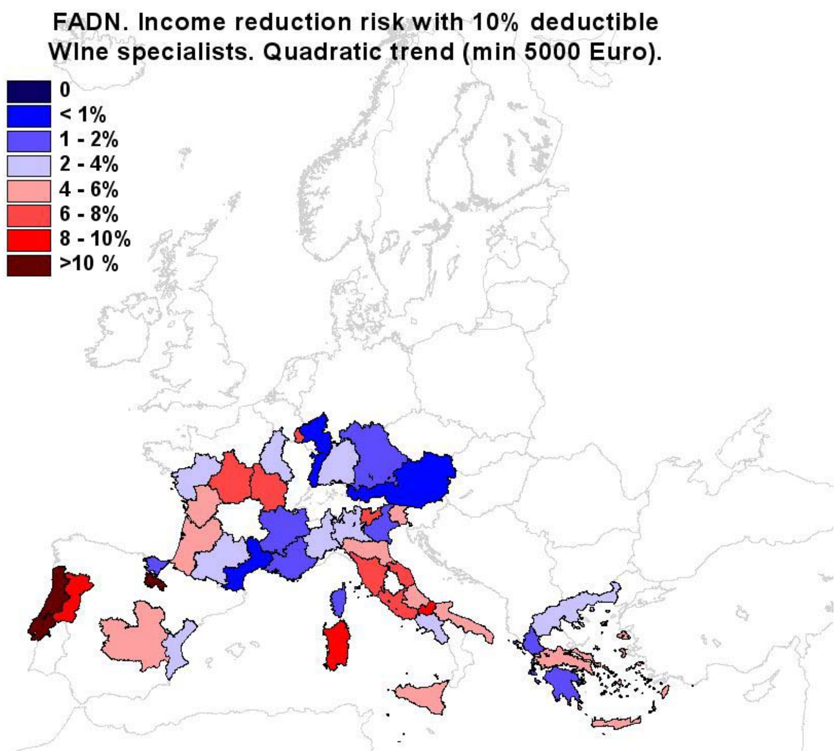
**Figure 31. Risk index for income reduction: field crop specialists**

([18]) See the glossary.



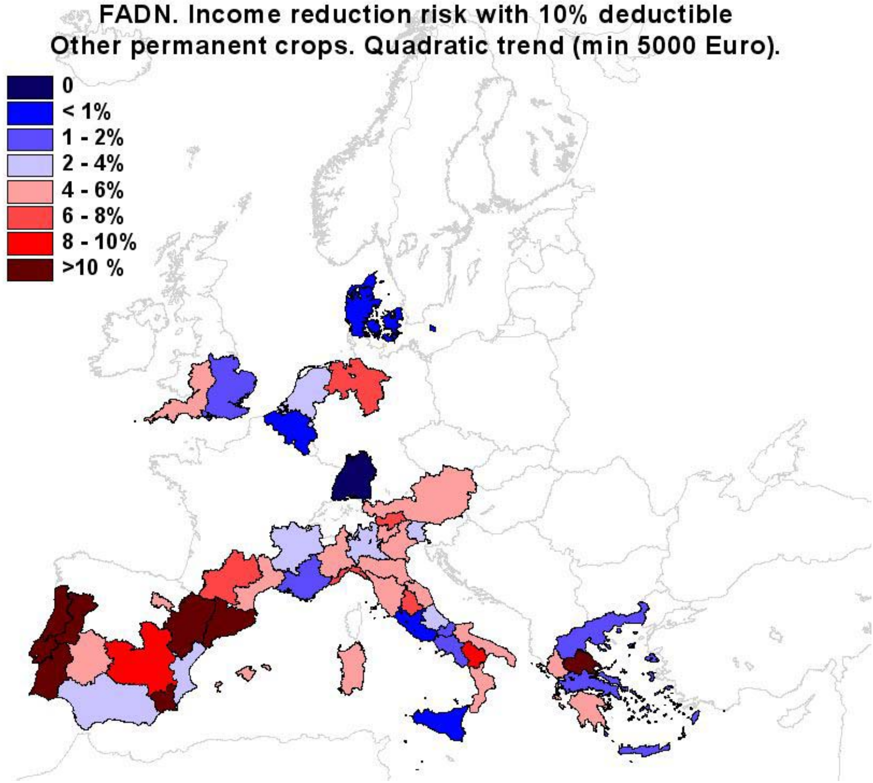

*Source:* Authors' elaboration with FADN data.

**Figure 32. Risk index for income reduction: horticulture specialists**



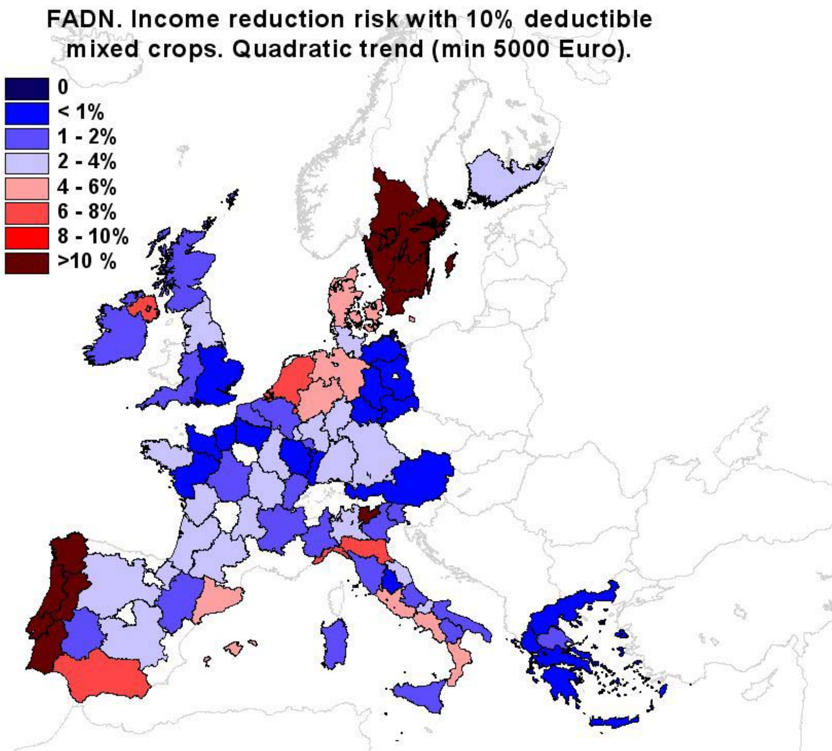

*Source:* Authors' elaboration with FADN data.

**Figure 33. Risk index for income reduction: wine specialists**




*Source:* Authors' elaboration with FADN data.

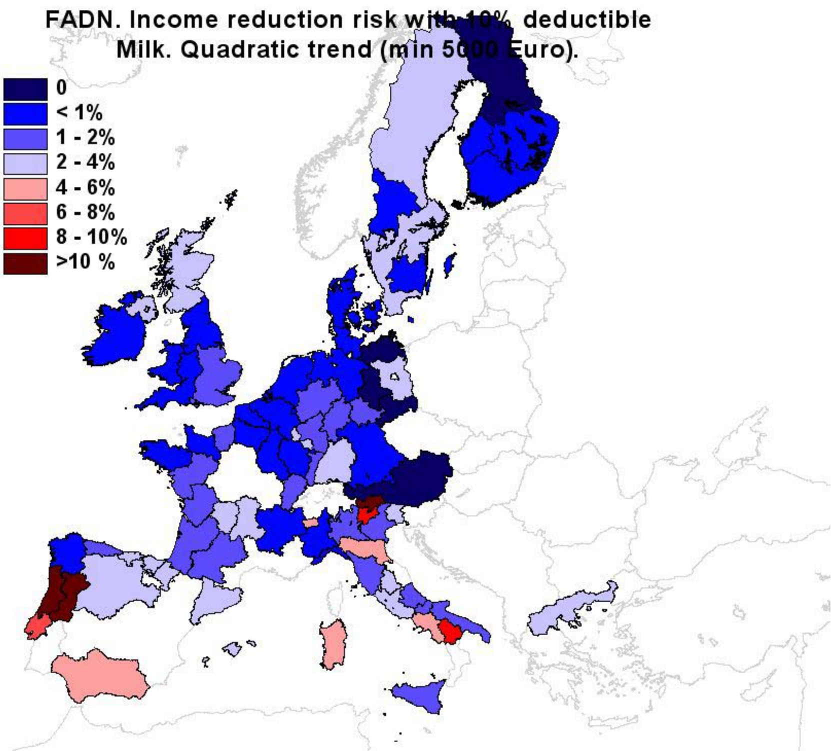
**Figure 34. Risk index for income reduction: other permanent crops**




*Source:* Authors' elaboration with FADN data.

**Figure 35. Risk index for income reduction: mixed farming**

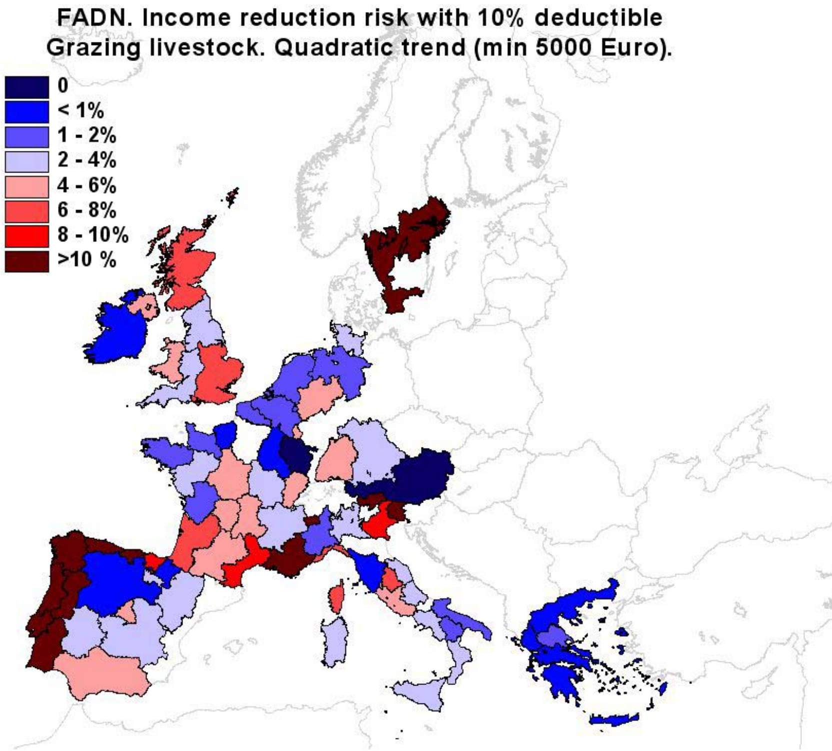
Figure 35 shows the risk percentage for mixed crop farms. A holding is deemed not to be specialising when the ratio of the main crop SGM on total SGM is below a threshold 2/3. We find an absence of data in some regions, which probably means that in those regions farms are highly specialised. These areas are in the north of Spain (area mainly dedicated to milk and livestock production), the north of Finland and Sweden, and in some regions of France.




*Source:* Authors' elaboration with FADN data.

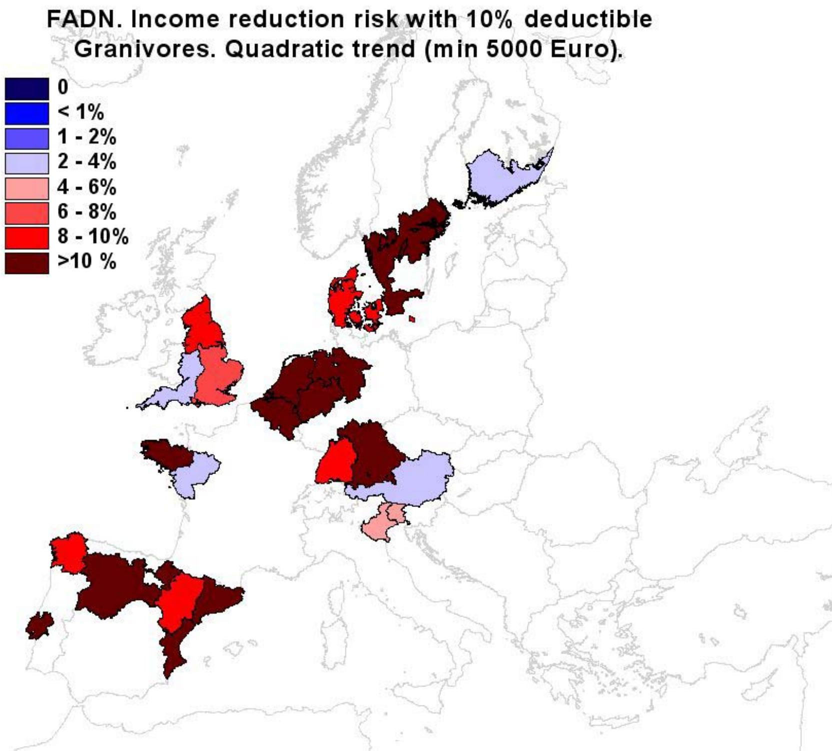
**Figure 36. Risk index for income reduction: milk specialists**

It is interesting to see that there are not very big differences among crop and livestock in general, the most risky areas being found in the Mediterranean countries and in the Scandinavian countries (see milk specialists and grazing livestock income risks in Figure 36 and Figure 37). However, as the granivores farming system is *hors-sol* and so much more independent from climate, we can observe in Figure 38 that risks are more homogeneously spread all around Europe. Also we can see that the level of risks are higher than for other speciality farms, at least for the data available, given that high risk levels of more than 10 % average or expected loss are found very often and the lowest risk areas are not below 2 % average losses.




*Source:* Authors' elaboration with FADN data.

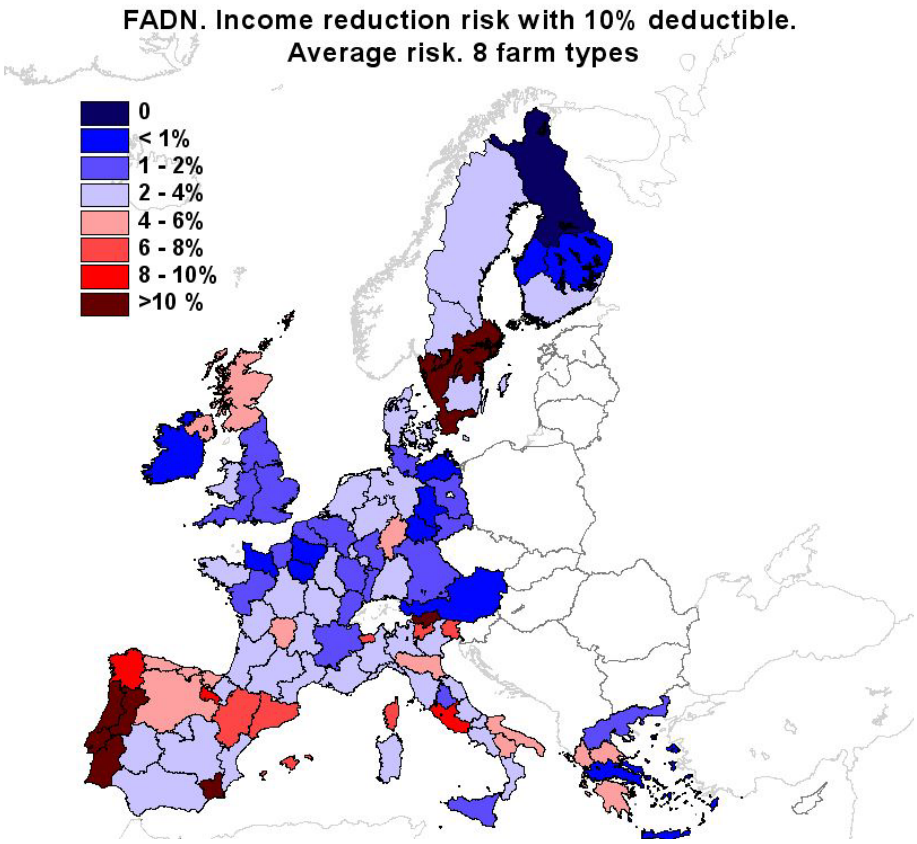
**Figure 37. Risk index for income reduction: grazing livestock**




*Source:* Authors' elaboration with FADN data

**Figure 38. Risk index for income reduction: granivore specialists**

Lastly, Figure 39 shows the weighted average of all the risks indexes per farm type. We can see that both maps present similarities, as if the mixed farms combined in themselves the main productions of the region, and so the resulting risk levels would assimilate the average risk levels of the region.



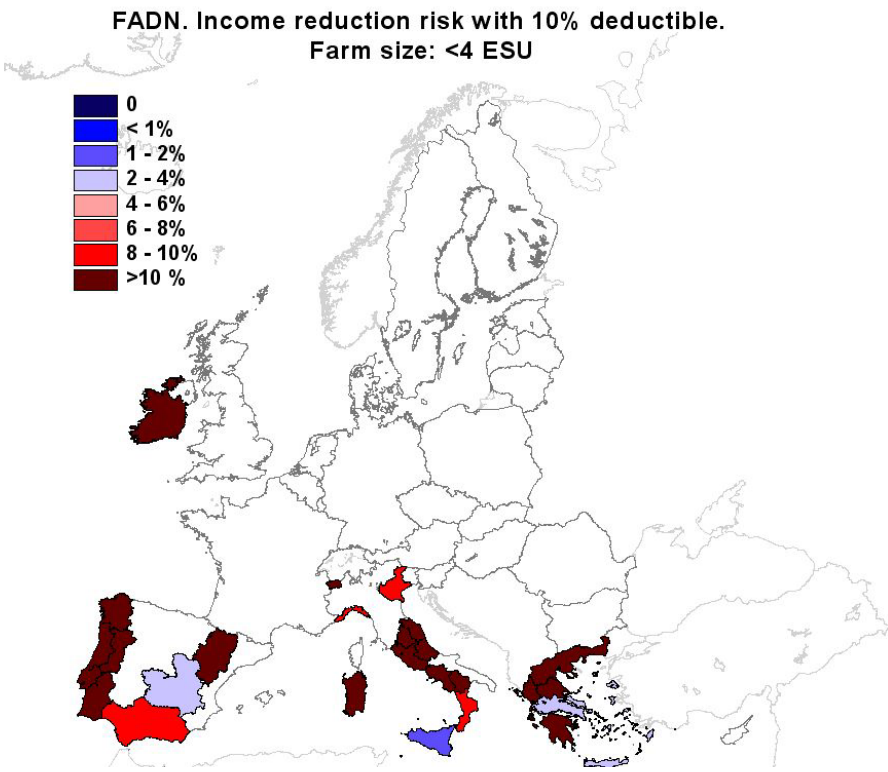

*Source:* Authors' elaboration with FADN data.

**Figure 39. Average risk index for income reduction per farm type**

The next set of maps (Figure 40 to Figure 45) shows the income risk per farm size. The economic size of farms is expressed in terms of European size units (ESU) ([19]).

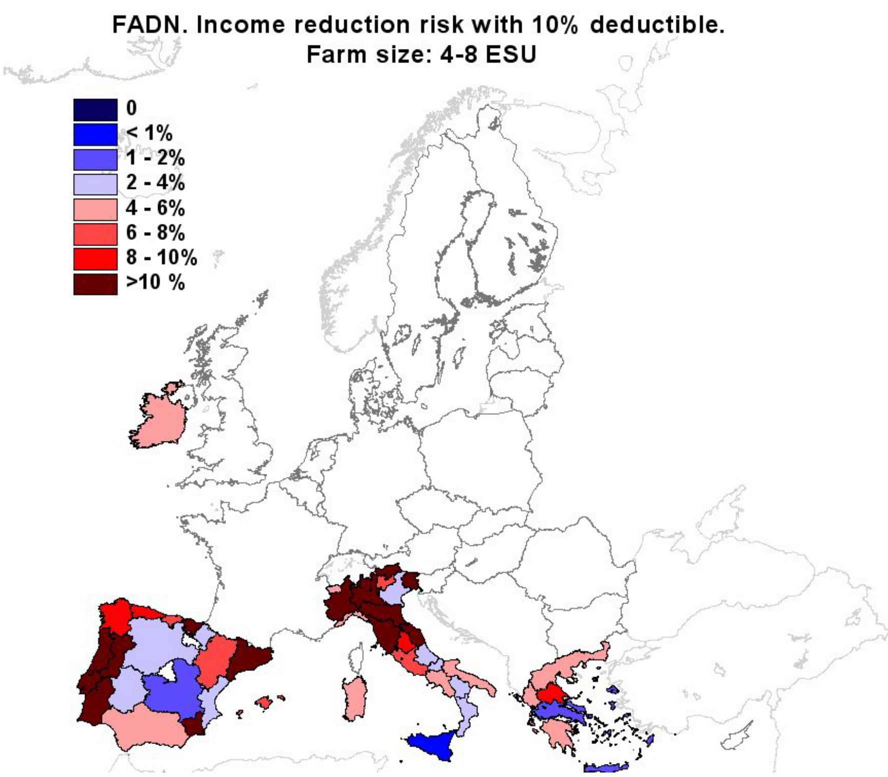
We can see in Figure 40 that very small farms (below 4 ESU) are not very widespread in Europe. They are mainly concentrated in the Mediterranean countries, like Portugal, Spain, Italy and Greece, and in Ireland. We can also see that they have an associated high level of income risk. Small farms (4–8 ESU), in Figure 41, show a similar geographic distribution, but the levels of risk are slightly lower.

([19]) See the glossary



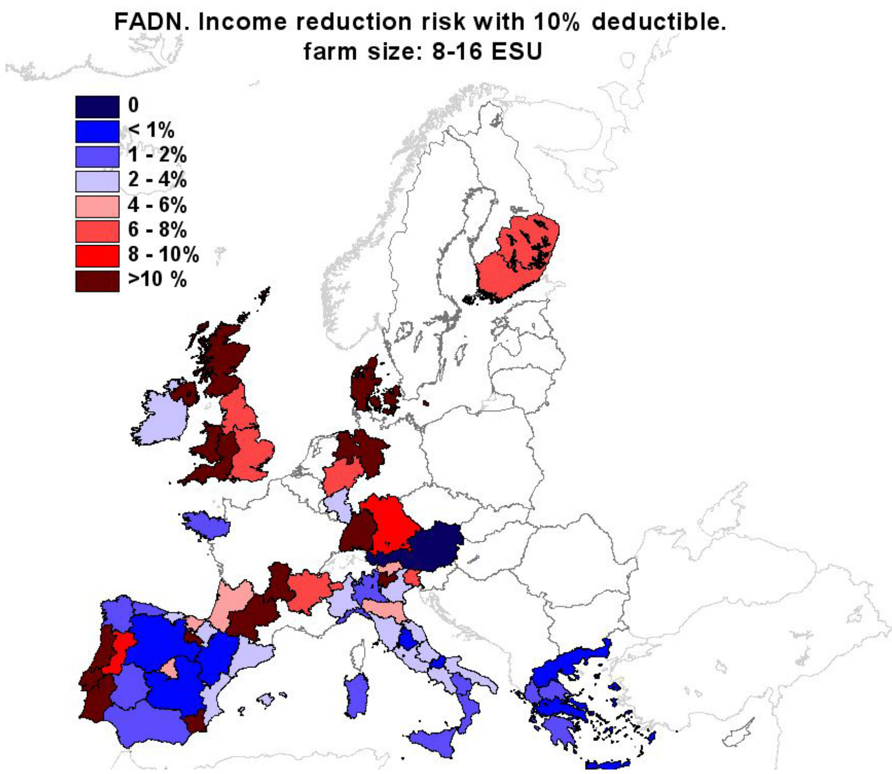

*Source:* Authors' elaboration with FADN data.

**Figure 40. Risk index for income reduction: very small farms (< 4 ESU)**




*Source:* Authors' elaboration with FADN data.

**Figure 41. Risk index for income reduction: small farms (4–8 ESU)**

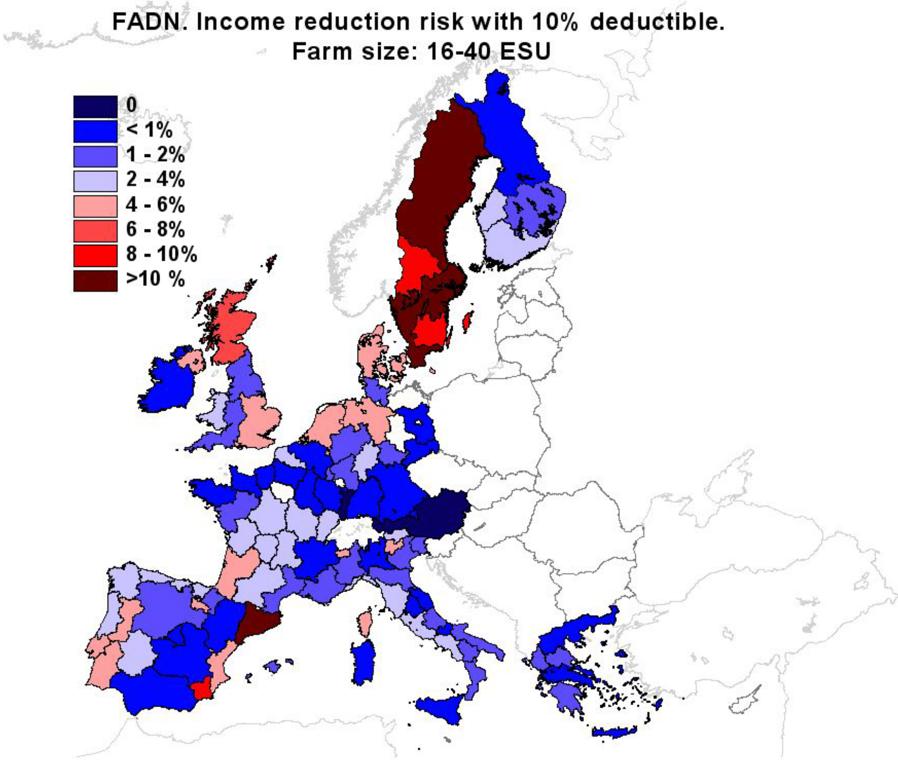



*Source:* Authors' elaboration with FADN data.

**Figure 42. Risk index for income reduction: small to medium farms (8–16 ESU)**

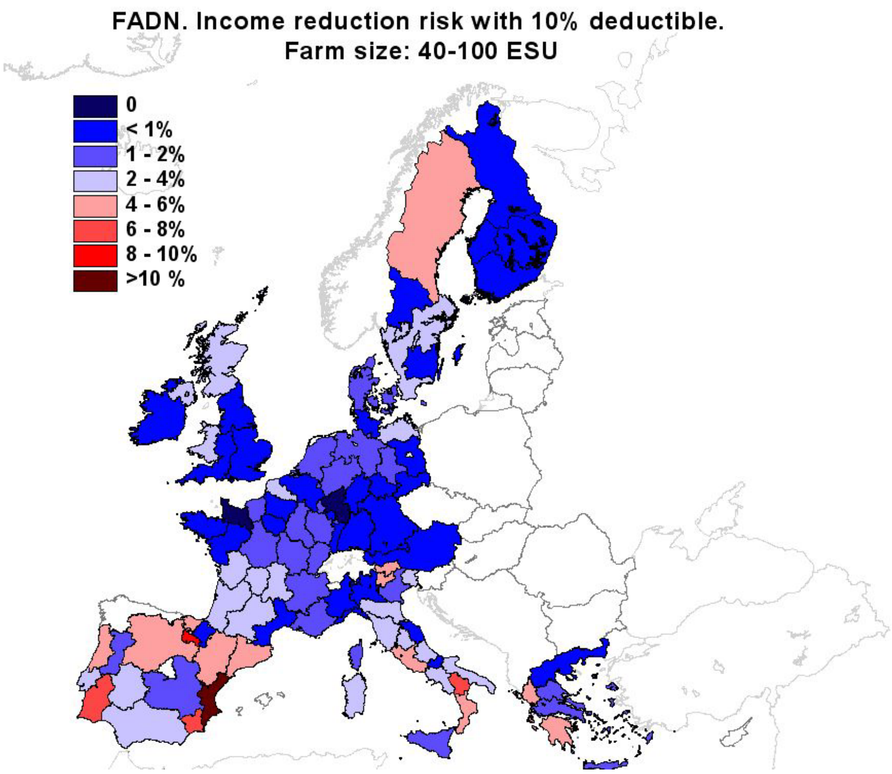
Small to medium farms (8–16 ESU) are more widespread throughout Europe, although they still do not appear in some regions of France or Germany, in the Benelux, Sweden and some regions of Finland (Figure 42). Instead, medium to large farms (16–40 ESU) are common in all European countries (Figure 43).

We can observe in Figure 44 that risks levels decrease as farms grow bigger. So, for large farms (40–100 ESU), we find a high frequency of average losses around 1 % (blue colours) while average losses around 10 % are only found in some regions in Spain. It is curious to see in Figure 45 one Spanish region with very large farms and also important risks. This probably corresponds to the existence of large extensions of land under a single owner whose income is not dependent on agriculture.



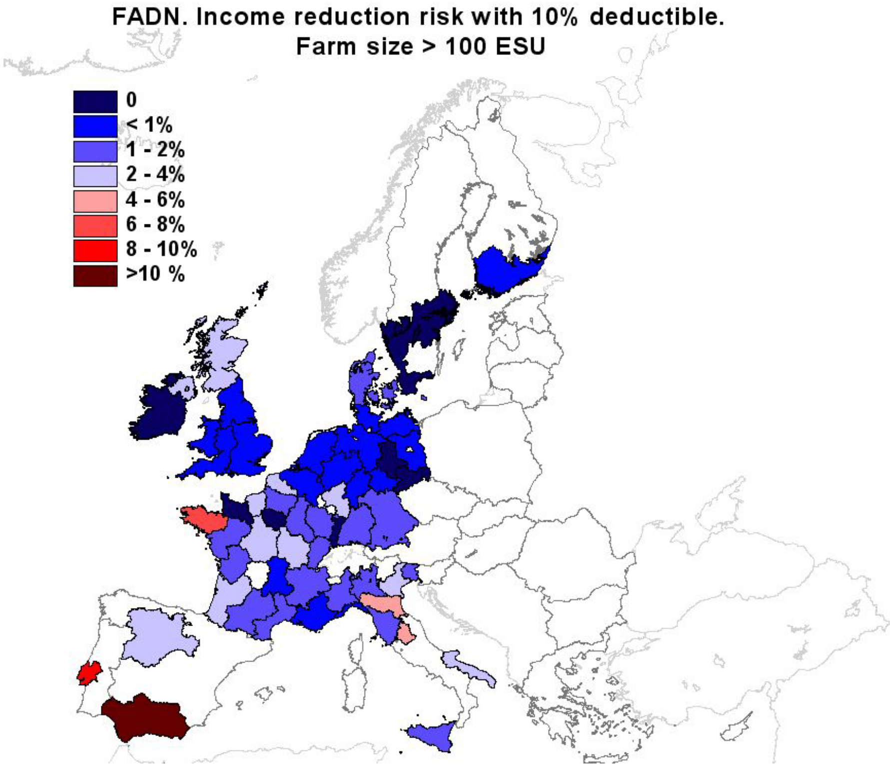

*Source:* Authors' elaboration with FADN data.

**Figure 43. Risk index for income reduction: medium to large farms (16–40 ESU)**




*Source:* Authors' elaboration with FADN data.

**Figure 44. Risk index for income reduction: large farms (40–100 ESU)**




*Source:* Authors' elaboration with FADN data..

**Figure 45. Risk index for income reduction: very large farms (> 100 ESU)**

### *3.6.3. The impact of agricultural insurance on the income of farmers*

The fact sheets collected gave us an approximate idea of the compensation that farmers get from insurance companies for damages due to unfavourable meteorological conditions. The data for different countries do not correspond to the same period of time, and there is a large variation of compensation from one year to another, but we can say that the average compensation that farmers obtain from insurers is around EUR 1 000 million/year. These payments mitigate the situations of serious farmers' income reduction. In order to know which part of the problem these payments reduce, we have to quantify in some way the income reduction risk.

Quantification of the income reduction risk necessarily involves some subjectivity. We have chosen an indicator computed on an approach that is consistent with the maps of income variability risk in Section 3.6.2, i.e. based on the time series of average income/AWU for each major farm type (or farm size category), considering a significant loss the one corresponding to an income below the trend by more than a 10 % deductible. Table 1, Table 2 and Table 3 report the total loss per farm size category, per farm type and per country with this definition. The total reduction is around EUR 3 000 to EUR 3 500 million/year and would be around EUR 1 000 million/year higher without agricultural insurances. This means that agricultural insurances mitigate significant farm reduction income by around 22 % to 25 %.

This approach has several limitations and needs a more in-depth analysis. The main limitation is that considering the behaviour of the 'average farm' for each class and region smoothes out a lot of the irregularities in farm income. This leads to an underestimation of the reduction risk that is in part compensated by choosing a low deductible level (10 %).

**Table 1. 'Significant' farm income reduction per year by farm size class**

| Farm size | Income reduction risk (million EUR) |
|---|---|
| 0–4 ESU | 1 201 |
| 4–8 ESU | 487 |
| 8–16 ESU | 344 |
| 16–40 ESU | 359 |
| 40–100 ESU | 376 |
| > 100 ESU | 423 |

*Source:* Authors' elaboration with FADN data.

**Table 2. 'Significant' farm income reduction per year by farm type**

| Farm type | Income reduction (million EUR) |
|---|---|
| Field crops | 1 109 |
| Horticulture | 193 |
| Wine | 270 |
| Other permanent crops | 526 |
| Milk | 196 |
| Grazing livestock | 310 |
| Granivores | 311 |
| Mixed | 579 |

*Source:* Authors' elaboration with FADN data.

**Table 3. 'Significant' farm income reduction per year by country**

| Country | Income reduction risk (million EUR) |
|---|---|
| Belgium | 49 |
| Denmark | 84 |
| Germany | 240 |
| Ireland | 11 |
| Greece | 148 |
| Spain | 577 |
| France | 396 |
| Italy | 703 |
| Luxembourg | 2 |
| Netherlands | 177 |
| Austria | 11 |
| Portugal | 864 |
| Finland | 16 |
| Sweden | 45 |
| United Kingdom | 172 |

*Source:* Authors' elaboration with FADN data.

# 4. Policies for disaster aid and for risk management in agriculture

## 4.1. Chapter synthesis

In this chapter the CAP origin is introduced and its history explained. Moreover, the chapter presents the definitions of crisis and disasters adopted by each Member State within the EU policy framework. The types of public aid that are allowed within WTO agreements, the EU legislation and the Member States' individual policies are discussed. Lastly, we present the state of the art of policy discussion in Europe on risk management in agriculture and, for comparison purposes, the current US agricultural risk management policy.

## 4.2. Policy framework: the EU agricultural policy

### *4.2.1. CAP origin*

The creation of a common agricultural policy was proposed in 1960 by the European Commission (see http://en.wikipedia.org/wiki/European_Commission). It followed the signing of the Treaty of Rome in 1957, which established the European Economic Community. The six Member States ([20]) strongly intervened individually in their agricultural sectors, in particular with regard to what was produced, maintaining prices for goods and how farming was organised.

By 1962, three major principles had been established to guide the CAP: market unity, community preference and financial solidarity.

The initial objectives were set out in the Article 39 of the Treaty of Rome:

— to increase productivity by promoting technical progress and ensuring the optimum use of production factors, in particular labour;

— to ensure a fair quality of life for the agricultural community;

— to stabilise markets;

— to guarantee availability of supplies;

— to provide consumers with food at reasonable prices.

The CAP recognised the need to take into account the social structure of agriculture and the structural and natural disparities between the various agricultural regions.

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([20]) Belgium, Germany, France, Italy, Luxembourg and the Netherlands.

### 4.2.2. How the CAP works

The CAP is an integrated system of measures which works by maintaining commodity price levels within the EU and which supports production, through subsidies. There are three main mechanisms.

— Import tariffs are applied to specific goods imported into the EU. These are set at a level to raise the world market price up to the EU target price. The target price is chosen as the maximum desirable price for those goods within the EU.
— An internal intervention price is set. If the internal market price falls below the intervention level then the EU will buy up goods to raise the price to the intervention level. The intervention price is set lower than the target price. The internal market price can only vary in the range between the intervention price and target price.
— Subsidies are paid to farmers growing particular crops. This was intended to encourage farmers to choose to grow those subsidised crops. The current reform of the subsidy system phased out specific crop subsidies in favour of flat-rate subsidies based on the area of land cultivated and for adopting environmentally beneficial farming methods. This strategy reduces, but does not eliminate, the economic incentive to overproduce.

### 4.2.3. Reforming the CAP

**Pre-1992**

In the 1960s, the Mansholt Plan was an idea that aimed to reduce the number of small farmers and consolidate farming into a larger, more efficient industry. Farming's special status, and above all the extremely powerful farming lobbies across the continent, saw the plan disappear from the Union's objectives.

Bruised by the failure of Mansholt, reforms were mostly absent throughout the 1970s, not least due to the various financial crises that rocked the Union during that decade, such as the oil supply problems.

The 1980s was the decade that saw the first key reforms of the CAP, foreshadowing further development from 1992 onwards. The influence of the farming community declined and, with the decline, reforms were encouraged. Environmentalists garnered great support in controlling the CAP, but it was a financial matter that ultimately offset the balance of the situation: due to huge overproduction, the CAP was becoming expensive and wasteful. These factors combined saw the introduction of a quota on dairy production in 1984 and, finally, in 1988 a ceiling on EU expenditure to farmers. However, the basis of the CAP remained in place, and the CAP was not drastically reformed until 1992.

**1992 — the MacSharry reforms**

In 1992, the MacSharry reform was conceived to limit rising production. At the same time another aim was to adjust to the trend toward a more free agricultural market.

The reform reduced levels of support for cereals and for beef. It also created ‘set aside’ ([21]) payments to withdraw land from production and payments to limit stocking levels, and introduced measures to encourage retirement and forestation.

One of the main motors behind the 1992 reform was the need to pacify the EU’s external trade partners at the Uruguay Round of the GATT trade talks with regard to agricultural subsidies.

The 1992 reform signalled a very important change. Several measures were introduced for the reduction of prices (making them more competitive on the European and world markets); for the farmers, compensation in case of big losses and environmental protection measures were also introduced.

In general, the MacSharry reform is considered successful and its results have had a positive impact on European agriculture.

**Agenda 2000**

During July 1997, the Commission proposed a reform of the agricultural sector within the framework of Agenda 2000, the negotiations ended during the European Council in March 1999 in Berlin.

Agenda 2000 represents the most radical and innovative common agricultural policy (CAP) reform since its origin. It brought the process started in 1992 to a solid base, giving a strong structure to the future development of the European agriculture competences: economics, environment and rural development.

**2003 — Fischler reform: a long-term perspective for sustainable agriculture**

‘On 26 June 2003, EU farm ministers adopted a fundamental reform of the common agricultural policy (CAP). The reform will completely change the way the EU supports its farm sector. The new CAP will be geared towards consumers and taxpayers, while giving EU farmers the freedom to produce what the market wants. To avoid abandonment of production, Member States may choose to maintain a limited link between subsidy and production under well defined conditions and within clear limits. These new “single farm payments” will be linked to the respect of environmental, food safety and animal welfare standards. Severing the link between subsidies and production will make EU farmers more competitive and market orientated, while providing the necessary income stability. [. . .] The different elements of the reform will enter into force in 2004 and 2005. The single farm payment will enter into force in

([21]) Set-aside is a term for land that farmers are not allowed to use for any agricultural purpose.

2005. If a Member State needs a transitional period due to its specific agricultural conditions, it may apply the single farm payment from 2007 at the latest.' ([22])

The reform of June 2003 and the publication of Regulations (EC) No 1782/2003 and (EC) No 1783/2003 ([23]) brought an end to the complex process of market reorganisation of European Community support for agriculture and rural development that began in 1992. The Fischler reform signalled a decisive step towards a more selective support, aimed at the conservation and enhancement of the environment, explicitly linked to beneficiaries' mode of conduct. One relevant aspect of the reform is that it offers Member States some options for putting into action the new reform instruments. In substance, it grants countries and local institutions an ample role, also in the area of market policies, and abandons the idea of a mechanistic, 'single' policy for the entire EU.

In April 2004, regulations were published containing methods of application ([24]).

Basically the key elements of the 2003 CAP reform are those listed below.

— 'A single farm payment for EU farmers, independent from production; limited coupled elements may be maintained to avoid abandonment of production,
— this payment will be linked to the respect of environmental, food safety, animal and plant health and animal welfare standards, as well as the requirement to keep all farmland in good agricultural and environmental condition ("cross-compliance"),
— a strengthened rural development policy with more EU money, new measures to promote the environment, quality and animal welfare and to help farmers to meet EU production standards starting in 2005,
— a reduction in direct payments ("modulation") for bigger farms to finance the new rural development policy.' ([25])

## 4.3. Definitions of 'disaster' and 'crisis'

In the policies for disaster aids and risk management, it is essential to have clear definitions of risks, disaster, calamity, crisis, etc. In this section, we look at the definitions we can find in the literature and, in the following sections, to the definitions applied in the context of public aid given in international, European and national spheres.

([22]) http://ec.europa.eu/agriculture/capreform/index_en.htm

([23]) Establishes the legal framework for the new decoupled scheme: the single payment scheme (SPS).

([24]) Regulations (EC) No 795/2004, (EC) No 796/2004 and (EC) No 817/2004.

([25]) http://ec.europa.eu/agriculture/capreform/index_en.htm

### 4.3.1. *Definitions of disaster, natural disasters, disasters in agriculture, calamity and crisis*

**Disaster**

Nowadays it is widely accepted that a disaster is multifaceted and open to a range of different interpretations. Disaster synonyms used by practitioners and experts have included ‘calamity’ and ‘catastrophe’; similar words are ‘emergency’ and ‘crisis’. Disasters are abrupt shocks to the socioeconomic and environmental system, involving loss of life and property.

The definition that is provided by the United Nations International Strategy for Disaster Reduction (UN/ISDR) ([26]) is one of the most appropriate definitions.

‘A disaster is a sudden, calamitous event that causes serious disruption of the functioning of a community or a society causing widespread human, material, economic and/or environmental losses which exceed the ability of the affected community or society to cope using its own level of resources’ (UN/ISDR, 2004). This definition is also used by the European Commission Humanitarian Aid Department (ECHO).

Disaster is a ‘situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance’ (definition considered in EM-DAT, the international emergency disasters database). Other definitions are: ‘An unforeseen and often sudden event that causes great damage, destruction and human suffering. Though often caused by nature, disasters can have human origins’; ‘the combination of hazards, vulnerability and inability to reduce the potential negative consequences of risk results in disaster’; etc.

For a disaster to be entered into the database of the UN/ISDR, at least one of the following criteria must be met:

— a report of 10 or more people killed,

— a report of 100 people affected,

— a declaration of a state of emergency by the relevant government,

— a request by the national government for international assistance.

([26]) The UN/ISDR aims at building disaster-resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development, with the goal of reducing human, social, economic and environmental losses due to natural hazards and related technological and environmental disasters. The UN/ISDR is the focal point in the UN system to promote links and synergies between, and the coordination of, disaster reduction activities in the socioeconomic, humanitarian and development fields, as well as to support policy integration. It serves as an international information clearinghouse on disaster reduction, developing awareness campaigns and producing articles, journals and other publications and promotional materials related to disaster reduction. The UN/ISDR headquarters is based at the Palais des Nations in Geneva.

Even though there is no common worldwide definition of 'disaster', there are some characteristics which are common to most definitions.

A disaster is generally considered as:

— being sudden, abrupt or unpredictable,

— causing human, material, economic or environmental losses,

— exceeding the ability of the affected community to cope with it.

The economic impact of a disaster usually consists of direct (e.g. damage to infrastructure, crops, housing) and indirect (e.g. loss of revenues, unemployment, market destabilisation) consequences on the local economy.

**Natural disasters**

Following the definitions of natural disaster by the UN Office for the Coordination of Humanitarian Affairs, natural disasters can be divided into three specific groups: hydro- meteorological disasters, geophysical disasters and biological disasters.

Hydro-meteorological disasters are natural processes or phenomena of an atmospheric, hydrological or oceanographic nature that may cause loss of life or injury, property damage, social and economic disruption or environmental degradation. These include floods and wave surges, storms, landslides, avalanches, and droughts and related disasters (extreme temperatures and forest/scrub fires).

Geophysical disasters are natural earth processes or phenomena that may cause loss of life or injury, property damage, social and economic disruption or environmental degradation. These include earthquakes, tsunamis and volcanic eruptions.

Biological disasters are processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances, which may cause loss of life or injury, property damage, social and economic disruption or environmental degradation. These include epidemics and insect infestations.

However, the European Commission includes in natural disasters only hydro-meteorological disasters and geophysical disasters, considering biological disasters (diseases, pests, contamination in the food chain as by dioxins) a separate group (EC, 2005b).

**Disasters in agriculture**

The disasters typical of the agricultural sector are mostly natural disasters. They can be classified in the following groups of risks:

— climatic events: hail, flood, drought, storms, etc.;

— damage caused by pests: snails, insects, etc.;

— diseases/epizootics: foot-and-mouth disease, swine fever, etc.

This differentiation of hydro-meteorological disasters or climatic events, and biological disasters, either caused by pests or by diseases, is also apparent in the definitions of the European agricultural legislation (see the following sections).

**Calamity**

Calamity also has several definitions and it is often considered equivalent to catastrophe, disaster or crisis. French legislation refers to calamity as a synonym of agricultural disaster. We adopt the French position in this report.

**Crisis**

A crisis may occur on a personal or societal level. It may be a traumatic or stressful change in a person's life, or an unstable and dangerous social situation, in political, social, economic or military affairs, or a large-scale environmental event, especially one involving an impending abrupt change. More loosely, it is a term meaning 'a testing time' or 'emergency event' ([27]). While crisis can affect at a personal or societal level, a disaster is the impact of a natural or man-made hazard that negatively affects society or the environment ([28]).

According to EC (2005b), while risk may be associated with either a positive or a negative outcome, the assumption is always made that a crisis has significant negative consequences. In the EC (2005b) report, a crisis is understood to be an unforeseen situation that endangers the viability of agricultural holdings, either at a localised level, across a whole sector of production or at a wider geographical level. In agriculture, a crisis may be caused by: natural disasters, diseases and pests affecting animal or plant health or contamination in the food chain; economic factors having short-term but significant effects on farm income; or market shocks with high intensity negative consequences.

### *4.3.2. Further discussion on the above definitions*

As previously mentioned, all the definitions of disaster are quite relative. On one hand, the UN/ISDR criteria either cannot be applied to agricultural losses or are very relative, depending on the subjective appreciation of each government. At the same time, what the difference is between the terms related to 'disaster', 'calamity', 'catastrophe', 'emergency' and 'crisis' is widely discussed. Lastly, the definitions do not usually differentiate the big disasters and crises from minor natural events causing small losses.

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([27]) http://en.wikipedia.org/wiki/Crisis (2007).

([28]) http://en.wikipedia.org/wiki/Crisis#Disaster (2007).

From this reflection we can conclude that it is not easy to reach a definition of disaster. Nevertheless, it can be easier and it seems to be necessary to define when the losses due to an event can be eligible for assistance and aids. So, this is what is going to be reviewed and discussed in the following sections. First, we address the conditions under which forms of aid are allowed by the international trade agreements (WTO). Secondly, we look at the conditions stated and the aids and subsidies allowed by the European Union legislation. Thirdly, we present the European States' definitions of those disasters eligible for ad hoc aids and for insurance subsidies.

Disasters and risks are managed in a different way in Europe. While risks are usually managed through risk management tools (production techniques, diversification, contracts, hedging, mutual stabilisation funds, insurance, etc.) described in Section 2.3, in the event of crisis, public solidarity at regional, national or EU level is broadly expected and accepted. However, as will be seen below, natural disasters and catastrophic events (in the sense of hydro-meteorological and geophysical disasters) and sanitary crises (biological disasters) are managed in a different way (EC, 2005b).

As will be seen in Section 4.5 and Section 4.6, each country follows its own legislation, its own definition of disaster and crisis.

## 4.4. Disasters and crises policies and aids from a WTO perspective

### *4.4.1. The EU and the WTO: committed to multilateral trade rules*

The growing trade between all countries, whether developed or less must be conducted under multilateral trade rules for the benefit of all countries, in particular developing countries. This is why the EU is a strong supporter of the WTO and has always played an active role in the WTO discussions and negotiations on trade in agriculture ([29]).

The EU is committed to the Doha Development Agenda (DDA) ([30]) negotiations, which aim at further liberalising trade while enhancing development. As regards agriculture, the agreement reached in August 2004 paved the way for further negotiations that could deliver a considerably bigger farm trade liberalisation than the previous trade negotiations (the Uruguay Round). The agreement locks in the EU's CAP reform. It should bring a substantial cut in trade-distorting agricultural support, the elimination of trade-distorting export competition practices and contribute to a

([29]) http://trade.ec.europa.eu/doclib/docs/2006/may/tradoc_113528.pdf

([30]) Launched in November 2001 in Doha, Qatar.

significant opening of agricultural markets. The EU has made major efforts to redirect its farm policy towards more transparent and non trade-distorting instruments — principally by divorcing most of the payments to farmers from levels of production.

### *4.4.2. The WTO agreements*

'The Final Act embodying the results of the Uruguay Round of multilateral trade negotiations', signed by ministers in Marrakesh on 15 April 1994 contains legal texts which spell out the results of the negotiations since the round was launched in Punta del Este, Uruguay, in September 1986. In addition to the texts of the agreements, the Final Act also contains texts of ministerial decisions and declarations which further clarify certain provisions of some of the agreements.

In WTO terminology, subsidies in general are identified by 'boxes' which are given the colours of traffic lights: green (permitted), amber (slow down — i.e. to be reduced), red (forbidden). In agriculture, things are, as usual, more complicated. The Agreement on Agriculture has no red box. All domestic support measures considered to distort production and trade (with some exceptions) fall into the amber box, which is defined in Article 6 of the Agreement on Agriculture as all domestic supports except those in the blue and green boxes. These include measures to support prices, or subsidies directly related to production quantities. These supports are subject to limits: *de minimis* minimal supports are allowed (5 % of agricultural production for developed countries, 10 % for developing countries); the 30 WTO members that had larger subsidies than the *de minimis* levels at the beginning of the post-Uruguay Round reform period are committed to reduce these subsidies. Domestic support exceeding the reduction commitment levels in the amber box is prohibited. The reduction commitments are expressed in terms of a 'total aggregate measurement of support' (total AMS) which includes all supports for specified products together with supports that are not for specific products, in one single figure.

There is a blue box for subsidies that are tied to programmes that limit production. This is the 'amber box with conditions' — conditions designed to reduce distortion. Any support that would normally be in the amber box is placed in the blue box if the support also requires farmers to limit production (details are set out in paragraph 5 of Article 6 of the Agreement on Agriculture). There are also exemptions for developing countries, sometimes called an 'SDT box' (special and differential treatment), including provisions in paragraph 2 of Article 6 of the agreement.

The green box is defined in Annex 2 to the Agreement on Agriculture. In order to qualify, green box subsidies must not distort trade, or at most cause minimal distortion (paragraph 1). They have to be government funded (not by charging consumers higher prices) and must not involve price support. They tend to be programmes that are not targeted at particular products, and include direct income supports for farmers that are not related to (are 'decoupled' from) current production levels or prices. They also include environmental protection and regional development programmes. ‘Green box’ subsidies are therefore allowed without limits, provided they comply with the policy-specific criteria set out in Annex 2.

In the current negotiations, some countries argue that some of the subsidies listed in Annex 2 might not meet the criteria of the annex’s first paragraph — because of the large amounts paid, or because of the nature of these subsidies, the trade distortion they cause might be more than minimal. Among the subsidies under discussion here are: direct payments to producers (paragraph 5), including decoupled income support (paragraph 6), and government financial support for income insurance and income safety-net programmes (paragraph 7), and other paragraphs. Some other countries take the opposite view — that the current criteria are adequate, and might even need to be made more flexible to take better account of non-trade concerns such as environmental protection and animal welfare.

The abovementioned, paragraph 7 of Annex 2, and also paragraph 8, relate to the governmental service programmes which care about the consequences of calamities. These programmes are:

— the economical risk insurance (for the price and of the revenue),

— the climate risk insurance.

Paragraph 7 opens the green box for government financial support for income insurance and income safety-net programmes under certain conditions. This paragraph was included under the proposal of Australia, Canada and the USA. Next we show the original text, together with that of paragraph 8, which includes in the green box payments for relief from natural disasters made either directly or by way of government financial participation in crop insurance schemes.

***Annex 2 to the Agreement on Agriculture:*** ‘***Domestic support: The basis for exemption from the reduction commitments***’

*7. Government financial participation in income insurance and income safety-net programmes*

*(a) Eligibility for such payments shall be determined by an income loss, taking into account only income derived from agriculture, which exceeds 30 % of average gross income or the equivalent in net income terms (excluding any payments from the same or similar schemes) in the preceding three-year period or a three-year average based on the preceding five-year period, excluding the highest and the lowest entry. Any producer meeting this condition shall be eligible to receive the payments.*

*(b) The amount of such payments shall compensate for less than 70 % of the producer’s income loss in the year the producer becomes eligible to receive this assistance.*

*(c) The amount of any such payments shall relate solely to income; it shall not relate to the type or volume of production (including livestock units) undertaken by the*

*producer; or to the prices, domestic or international, applying to such production; or to the factors of production employed.*

*(d) Where a producer receives in the same year payments under this paragraph and under paragraph 8 (relief from natural disasters), the total of such payments shall be less than 100 % of the producer's total loss.*

*8. Payments (made either directly or by way of government financial participation in crop insurance schemes) for relief from natural disasters*

*(a) Eligibility for such payments shall arise only following a formal recognition by government authorities that a natural or like disaster (including disease outbreaks, pest infestations, nuclear accidents, and war on the territory of the Member concerned) has occurred or is occurring; and shall be determined by a production loss which exceeds 30 % of the average of production in the preceding three-year period or a three-year average based on the preceding five-year period, excluding the highest and the lowest entry.*

*(b) Payments made following a disaster shall be applied only in respect of losses of income, livestock (including payments in connection with the veterinary treatment of animals), land or other production factors due to the natural disaster in question.*

*(c) Payments shall compensate for not more than the total cost of replacing such losses and shall not require or specify the type or quantity of future production.*

*(d) Payments made during a disaster shall not exceed the level required to prevent or alleviate further loss as defined in criterion (b) above.*

*(e) Where a producer receives in the same year payments under this paragraph and under paragraph 7 (income insurance and income safety-net programmes), the total of such payments shall be less than 100 % of the producer's total loss.*

*Source:* WTO (2004).

**Figure 46. Annex 2 to the WTO Agreement on Agriculture**

There is wide debate about which current payments fall within each box. The 'Canadian farm income program' (CFIP), formerly 'agricultural income disaster assistance' (AIDA), was notified in the green box because it provides cover to income (so it should fall within the conditions stated by paragraph 7). However, this programme no longer exists. Both CFIP and 'Net income stabilisation account' (NISA) were substituted by one single programme, 'Canadian agricultural income stabilisation' (CAIS), in 2003.

The revenue insurance programmes in the USA do not fall under paragraph 7 or paragraph 8. They cannot be included under paragraph 7 because they do not cover income but revenue, and they do not fall under paragraph 8 because they do not cover only against climatic or natural disasters but also against market risks. So, they have been notified in the amber box and, thus, they are subject to reduction compromises.

Public aid to crop insurance is ‘conceptually’ included in the green box, as can be deduced from paragraph 8. However, when this would be applied, subsidies to agricultural insurances result, by a formal requirement, excluded from the box. Assuming that aid complies with the trigger or threshold of the 30 % minimum loss, the exigency of a public formal declaration by government authorities every time there is a loss constitutes a constraint as it is not operational in an insurance model managed by private companies. This would eliminate one of the advantages of the insurance schemes over the ad hoc aids: the agility of the system. Therefore most of the subsidies to the European and North American crop insurance schemes have been notified within the amber box.

## 4.5. Disaster and crisis policies and aids in EU legislation

### *4.5.1. European aid for disasters*

In the event of a natural disaster or major catastrophe, local, regional or national authorities in the Member States may intervene with appropriate emergency aid or restorative measures. At EU level, the Commission has the role of assessing these forms of State aid to ensure that they do not distort competition (see the following sections).

To supplement regional and national measures, the EU rural development policy may provide support both for restoring agricultural and forestry production potential damaged by natural disaster and for appropriate preventive actions. The current regulation, however, excludes Community financial participation in insurance and payments for income or yield losses, since insurance is not regarded as a preventive action.

In the event of natural disasters, the Community may also apply ad hoc derogations to common market organisations. Past examples have included the use of set-aside land for animal feed production, the advanced transfer of direct payments and the sale of intervention stocks at reduced prices to improve supplies of animal feed.

Following the floods which hit central Europe in August 2002 the European Union Solidarity Fund (EUSF) was created, mainly to assist Member States and countries negotiating accession, in the event of major natural disasters where the cost of the damage exceeds EUR 3 billion or 0.6 % of the gross domestic product of the Member State in question.

The EUSF does not compensate for individual losses. It is designed to provide effective and flexible emergency financial aid for measures such as temporary accommodation or the provisional repair of vital infrastructures permitting the resumption of everyday life. With an annual budget of EUR 1 billion, the EUSF was not set up with the aim of meeting all the costs linked to natural disasters. Also, long-term action — lasting reconstruction, economic redevelopment, disaster prevention — is not covered by the EUSF (EC, 2005b).

In the case of sanitary crises, Community legislation clearly establishes that it is the Member States which are primarily responsible for preventing the outbreak and spread of animal diseases and other sanitary crises. In the event of emergency measures to eradicate epizootic diseases in livestock, Member States may compensate farmers for their capital losses and loss of profit linked to animals slaughtered or crops destroyed, within the limits specified by Community State aid rules (see the following sections). Nevertheless, the EU Veterinary Fund reimburses up to 50 % of Member States' costs in compensation for culling, destruction of animals and animal feed, cleaning and disinfection. For measures to eradicate foot-and-mouth disease, EU cover may increase to up to 60 % of Member States' expenditure. Member States' vaccination schemes can also be co-financed. The Veterinary Fund does not, however, compensate farmers who suffer economic losses due to limitations imposed on the movement of livestock for sanitary reasons. These are dealt with under the CAP.

Several common market organisations (CMOs) ([31]) have a specific veterinary crisis provision, allowing exceptional market support measures to be taken in the event of animal disease, to react to market distortions caused by transport restrictions imposed to combat the spread of disease. This applies to beef and veal meat, milk and milk products, sheepmeat and goatmeat, pigmeat, poultrymeat and eggs. Since it is the Member States that are primarily responsible for preventing the outbreak and spread of disease, the cost of these exceptional market measures should not be borne by the Community budget alone, but should be shared between the Community and the Member State concerned. There is a co-financing rate of 50 %, which corresponds to the general reimbursement rate provided by the Veterinary Fund (EC, 2005b).

Economic crises affecting the EU internal market for agricultural products are addressed at Community level. Although the CAP reform has substantially reduced the relevance of supply control and price stabilisation instruments, safety-net provisions in the event of crisis remain available in several CMOs. This is the case, for example, for the main cereals and skimmed milk powder, where the role of the intervention mechanism has been limited to that of a genuine safety net. In the event of a market crisis in the beef sector, the Commission has the possibility of introducing exceptional measures. Under certain conditions producer organisations in the fruit and vegetables sector may apply withdrawal measures. The common market organisation for wine provides producer organisations with the option of applying crisis distillation measures if the market is seriously unbalanced. Thus, the instruments available differ significantly between market organisations.

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([31]) See the glossary.

### 4.5.2. *State aid rules*

The 1957 Treaty of Rome established the European Economic Community. Title V in Part Three of this Treaty settled the common rules on competition. Its Section 3, Article 92, delimited the aid that can be granted by the States. The 1997 Treaty of Amsterdam amended the Treaties establishing the European Communities, including the Treaty of Rome and also the Treaty on European Union (Maastricht 1992). The 1997 Treaty of Amsterdam provides a consolidated version of the Treaty of Rome. Both in this consolidated version and in the 2002 consolidated version of the same Treaty (from now on the Treaty), the categories of aid that can be granted by the States appear in Part Three, Title VI, Chapter 1, Section 2, Article 87.

Article 87 (previously Article 92 of the 1957 Treaty of Rome) prohibits certain State aid, and authorises the European Commission to accept some such categories of aid as 'compatible with the common market'. Among the accepted forms of aid are aid to soothe the effects of natural disasters, and other types of aid. Article 87(2)(b) and Article 87(3)(c), reproduced in Figure 47, are the basis for aid related to risk management and safety-net programmes in agriculture.

Section 2

Aids granted by States

Article 87 (ex Article 92)

1.

2. The following shall be compatible with the common market:

(a) …

(b) aid to make good the damage caused by natural disasters or exceptional occurrences;

(c) …

3. The following may be considered to be compatible with the common market:

(a) …

(b) …

(c) aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest;

(d) …

(e) …

*Source: Official Journal of the European Communities* (2002)

**Figure 47. Aids granted by States in the European treaties**

The Commission has applied Article 87 of the 1997 Treaty in numerous decisions. The 1993 publication of the then Economic and Social Committee (ESC) on EC systems of agricultural insurance already collected information on how the former

Article 93 was to be applied. Later, the Commission stated its policy in the ‘Community guidelines for State aid in the agriculture sector’ (‘agriculture guidelines’ from now on). These guidelines were not compulsory for Member States but they constituted a guide for the Commission in order to approve or reject Member States’ aid.

The former agricultural guidelines applied from 2000 to 2006. In December 2006 the application of Articles 87(2)(b) and 87(3)(c) was reviewed with the introduction of a regulation (EC, 2006a) and new Commission guidelines (EC, 2006b). The regulation is compulsory for Member States and it avoids the need for many different forms of aid to be notified to the Commission (the regulation makes them exempt from the notification requirement of Article 88(3) of the Treaty). The regulation establishes that, following the 2006 guidelines, Member States’ aid needs to be evaluated on an individual basis by the Commission only for some cases. Next we will comment the 2006 regulation (which entered into force the 1 January 2007) and the guidelines 2007–13.

## Commission Regulation (EC) No 1857/2006 of 15 December 2006

The former regulation, ‘Commission Regulation (EC) No 70/2001 of 12 January 2001 on the application of Articles 87 and 88 of the EC Treaty to small and medium-sizes enterprises’ (OJ L 10, 13.1.2001, pp. 33–42) did not directly address the aid to be given to risk and crisis management in agriculture. So, all the aid given for agriculture under Article 87 should follow the ‘Community guidelines for State aid in the agriculture sector’ (agricultural guidelines) which have been mentioned above. In January 2007 Commission Regulation (EC) No 1857/2006 on the application of Articles 87 and 88 of the Treaty to State aid to small and medium-sized enterprises active in the production of agricultural products and amending Regulation (EC) 70/2001 (from now on ‘the 2006 regulation’) entered into force (EC, 2006a). This regulation includes the aid given under Article 87(3)(c), and some types of aid given formerly under Article 87(2)(b), which are now given also under Article 87(3)(c) (see Table 4).

**Table 4. Main rules applying for the different types of risk management State aid**

| Aid | Before 2007 | | From 2007 | |
|---|---|---|---|---|
| | Main rule | Treaty article | Main rule | Treaty article |
| Natural disaster | Guidelines 2000–06 | 87(2)(b) | Guidelines 2007–13 | 87(2)(b) |
| Adverse climatic events | Guidelines 2000–06 | 87(2)(b) | 2006 regulation ([1]) | 87(3)(c) |
| Agricultural insurance | Guidelines 2000–06 | 87(2)(b) | 2006 regulation ([1]) | 87(3)(c) |
| Sanitary risks | Guidelines 2000–06 | 87(3)(c) | 2006 regulation ([1]) | 87(3)(c) |

([1]) In cases not covered by the 2006 regulation the guidelines 2007–13 apply.

*Source:* Authors’ elaboration.

As can be observed in Table 4, the forms of aid given in the case of natural disaster, in the case of climatic events which assimilated to natural disasters, and to agricultural insurance under certain conditions were included under Article 87(2)(b) of the Treaty. It considered that, besides the evident natural disasters and natural occurrences, other risks that could be considered as natural disasters could be included as such under the damage intensity criterion ([32]). Sanitary risks had a different treatment: 'this does not normally constitute a natural disaster or an exceptional occurrence within the meaning of the Treaty. In such cases aid to combat animal and plants diseases may only be permitted by the Commission on the basis of Article 87(3)(c) of the Treaty' (EC, 2000), which provides that aid to facilitate the development of certain activities may be considered compatible with the European Union provided that it does not affect trading conditions to an extent contrary to the common interest. So, these forms of aid 'may only be accepted as part of an appropriate programme [. . .] for the prevention, control or eradication of the disease concerned' (EC, 2000).

With the introduction of the 2006 regulation, adverse events that can be assimilated to natural disasters and aids given to agricultural insurance programmes are no longer justified by Article 87(2)(b), but they fall under Article 87(3)(c).

The 2006 regulation applies only for a selected number of cases.

— It applies only to 'transparent aid' ([33]).
— It does not apply to aid granted to enterprises active in the processing or marketing of agricultural products.
— It does not apply to fishery and aquaculture products.

All the cases not covered by the regulation have to be evaluated by the Commission, following the guidelines. According to Article 3 of the regulation, 'aid which does not fall within the scope of this regulation [. . .] shall be notified to the Commission in accordance with Article 88(3) of the Treaty. Such aid shall be assessed in accordance with the criteria laid down in the Community guidelines for State aid in the agriculture and forestry sector 2007 to 2013' (EC, 2006a).

The 2006 regulation does not enter into the definition of aid to be given in the case of a natural disaster, leaving its establishment to the guidelines. It defines the aids that can be given in the other three cases: adverse climatic events (which are not any

([32]) The damaged intensity criterion specified that the loss in the normal agro-livestock production must reach the 30 % and the 20 % in the less-favoured areas. In the case of damage to the means of production the effects of which are felt over several years (for example the partial destruction of tree crops by frost) for the first harvest following the occurrence of the adverse event the percentage real loss in comparison with a normal year, determined in accordance with the principles set out in the previous paragraphs, must exceed 10 % and the percentage real loss multiplied by the number of years in which production is lost must exceed 20 % in the less-favoured areas and 30 % in other areas.

([33]) See the glossary.

more assimilated to natural disasters), insurance and sanitary risks. It includes four articles which are related to these aids:

— Article 10: Aid in respect of animal and plant diseases and pest infestations,
— Article 11: Aid for losses due to adverse climatic events,
— Article 12: Aid towards the payment of insurance premiums (there is also a reference to this in Article 16), and
— Article 16: Support for the livestock sector.

**Article 10**

Regarding **animal and plant diseases**, it clearly differentiated two types of aid: payment of the costs of prevention or eradication of animal or plant diseases or pest infestations — this aid must not involve direct payments to producers — and the compensation to the farmers for their losses, which requires a formal recognition by public authorities. Both types of aid are allowed to compensate up to 100 % of the costs.

**Article 11**

Regarding **adverse climatic events** which can be assimilated to natural disasters ([34]), they are eligible for aid but the compensation cannot exceed 80 % of the losses and 90 % in less-favoured areas ([35]). These same maximums (or gross aid intensity) of 80 % and 90 % apply for damages to farm buildings and farm equipment ([36]). Also, the event must be formally recognised by public authorities as a disaster.

One of its main novelties is that it sets a condition for losses suffered from 1 January 2010: compensation must be reduced by 50 % unless it is given to farmers who have taken out insurance covering at least 50 % of their average annual production or production-related income and the statistically most frequent climatic risks in the Member State or region concerned ([37]). Also, from January

([34]) For a definition on 'adverse climatic event that can be assimilated to a natural disaster' see the glossary.

([35]) In the guidelines 2000–06 there was also the 30 % threshold that now applies to the definition of 'adverse climatic events that can be assimilated to a natural disaster', but there was also an additional and different threshold of 20 % for less-favoured areas. Instead, there was no relative deductible as there is now, so that a part of the damage is always borne by the farmer, but the compensation could be up to 100 % of the damages (see the glossary for definitions of threshold and deductible). This led to the result that a farmer with a loss of 29 % received no compensation, whilst a farmer with a loss of 30 % may have received compensation for 30 %, which did not sufficiently encourage farmers to make all efforts to limit the damage.

([36]) In the guidelines 2000–06, neither thresholds nor deductibles applied to buildings and equipment, where the damages could be accepted up to 100 % of actual costs.

([37]) The condition to be insured in order to receive the whole compensation for losses suffered after 2010 aims at encouraging farmers to buy insurance whenever possible and to improve their own risk management. In the 2006 version, there is a clerical error which refers to this condition as applying only to farm buildings, but it should be modified in the first corrigendum.

2011, there is an additional requirement for the State: it has to comply with the water directive in order to be able to compensate for losses due to drought.

**Article 12**

Regarding the aid towards the payment of **insurance premiums**, it is stated that 'The gross aid intensity must not exceed:

(a) 80 % of the cost of insurance premiums, where the policy specifies that it provides cover against losses caused by adverse climatic events which can be assimilated to natural disasters;

(b) 50 % of the costs of the insurance premiums, where the policy specifies that it provides cover against:

- (i) losses referred to in point (a) and against other losses caused by climatic events; and/or
- (ii) losses caused by animal or plant diseases or pest infestations.' ([38])

Where the insurance also covers other losses caused by adverse climatic events, or losses caused by animal or plant diseases, the aid rate is reduced to 50 % of the cost of the premium.

There is a novelty in reference to the old guidelines 2000–06, besides that of the regulation not applying to big firms or big agricultural holdings nor to firms dedicated to the transformation and commercialisation of agricultural products, in that 'The aid must not be limited to insurance provided by a single insurance company or group of companies, or be made subject to the condition that the insurance contract be taken out with a company established in the Member State concerned.'

**Article 16**

Within the **support for the livestock sector**, some aid can be allowed in the following cases: 'aid at a rate of up to 100 % of costs of removal of fallen stock, and 75 % of the costs of destruction of such carcasses; alternatively, aid up to an equivalent amount towards the costs of premium paid by farmers for insurance covering the costs of removal and destruction of fallen stock'. 'The aid shall not involve direct payments of money to producers.'

([38]) This point presents only one change when compared with the guidelines 2000–06: under these guidelines, insurance for animal and plant diseases had the same treatment of insurance against climatic events in the sense that it needed to be combined with cover against natural disasters or assimilated climatic events in order to be eligible for a 50 % subsidy. In the 2006 regulation there is no more the obligation to combine insurance for animal or plant diseases with insurance against catastrophes and assimilated events. The Commission considers that 'Member States should be allowed to offer public support for animal and plant disease alone' (EC, 2006b, p. 22).

Articles 10 and 11 include the constraints that aid schemes must be introduced within three years following the occurrence of the expense or loss, and that aid must be paid out within four years following the occurrence ([39]).

## Community guidelines for State aid in the agriculture and forestry sector 2007–13

The ‘Community guidelines for State Aid in the agriculture and forestry sector 2007 to 2013 (2006/C 319/01)’ (OJ C 319, 27.12.2006, pp. 1–33), from now on ‘guidelines 2007–13’, ‘apply to all State aid, granted in connection with activities related to the production, processing and marketing of agricultural products […]. They apply to any aid measure in whatever form, including aid measures financed by parafiscal taxes, which falls within the definition of State aid laid down in Article 87(1) of the Treaty. These guidelines do not apply to State aids in the fisheries and aquaculture sector.’ (guidelines 2007–13, p. 1).

It is stated in the general principles, and again in Section V.B, that the compensation will not be paid later than four years after the occurrence of the losses. Regarding the application of Articles 87(2)(b) and 87(3)(c) of the Treaty, there are four points related to this within Section V ‘Risk and crisis management’. These points are listed below.

### V.B.2. Aid to make good the damage caused by natural disasters or exceptional occurrences

This point defines the notions of ‘**natural disaster**’ and ‘exceptional occurrence’ contained in Article 87(2)(b). The ‘Commission has consistently held that the notions of “natural disaster” and “exceptional occurrence” contained in Article 87(2)(b) must be interpreted restrictively. [. . .] Hitherto the Commission has accepted that earthquakes, avalanches, landslides and floods may constitute natural disasters. [. . .] Exceptional occurrences which have hitherto been accepted by the Commission include war, internal disturbances or strikes, and with certain reservations and depending on their extent, major nuclear or industrial accidents and fires which result in widespread loss. [. . .] As a general rule, the Commission does not accept that outbreaks of animal or plant diseases can be considered to constitute natural disasters or exceptional occurrences. However, in one case the Commission did recognise the very widespread outbreak of a completely new animal disease as an exceptional occurrence. Because of the inherent difficulties in foreseeing such events, the Commission will continue to evaluate proposals to grant aid in accordance with Article 87(2)(b) of the Treaty on a case by case basis, having regard to its previous practice in this field.

([39]) This constraint did not exist in the guidelines 2000–06.

Once the existence of a natural disaster or an exceptional occurrence has been demonstrated, the Commission will permit aid of up to 100 % to compensate for material damage.' (EC, 2006b, p. 18) ([40]).

**V.B.3. Aid to compensate farmers for losses caused by adverse weather conditions**

This point follows closely Article 11 of the 2006 regulation and clarifies the changes from the guidelines 2000–06 ([41]).

**V.B.4. Aid for combating animal and plant diseases**

The same as in the previous point, it explains the changes from the previous guidelines and refers to Articles 10 and 16 of the 2006 regulation. It also adds that the Commission will neither authorise State aid for fallen stock given to operators active in the processing and marketing, nor aid towards the costs of the disposal of slaughterhouse waste.

**V.B.5. Aid towards the payment of insurance premiums**

It also analyses the changes from the previous guidelines and refers to Article 12 of the 2006 regulation. It again mentions that the Commission will not authorise State aid towards the payment of insurance premiums in favour of large companies, and companies active in the processing and marketing of agricultural products. Lastly, it refers to reinsurance: 'The Commission will examine other aid measures in connection with insurance against natural disasters and exceptional occurrences on a case by case basis, in particular reinsurance schemes and other aid measures to support producers in particularly high risk zones.' (EC, 2006b)

### *De minimis* aids

'Until recently, the Commission took the view that any national or regional aid given to support agriculture, however small, had the potential to distort competition and affect trade between Member States. All cases of State aid in the agricultural sector were therefore subject to Commission authorisation; the *de minimis* rule ([42]) applied

([40]) In the definition of natural disasters and exceptional occurrences there are no significant changes from the guidelines 2000–06.

([41]) For example, the 30 % threshold of losses in the year of the adverse weather conditions' occurrence also applies to perennial crops, such as fruit trees. Instead, in the previous guidelines the losses were considered during several years: 'In the case of damage to the means of production the effects of which are felt over several years (for example the partial destruction of tree crops by frost) for the first harvest following the occurrence of the adverse event the percentage real loss in comparison with a normal year, [. . .] must exceed 10 % and the percentage real loss multiplied by the number of years in which production is lost must exceed 20 % in the less-favoured areas and 30 % in other areas,' (EC, 2000)

([42]) See Section 4.4.1.

in other sectors was not applied to agriculture. However, the procedure for notifying State aid was criticised for being too heavy, in particular for small amounts of aid intended for delivery without delay. Member States needed more flexibility, in particular concerning these small amounts.'

'Very small amounts of aid granted in the agricultural and fisheries sector do not have to be regarded as distortive to the internal market, provided certain conditions are met. [. . .] For these reasons, the Commission adopted a regulation on *de minimis* aid in the agricultural and fisheries sector, allowing a maximum of EUR 3 000 per farmer to be paid over any three-year period. The total amount of *de minimis* aid granted to all farming enterprises in a Member State over three years must remain below a ceiling set by the Commission of about 0.3 % of the value of its total agricultural output, in order not to affect trade between Member States or distort competition. Export aids and aid conditional upon the use of domestic over foreign products, as well as any aid fixed on the basis of the price or quantity of the product placed on the market, are excluded from the *de minimis* exemption. Within these limitations, Member States may spend the money in any way they consider appropriate and without any delay.' (EC, 2005b, pp. 10–11).

## 4.6. Disaster and crisis definitions, policies and aid in the EU-27 member countries

Through the fact sheets, national experts provided information on the Member States' definitions of disaster and crisis which are eligible for aid, as well as the definitions of insurable risks, when they exist. These definitions are shown in Table 5.

**Table 5. Definitions of disaster**

| Country | Definition, concept |
|---|---|
| Austria | — Catastrophe: The catastrophe fund compensates extraordinary losses such as flood, avalanches and storm. The compensation of loss by the catastrophe fund is linked to the condition that there is a disaster defined by the public authorities. But there is no legal title of compensation.<br>— Most of the financial contributions of the public fund are used for preventive measures.<br>— Insurable risk: Only a small part from the catastrophe fund is reserved for the support of agricultural insurance (hail and frost). Other insurable risks like drought, storm, flood and livestock are without public support to the premium paid by farmers.<br>— There is no ad hoc aid for insurable risks. |
| Belgium | According to the Law of 12 July 1976, the agricultural calamities are defined as 'The natural phenomena of exceptional nature and character, or the unforeseeable and massive action of noxious organisms only in the case in which they have caused important and generalised destruction of soils, crops or harvests, as well as the diseases and intoxications of exceptional character if they have caused, by mortality of compulsory slaughter, |

| Country | Definition, concept |
|---|---|
| | important and generalised losses of animals useful to farming'. The Royal Act 6 July 2002, in order to conform to the European legislation, introduces a deductible of 30 %. |
| Bulgaria | — The new Law on Crisis Management defines 'crisis' as 'an unexpected or expected change of already established living conditions as a result of human activities, events or natural phenomenon, and when the life, the health or the property of big groups of people, territories, environment, the cultural or the material values of the country are in danger'. The law stipulates the publication of a statute for its application but it has not yet been published.<br>— Insurance is not subsidised. |
| (Croatia) | — The Law on Protection from Natural Disasters regulates actions (financial and other types of help) in the case of disaster. According to the law, disaster is a sudden and huge accident that severely interrupts everyday life, causes victims, property, infrastructure and/or environmental damages to an extent higher than the local community's ability to eliminate consequences.<br>— Disaster could be caused by natural, technical, technological or biological events. Earthquakes, (degree VII or more on the Mercalli–Cancani–Seiberg scale), fire, floods, drought, hail, frost, high snow, snowdrifts and avalanche, ice on the watercourses, landslides and similar phenomena which cause significant changes in everyday life are understood as disasters. To obtain aid some conditions should be satisfied. The volume of direct damages must be higher than 20 % of the local unit annual budget in the last year and the yield must be a minimum of 30 % less than the three-year average. |
| Cyprus | — The first definitions of natural disaster in Cyprus were specified in 1977 when the government prepared the first legislation for creating an organisation (AIO) and a relevant scheme (agricultural insurance scheme) which was initiated in 1978. The major perils which are covered by the Cyprus legislation are hail, frost, drought, rain, flood, water spot, windstorm, strong dry wind, heatwave and warm dry air. Currently the subsidisation level is 50 %, which is the maximum possible under the EU's current guidelines.<br>— Some ad hoc aids are given for products not covered by the public scheme, but triggers are not specified. |
| Czech Republic | According to Act No 586/1992 Coll., concerning income taxes, as amended, a natural disaster is defined as accidental fire or explosion, thunderbolt, windstorm with wind speed exceeding 75 km per hour, flood, hail, land slippage, landslide and rockfall not caused by industrial activity or building activity, avalanches or earthquake recording at least fourth degree on the international macro-seismic scale. |
| Denmark | No explicit definition seems to exist. The government has a support scheme that grants subsidies in accordance with the Danish Act on Compensation for Damage Caused by Storm (storm surge flooding and forest storm damage). |
| Estonia | Laws are harmonised with EU laws, but no definitions are provided. |
| Finland | — The Crop Damage Compensation Act has been amended several times since 1975. It allows the government to compensate loss of crop yield due to frost, hailstorm, pouring rain, storm, unexceptional flood, unexceptional drought, or other similar and unusual ('catastrophic') change in the natural conditions, to which an agricultural producer is unable to adapt, unusual conditions during the over-wintering, or unusual flood or unusually voluminous rain, which prevents a producer from seeding the crop. There is a reference yield for each region and crop. Reference yield is the arithmetic mean of the average yield of the crop during the past five years in a given region. Franchise deductible is 30 %; i.e. producer is eligible for the compensation if actual yield (calculated at the farm level) is less than 70 % of |

| Country | Definition, concept |
|---|---|
| | the reference yield. The producer must farm in Finland and he must cultivate at least 3 ha of field crops or at least 0.5 ha of vegetables (including horticulture). The farm must be cultivated in accordance with the common agricultural practices of the region.<br>— Another public system is the practice of compensating direct losses due to highly contagious animal diseases from the State budget. It is based on the Animal Disease Act, which has been amended several times in recent decades. |
| France | — The 1964 Law for Agricultural Calamities, modified by the 2006 Orientation Law, defines the characteristics of the damages that can be subject to a public indemnity from the 'Agricultural Calamity Regimen', among them:<br>• exceptional character of the climatic phenomenon causing the damages (long periods between events, losses intensity), which has to be officially established by inter-ministerial decree on the basis of a local assessment performed by the administration and of an examination conducted by a national administrative corporation;<br>• damage for which there is no efficient preventive technique available;<br>• in the case of crop losses, they must be above a double threshold: 27 % or more of normal crop value and 14 % of the farm gross revenue; the 27 % which meant a loss of EUR 27 per EUR 100 of 'production value + CAP aids', after the single payment has now become 42 % of production value alone, regardless of the single payment value.<br>— Multi-peril insurance is subsidised at maximum rate of 35 %. |
| Germany | No definition, in the case of natural disasters the competence is of the federal states. |
| Greece | Disaster and related concepts are defined in the regulation for 'State financial aid', recently issued by ELGA (1/2006), and are similar to those found in the Community guidelines for State aid in the agriculture sector (2000/C 28/02). |
| Hungary | — The definitions of disaster were laid down in Law LXXIX of 1991 on Land Taxation. Natural disasters can be, according to Article 7: Drought in all cultivation activities; hailstorm, flood, standing water and fire losses in all taxable cultivation activities; frost and sand-blast on arable farming, horticulture, viticulture and fruit farming.<br>— Farmers are eligible for lease reduction or cancellation when the yield does not reach two thirds of their average yield. They are eligible for tax and to lease reduction or cancellation when the losses exceed 25 % of the yield in the affected area or 15 % of the crop yield in the whole farm (since 1994).<br>— Direct *ex post* aids are defined on an ad hoc basis. In the case of the 2003 extreme drought and frost, the regulation issued established that farmers would be entitled to subsidies if the extent of frost and/or drought losses together exceeded 30 % in the case of arable crops (including vegetables), viniculture, fruit farming, forestation and fishponds. The final amount of the compensation is 30 % of the loss value exceeding 30 %. Farmers would be entitled to preferential credit if frost and/or drought losses are 20 % or greater.<br>— Insurance has not been subsidised since 2004. |
| Ireland | There is no definition of 'disaster' used in public policy. Responses to situations are on an ad hoc basis. The typical policy response has been to seek EU approval for limited measures, such as paying direct payments earlier than scheduled. |
| Italy | — For the purposes of the national farm risk management system, natural calamity or exceptional event are those defined in point 11.2 of the |

| Country | Definition, concept |
|---|---|
| | ‘Community guidelines for State aid in the agriculture sector’ (2000/C 28/02) and also the adverse atmospheric conditions foreseen in point 11.3 of the foresaid orientations. That reference is explicitly contained in the main law currently in force on the subject: Legislative Decree 29/March 2004 No 102: Reform of the National Solidarity Fund.<br>— Insurance is subsidised. There are no explicit definitions. |
| Latvia | Upon entering the European Union, the definitions which are specified in Community guidelines for State aid in the agriculture sector were applied. |
| Lithuania | Criteria of natural disaster are indicated in Lithuanian Government Resolution No 241 ‘Regarding confirmation of criteria of extreme events’ of 9 March 2006. Natural events which cause more than 20 % of losses in average agricultural production in LFAs and more than 30 % of losses in other areas are considered to be a natural disaster. |
| Luxembourg | — There is no definition of ‘disaster’ used in public policy. No ad hoc aid has been given.<br>— The EC guidelines are followed in insurance subsidisation. |
| Netherlands | — There is a general law on indemnity payments for disasters but the government has announced that this is no longer applicable for agriculture. Weather adversaries are considered to be normal risks for which the taxpayer does not have to pay.<br>— For livestock there are funds that are sector-wide and ultimately financed by all the farmers until a maximum per sector. It is a fund for epidemic livestock diseases, concerning cattle, pigs, poultry, sheep and goats. It is financed by farmers through levies on the production of milk, meat, etc. When the costs of suppression of an epidemic outbreak reach a certain level, agreed in advance, the government will carry the costs. |
| Poland | No explicit definition seems to exist. The government offers ad hoc aid in the case of tremendous natural disasters (i.e. flood), but we could not find any regulation fixing the conditions under which an event can be considered as a disaster. |
| Portugal | — Aid is given by the fund for losses caused by risks not covered by the current crop insurance products, in those cases where a calamity situation is officially declared both by the Ministry of Finances and by the Ministry of Agriculture, Rural Development and Fisheries.<br>— Climatic agricultural calamity is defined as the happening of phenomena, exclusively climatic, with an exceptional character, which cause a generalised damage on crop production of at least 50 %, resulting from this in an important decrease in the farmers’ yields. The determination of the damages refers to the yields usually obtained in the region, calculated on the basis of the average obtained in the last six years, with exclusion of the year of lowest productivity. |
| Romania | — According to Law 381/2002, natural phenomena and diseases are considered to be the following: excessive drought, floods coming from overflowing rivers, or broken bridges, heavy rains, excessively low temperatures below the biological resistance limit of the plant, heavy snowfalls which cause loss in vegetal and livestock sectors, rapid melting of snow which causes floods, rivers overflowing, hurricanes.<br>— The indemnities are granted to the agricultural producers as follows.<br>• For agricultural crops and plantations affected by calamities, only for losses which exceed 30 % of production, the maximum level of indemnities being 70 % of the expenses made until the date the event occurred. |

| Country | Definition, concept |
|---|---|
| | • For animals, birds, bees' families and fish, the indemnity represents maximum of 80 % of the insurance value**,** diminished with the value of the resulting by-products which can be commercialised according to legal provisions.<br>— The agricultural producers benefit from the stipulation of this law if they are affected by natural phenomena presented above and if they are located in a calamity area declared by governmental decision, and if their crops, plantations, animals, fowls, or fish are insured by insurance companies approved by the Ministry of Agriculture. |
| Slovakia | No information |
| Slovenia | — According to the Slovenian law a natural disaster is a 'disaster caused by earthquake, flood, landslide and snow slide and disasters in agriculture and forestry caused by adverse weather conditions'. The causes for disaster in agriculture and forestry are sleet, frost, drought, storm and hail. In addition, mass outbreak of plant or animal diseases and pests are included.<br>— The Law on Natural Disaster Relief (Official gazette No 114/2005; p. 12354) is related to the Law on protection from natural and other disasters (Official gazette RS No 21/2006; p. 5609).<br>— Disaster aid is paid to the applicant if the evaluated damage resulting from natural disaster reaches 30 % of normal production; whereas for the less-favoured areas (LFAs) the limit is set at 20 %. If a natural disaster results in a long-term production potential deterioration (e.g. perennials), the aid is paid when the production in the first year after the natural disaster occurrence is reduced by 10 %. Moreover, in all the following years in which the production is reduced due to the natural disaster, the total damage has to add up to 30 % of a standard annual production and for the LFAs the damage is set at 20 %. |
| Spain | — For ad hoc measures, a legal declaration by the government is necessary. Damages must be caused by extraordinary phenomena. There is no explicit mention of definition of crisis and disaster. The guidelines implicitly apply. Aid can only be given for non-insured risks.<br>— According to the Spanish law, it is permitted to insure all the damages produced by natural phenomena which cannot be managed by the farmer, always under the condition that the losses are higher than a minimum threshold, established in every insurance contract. |
| Sweden | — *Ad hoc measures for climatic calamities not covered by insurance:* There is no particular definition of disaster, and the Swedish policy is to apply these measures restrictively. Until now no such compensation has been paid. The government does not consider the market has suffered from any obvious market failures.<br>— *Regulated measures for infectious diseases, contaminated feed, plant pests and radioactive fall-out:* The Swedish Board of Agriculture is responsible for the management and combat of these disasters. Regarding infectious disease there is a pre-existing system for compensation payments. For the other types of disasters mentioned, ad hoc compensations apply. Farmers do not pay any explicit fee. |
| (Turkey) | — *On aid given for natural disasters (1977):* Aid is given to farmers and agricultural production cooperatives whose farms, agricultural products, livelihood stocks, and production means and facilities are damaged or have completely vanished because of fire, earthquake, landslide, storm, flood, frost, hail, drought, pests and diseases, etc. and whose working and production conditions suffer a significant collapse, that is, either (a) a loss of 40 % (in terms of value) damage on products, production factors and facilities, with no other agricultural and other income to compensate for this |

| Country | Definition, concept |
|---|---|
| | loss and no possibility to barrow from money landing banks, cooperatives and other such institutions; or (b) in the case where less than 40 % of production, production factors or facilities are damaged, there is no possibility of barrowing credit and there are no other income sources and, thus, no possibility to continue agricultural activity and to survive.<br>— *On insurable risks (Law 2005):* the cover for losses caused by drought, hail, flood, storms, whirlwind tornadoes, earthquakes, fire, accidents, pests and animal diseases for crops, greenhouses, agricultural buildings, agricultural machinery and livestock and/or other risks considered as important for agriculture shall be determined by the Council of Ministers upon the proposals of the Committee. |
| UK | — There is no definition, no legislation and no disaster assistance for crops.<br>— Livestock: A 'notifiable disease' is a disease named in Section 88 of the Animal Health Act 1981 or an 'Order' made under that Act.<br>— Insurance is not subsidised. |

Note: Croatia and Turkey are in parentheses because they are not yet part of the EU.
*Source:* Authors' compilation from fact sheets.

Some of the countries have the constraint that aid must not be given in the case of crisis or disaster due to an insurable risk. This is the case for Austria, Greece, Italy, Portugal, Spain, Sweden and Turkey for subsidised insurable risks and in France if insurance has reached a significant diffusion level.

As can be seen from the definitions in Table 5, most EU States follow the Community guidelines (2000) on agriculture in order to decide when they are going to bestow aid. We have classified the Member States in four groups according to their observance of the guidelines: some of them incorporate or explicitly mention the guideline definitions in their legislation; others just assume them without explicit mention; some others have a definition more restrictive than that established in the guidelines, as is the case for the calamity fund system in France. Lastly, some States have less-restrictive definitions than those in the guidelines ([43]). Table 6 summarises which Member States follow more or less closely the Community guidelines.

([43]) As such, the guidelines were not enforcing but 'advisory', so countries were not obliged to follow them. This situation has changed since the entry into force of the regulation.

**Table 6. States' crisis and disaster definitions in relation to their following of the agricultural guidelines**

| Explicitly mention the EC guidelines definition | EC guidelines with no explicit mention in legislation | More restrictive definition | Less restrictive definition | Unknown |
|---|---|---|---|---|
| Belgium | Finland | Austria | Bulgaria | Denmark |
| Cyprus | Germany | France | Czech Republic | Poland |
| Estonia | Ireland | Portugal | Hungary | Slovakia |
| Greece | Luxembourg | Romania | | Malta |
| Italy | Spain | Netherlands | | |
| Latvia | | Sweden | | |
| Lithuania | | UK | | |
| Slovenia | | | | |

Legend:
Explicitly mention the EC guidelines definition: means that the Member State's official definition of risks eligible for State aid reproduces and/or cites the guidelines.
EC guidelines with no explicit mention in legislation: means that Member State follows the guidelines, but does not mention them.
More restrictive definition: means that the Member State's definitions of risks eligible for State aid comply with the guidelines and are sometimes even stricter.
Less restrictive definition: means that the Member State's definitions of risks eligible for State aid do not follow the guidelines.
Unknown: information is not provided by the Member State.
Notes:
As Croatia and Turkey are still not part of EU they are not included in the table. Croatia has a less restrictive official definition of disaster and crisis; Turkey has a more restrictive official definition of disaster and crisis but a less restrictive one for insurance subsidies.
*Source:* Authors' elaboration from information in fact sheets provided by the experts in each country (2006).

This classification for the Member States which do not exactly follow the guidelines is justified by the following highlights.

- EU States with a **more restrictive** definition:

**Austria:** Disaster defined by the public authorities related to the occasion; no aid for insurable risks.
**France:** Crop losses above a higher threshold: 42 % of the production value of the damaged crop and 14 % of the whole farm gross revenue. It also requires that no efficient preventive technique be available.

**Portugal:** Damage on crop production of at least 50 % [. . .] of the yields usually obtained in the region.
**Romania:** Additional condition that their crops, plantations or animals are insured by insurance companies approved by the Ministry of Agriculture.
**Netherlands, Sweden and the UK:** No aid is given for climatic risks on crops, only for livestock diseases

- EU States with a **less restrictive** definition:

**Bulgaria:** more general definition.
**Czech Republic:** More detailed specification of defined risks called 'natural disasters'.
**Hungary:** More risks defined as 'natural disasters'; Lower triggers, 15 % or 20 %, applying for some kinds of support, like preferential credit or tax and lease reduction and cancellation.

## 4.7. Discussion on a disaster definition common for the EU

From the analysis of the EU and Member States' definitions of disaster and crisis we have seen that the whole system misses a common definition and attitude against risks and disasters. In the current policy context, where the EU agriculture is going in the direction of a more liberalised market, the EU legislation on matter of risk could be adapted to the changes by providing or allowing further protection against climatic and market risks. This adaptation should take into account the conditions set in the WTO agreements. Further than the definitions established by the new regulation, we suggest completing them with the information learnt from the Member States' individual experiences and the authors' reflections.

If a common EU definition was to be applied to all member countries, it could take into consideration the following aspects:

— the exceptional character of the climatic, geophysical or biological phenomenon;

— a minimum number of farms or a surface large enough must be affected;

— minimum thresholds for the losses should be established at crop level and/or at farm level (these already exist in the European Guidelines and Regulation (EC 2006a, EC 2006b)

— an official declaration of disaster should be required (this implies the need to establish a fast procedure)

— no efficient preventive technique should be available

— no insurance should be available

## 4.8. The state of the discussion on the options on an EU risk management policy

### *4.8.1. The communication from the Commission to the Council*

The communication from the Commission to the Council on risk and crisis management in agriculture (COM(2005) 74) (EC, 2005a) had the purpose to launch a discussion on risk and crisis management in the framework of the CAP reform. It fulfils the Commission's commitment to the Agricultural Council when the CAP reform was agreed. The mandate of the Council had two aspects.

— Whether it was appropriate to include provision for crisis in each common market organisation (CMO), as exists in the CMO for beef. This latter option is rejected. This first option was rejected in the Commission communication.

— How some of the funds generated by the new 'modulation' mechanism might be used to finance risk, crisis and disaster measures in agriculture ([44]).

A Commission staff working document (EC, 2005b), linked to the communication, analyses several types of risks and crises in agriculture, and the measures that have been applied in recent years. The possible support to insurance in this scheme would come from the funds assigned to the second CAP pillar.

The communication from the Commission to the Council (EC, 2005a), proposes a few possible measures to help farmers in the European Union manage risks. The aim is to help farms resist temporary shocks and improve their access to finance. Such measures would in any case differ from the type of guarantees provided by the 'old' CAP. Three main options are identified. They refer to agricultural insurance, mutual funds and to an income crisis tool. Specific training for farmers on the use of risk management instruments within rural development programmes is also mentioned.

The communication specifies that 'the wide range of risk management tools available in the Member States could be developed further to help to improve competitiveness and the economic sustainability of farm enterprises. However, these tools cannot and are not intended to offer the kind of guarantees provided by the former CAP, but would rather help the farm business withstand temporary shocks and improve its access to finance for the development of its activities. It is with this perspective that the development and availability of risk management instruments might usefully be encouraged' (EC, 2005a, p. 4).

'The Commission has looked at a number of options for encouraging the development of risk management tools and providing an improved response in the event of crisis. The Commission suggests that the potential of certain possibilities

([44]) http://ec.europa.eu/agriculture/publi/communications/risk/index_en.htm should be assessed, from the point of view of individually or jointly, completely or partially replacing Community and Member States' ad hoc emergency measures. If introduced to the menu of rural development measures, these options would be available for Member States and regions to take up and use, according to their specific priorities for the next programming period.

Independent of any decision on the [foresaid options, which are commented on below[, the causes of the rather weak development and use of market-based risk management tools (insurance, futures market, contract farming) could be addressed by training measures within rural development programmes. This would help improve awareness of current risks, improve risk management strategies and provide know how, for instance on the use of futures and options, which could also lead to a wider use of contracts between the food industry, traders, and farmers.' (EC, 2005a, p. 6)

**The three options for risk and crisis management**

The three options identified are as follows.

— Option 1: contributing to the payment of premiums farmers pay for insurance against natural disasters, extreme weather conditions or animal and plant diseases. Supporting reinsurance might also be an option.

— Option 2: encouraging the development of mutual funds for agriculture, by granting temporary and digressive support for the funds' administration.

— Option 3: launching new instruments to protect farmers in different types of income crises.

'***Option 1: Insurance against natural disasters — Financial participation in farmers' premium payments***

Insurance provides an alternative to public *ex post* compensation payments for losses caused by natural disasters at EU and national or regional level. Certain Member States have already established national schemes to encourage farmers to obtain insurance cover against such events.

A new measure, eligible under the rural development regulation, could therefore provide a financial contribution towards the premiums paid by farmers for insurance against income loss as a result of natural disaster or disease.

The amount granted per farmer under such a measure by EU and national/regional support should not exceed 50 % of the total premium cost for the insurance in question.

To be eligible for support from rural development funding, disaster insurance schemes must comply with EU agricultural State aid guidelines and WTO green box requirements. Insurance schemes eligible for co-financing would determine the level of compensation for production losses [. . . , which has to] exceed 30 % of the average agricultural production in the preceding three-year period, or a three-year average based on the preceding five-year period, excluding the highest and the lowest entry. This measure would require Member States to establish a historical reference system at farm level.

Insurance payments should compensate not more than 100 % of the income loss, at the level of the beneficiary, in the year the disaster occurred. [. . .] If the natural disaster, in addition to insurance, would trigger eligibility for other public compensation, the overall compensation by all schemes should not exceed 100 % of the income loss in the year the disaster occurred.

As many agricultural risks normally affect a large number of farms (systemic risk) insurance companies have to buy relatively expensive reinsurance. This is one of the reasons why private markets for agricultural insurance are not [everywhere] well developed. Thus, a policy measure improving access to reinsurance could also help develop private agricultural insurance schemes. As an alternative to supporting insurance premiums, the encouragement of national reinsurance schemes could also be examined. At the national level, in addition to co-insurance arrangements between private insurance companies, governments could:

(1) offer full reinsurance at reduced prices,

(2) offer part of the necessary reinsurance at no cost, thus reducing the insurance company's overall need for reinsurance, and

(3) be a partner for reinsurance via stop loss agreements [([45])].

***Option 2: Supporting mutual funds***

Mutual funds represent a way of sharing risk among groups of producers who want to take their own responsibility for risk management. The fund's capital can be called on by members in the event of severe income losses to be specified by predefined rules. Up till now agricultural mutual funds, established on private initiative, have been set up mainly at a sector-specific level, where producers share comparable risks. While they are not currently available to all agricultural holdings they have the potential to develop into a more common risk management tool to cover income losses.

With this in mind, the Community could envisage providing support for developing mutual funds in the agricultural sector. Under this option, temporary and degressive support for the administrative operation could be granted per farmer participating in funds formally recognised by the Member State's competent authority.

***Option 3: Providing basic cover against income crises***

With CAP reform focusing on income stabilisation and decoupling support from agricultural production, a generalised approach to respond to income crises seems to be more appropriate than any sector-specific approach. A more general cover against crises that result in severe income losses would allow existing safety net

([45]) See the glossary.

provisions to be further simplified and improve the balance between different agricultural sectors.

[. . .] if the scope of rural development measures should prove insufficient, the question of new instruments to address situations where liquidity problems and serious income losses occur must be raised. Any such measures should meet the [conditions set by paragraph 7, Annex 2 to the Uruguay Round Agreement on Agriculture ([46]). These income stabilisation payments] would require agreement on a precise, accounting definition of income and for Member States to establish a system of reference income at farm level. [. . .]' (EC, 2005a, pp. 6–8).

### *4.8.2. The position of the insurance sector*

In April 2005, the European Committee of Insurers (CEA) addressed a letter to the Deputy Director-General of the Agriculture and Rural Development the Commission's communication (COM(2005) 74) (see the previous section). Some of the comments are shown below.

- The Agriculture DG's paper proposes a different level of financial aid to the cost of the premium compared with the directive (2000/C 28/02), paragraph 11.5.
- The provisions of the paper are based on WTO requirements, in particular on those of the 'green box'. Nevertheless, the interpretation of such requirements is also quite confusing. The CEA considers it useful to review all the definitions under the said 'green box'.

In global terms, the position of the insurance companies represented by the CEA active in the agriculture sector is that they strongly support the EC initiative, which envisages new measures to enable farmers to react in the event of a crisis. They welcome the idea to support crop and livestock insurance with subsidies to the cost of premiums. They also express their interest in the political measures to improve access by insurers to reinsurance. In particular they mention the possibility of establishing co-insurance and co-reinsurance systems at a national level, as well as a public reinsurance system, possibly supported by the EU common agricultural policy (CEA, 2005b). However, according to the report by Wilkens (2003) and to the CEA (2005c), they prefer the coexistence of national systems rather than the implementation of a standardised European direct insurance system ([47]).

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([46]) See Section 4.4.2.

([47]) Wilkens justifies his position by arguing that, as a whole, national insurance systems should be formed in such a way that they correspond to the agricultural needs of each EU country and their structures. A standardised European direct insurance system would not meet these demands. The CEA justifies this position by arguing that the wide differences existing between the different countries must be taken into account.

During the year 2004 the Committee for the Insurance for Agricultural Risks of the CEA had elaborated a questionnaire with the aim of establishing the ‘average annual amount of losses’, that is, the average ‘risk premium’ (costs of acquisition and management not included) needed to cover natural catastrophic risks related to agriculture and livestock (only cows, pigs and sheep) on the bases of a combined cover. The CEA estimated the ‘average annual amount of losses’ was around EUR 3.7 billion for the EU-15 (the 15 Member States before the enlargement) (CEA, 2004). The CAP budget (direct aids and market measures only) was close to EUR 50 billion ([48]) for 2006 (http://europa.eu/rapid/pressReleasesAction.do?reference=IP/05/489&format=HTML&aged=0&language=EN&guiLanguage=en), so it is much higher.

## 4.9. The US agricultural risk management policy

Some information on the US agricultural risk management policy is given below for information purposes, for comparison with the EU policy, and with the aim of clarifying the framework when the US agricultural insurance system and products are presented in the next chapter.
The US agricultural insurance policy is defined in the insurance acts. However, agricultural insurance policy is closely related with farm policies, which are settled in the farm bills (see Table 7 ).

**Table 7. US farm bills and insurance acts**

| US farm bills | US insurance acts |
|---|---|
| 1990 Food, Agriculture, Conservation and Trade Act | 1980 Act |
| 1996 Farm Bill<br>The Federal Agriculture Improvement and Reform Act | 1994 Act |
| 2002–07 Farm Bill<br>The Farm Security and Rural Investment Act | 2000 ARPA<br>Agricultural Risk Protection Act |
| 2008–13 Farm Bill | |

*Source:* Authors’ compilation

Insurance was strongly promoted from the 1994 Act, which opened the way for revenue and income insurance products. After the 1996 Farm Bill, an important weight of the US farm policy was laid on agricultural insurance. However, by establishing the counter-cyclical payments, the 2002 Farm Bill established an important public tool for market risk management.

([48]) In this report 1 billion is 1 000 million.

### The 2002–07 Farm Bill and counter-cyclical payments

The 2002–07 Farm Bill ([49]) establishes among other Commodity programmes (Title I), a support programme which is directly related with risk management: counter-cyclical payments (CCPs). CCPs are subsidies given to farmers by the government whenever the commodities' effective price is lower than a target price established by the government. Because they are in an inverse relation with the market price, these payments have been called 'counter-cyclical'. The effective price for a covered commodity is equal to the sum of the following:

(1) The higher of the following:

- (A) The national average market price received by producers during the 12-month marketing year for the covered commodity, as determined by the Secretary.
- (B) The national average loan rate for a marketing assistance loan for the covered commodity in effect for the applicable period under subtitle B.

(2) The payment rate in effect for the covered commodity for the purpose of making direct payments with respect to the covered commodity.

The target prices are established in the 2002 Farm Bill. They apply to wheat, maize, grain sorghum, barley, oats, upland cotton, rice, soybeans and other oilseeds.

The payment rate used to make counter-cyclical payments with respect to a covered commodity for a crop year shall be equal to the difference between (1) the target price for the covered commodity; and (2) the effective price. If counter-cyclical payments are required to be paid for any of the 2002 through 2007 crop years of a covered commodity, the amount of the counter-cyclical payment to be paid to the producers on a farm for that crop year shall be equal to the product of the following:

(1) The payment rate.

(2) The payment acres of the covered commodity on the farm.

(3) The payment yield or updated payment yield for the farm, depending on the election of the owner of the farm.

CCPs are paid according to a fixed yield per farm, so that they are not directly coupled to the farmer's final production. However, the payments are made according to the farmers' most recently seeded surfaces, so they are not completely decoupled from production.

Also, CCPs are commodity-specific payments and they cannot be considered non-specific. The decoupling is a classification criterion in the green box. But because CCPs are dependent on the prices, it can be argued that they are not decoupled from prices and, so, not eligible for the green box (Basco et al., 2002).

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([49]) http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=107_cong_public_laws&docid=f:publ171.107.pdf

**The standing disaster assistance programme**

The Senate-approved 2008–13 Farm Bill version includes a standing disaster assistance programme that is expected to replace the ad hoc aids provided until now. The proposed programme would provide compensation based on shortfalls in 'whole farm' revenue, including all crops produced on the farm. To be eligible for the proposed standing disaster payment programme, farms would be required to purchase at least the catastrophic level of federal crop insurance. The disaster payment programme would compensate farms for 52 % of the difference between their disaster payment programme guarantee and their realised total farm revenue. For purposes of the proposed programme, realised farm revenue would include market revenue, any crop insurance indemnities, and 20 % of any federal direct fixed payments. Other federal income support payments (e.g. price or revenue counter-cyclical payments and loan deficiency payments) would not be included in revenue to count against the disaster payment programme guarantee.

The proposed standing disaster payment programme would also provide authority for a permanent livestock indemnity programme. This programme would compensate livestock producers for death losses in excess of normal mortality, caused by adverse weather conditions (Anderson et al., 2008).

# 5. Existing agricultural insurance systems

## 5.1. Chapter synthesis

This chapter describes the agricultural insurance systems existing throughout the world, and then the European systems. In the USA, Canada and other non-EU countries, there are some insurance instruments developed, such as index insurances, area insurances, whole farm insurance or types of revenue insurance which are not developed in EU. The EU has mostly classic insurance schemes (mainly single-risk and combined insurance, but also yield insurance), mainly private except in Greece and Cyprus where insurance is public and compulsory. In many countries the market is in the hands of no more than two or three insurance companies.

An overview is given on the main figures of insurance at country level, their evaluation and market conditions. On average, in 2004 approximately 23 % of crop value was insured. Premiums amounted on average to EUR 1 583 million and 4 % of the insured value, and subsidies to EUR 497 million or 32 % of the premiums. Data at country level come from two sources: the information collected in the fact sheets and information provided by the European Committee of Insurers (CEA). Average loss ratios are from 60 % to 70 %.

Section 5.6 enters into more details about technical aspects of agricultural insurance to better explain the countries' data and the different insurance products. Average premiums for hail can vary from 1 % for arable crops to 18 % for fruits. Deductibles, franchises, bonus/malus and other techniques are usually used to avoid moral hazard and adverse selection. Section 5.7 describes the role of the European reinsurance systems. Reinsurance is mostly done from the international reinsurance market (Swiss Re, Munich Re, Partner Re, etc.), mainly in the modalities of stop-loss and quota-share reinsurance.

## 5.2. General overview of the agricultural insurance systems in non-European countries ([50])

A wide range of agricultural insurance schemes based on different approaches exist in the world. The following figures and tables give an overview of the main types of insurance in the different countries. They can be compared with similar schemes available in the EU Member States and candidate countries (Section 5.3).

The figures represent maps corresponding to the same type of insurance products. Figure 48 shows the existence of single-risk and combined insurance schemes. Figure 49 addresses yield and income insurances. Figure 50 focuses on index-based schemes and Figure 51 points out non-insurance schemes such as calamity funds, stabilisation accounts and ad hoc aid. The information shown in the maps is contained in Table 8, which follows the figures. Next we comment on the table, following the order of the columns, that is, by type of insurance system, which have been defined in Section 2.4.

**Single- and combined-risk insurance**

Single- and combined-risk insurance schemes are available in most countries, predominantly with a basic cover in hail insurance. The particular case of Canada and the USA is quite different because, even though there is yield insurance, single-risk insurance schemes are not popular. In both countries, there is a basic cover which corresponds to yield insurance which covers only for losses above 50 % of the average yield (it is called CAT or catastrophic cover). It is highly subsidised by the government (almost entirely in the USA — where farmers only pay an administrative fee — and 50 % in Canada). As the level of cover increases, the subsidy decreases. But for any level of cover, the most important risks are included, so it is possible to speak of yield insurance at a wide variety of cover levels.

**Revenue and income insurance**

The USA is currently the only country where revenue and income insurance exists. In the UK there was a private revenue insurance product offered by Dalgety Co. but it was soon removed from the market. In Canada there was an income insurance named gross revenue insurance plan (GRIP), which also failed, and now there is an income stabilisation programme, which will be presented below.

The USA has developed a wide variety of revenue insurance products: three standard revenue insurance products, one livestock price insurance, one livestock gross margin insurance, one area revenue index insurance and one whole-farm income insurance.

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([50]) For the definitions of agricultural schemes used in this and the following chapter, see Section 2.4.

The three standard revenue insurance products are crop revenue cover (CRC), revenue assurance (RA) and income protection (IP). Among them, the most popular is CRC, which offers the possibility to get a higher price if the market price increases. These revenue insurance products apply for the main field crops such as maize, soybeans, wheat, rice and cotton. Livestock risk protection (LRP) provides protection against declining livestock prices for swine, feeder cattle and fed cattle. Livestock gross margin (LGM) protects the gross margin between the value of insured hogs and the cost of feed input (maize and soybean meal). The area revenue index insurance and the whole-farm income insurance products are introduced below. One main characteristic of most of the US insurance products which offer some price risk protection is that the reference price is the futures market price and, mainly, the guaranteed price is that predicted by the futures market. So, they provide cover against the oscillation of the price within the year. Revenue insurance is very important in the USA, 73 % of the premiums collected come from these types of insurance.

**Whole-farm insurance**

In Japan there is a whole-farm insurance which covers against all climatic hazards for all crops on the farm. The USA offers an adjusted gross revenue (AGR) insurance, which uses a grower’s historic tax information as a basis to calculate a level of guaranteed revenue. It can cover both crops and livestock whenever the income coming from livestock is less than 35 % of the total income. AGR-Lite is also available in limited areas and is identical to AGR with some exceptions. Among these, producers are eligible for this programme regardless of the percentage of their income which is derived from animals or animal by-products.

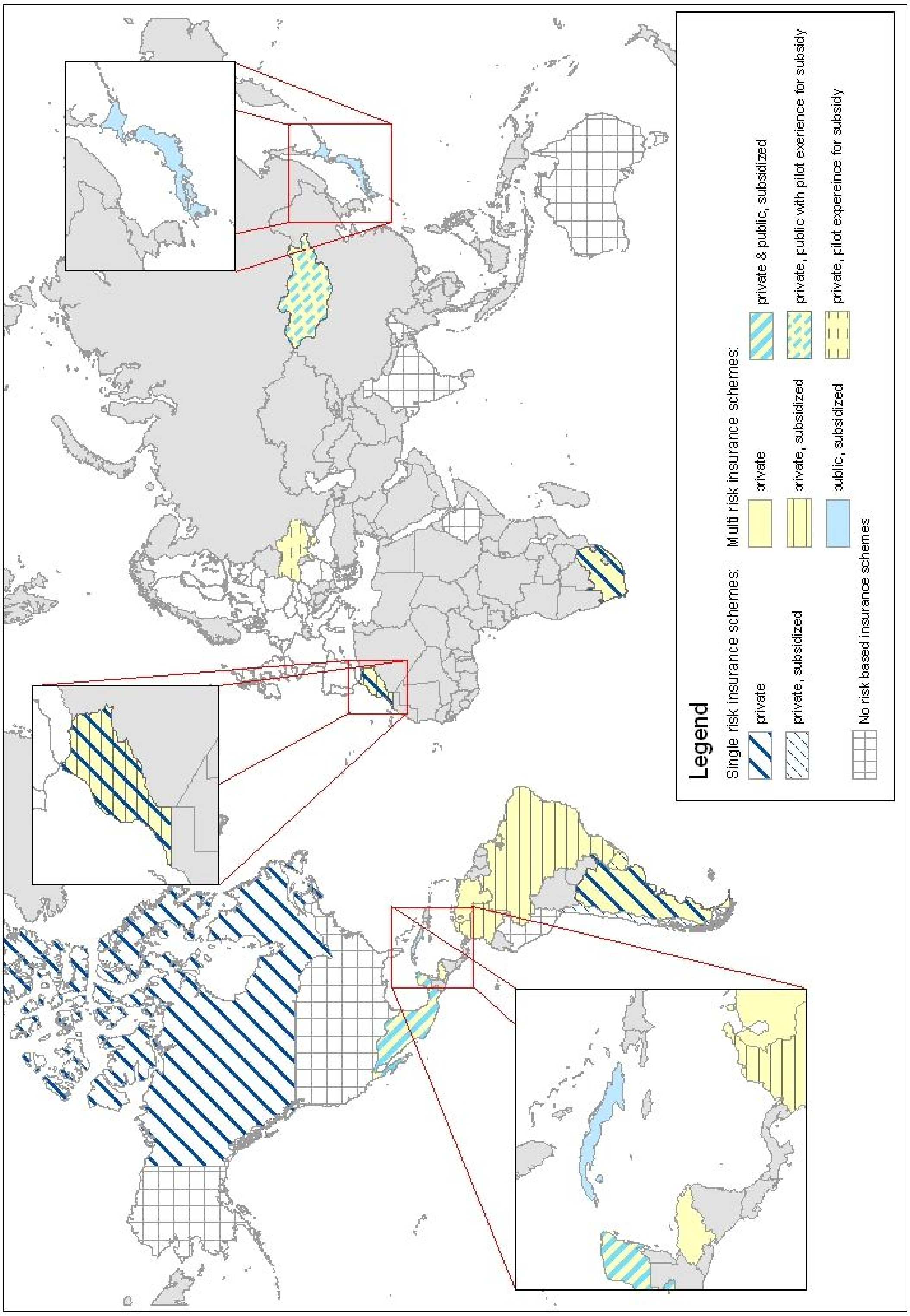



**Figure 48. Single and combined insurance schemes in the world**

*Sources:* Authors' elaboration from information in ALASA (1992), ENESA-ID (2004), Ibarra and Mahul (2004), Skees et al. (2005), Skees and Enkh-Amgalan (2002), Skees et al. (2001), Stoppa and Hess (2003) and World Bank (2005).

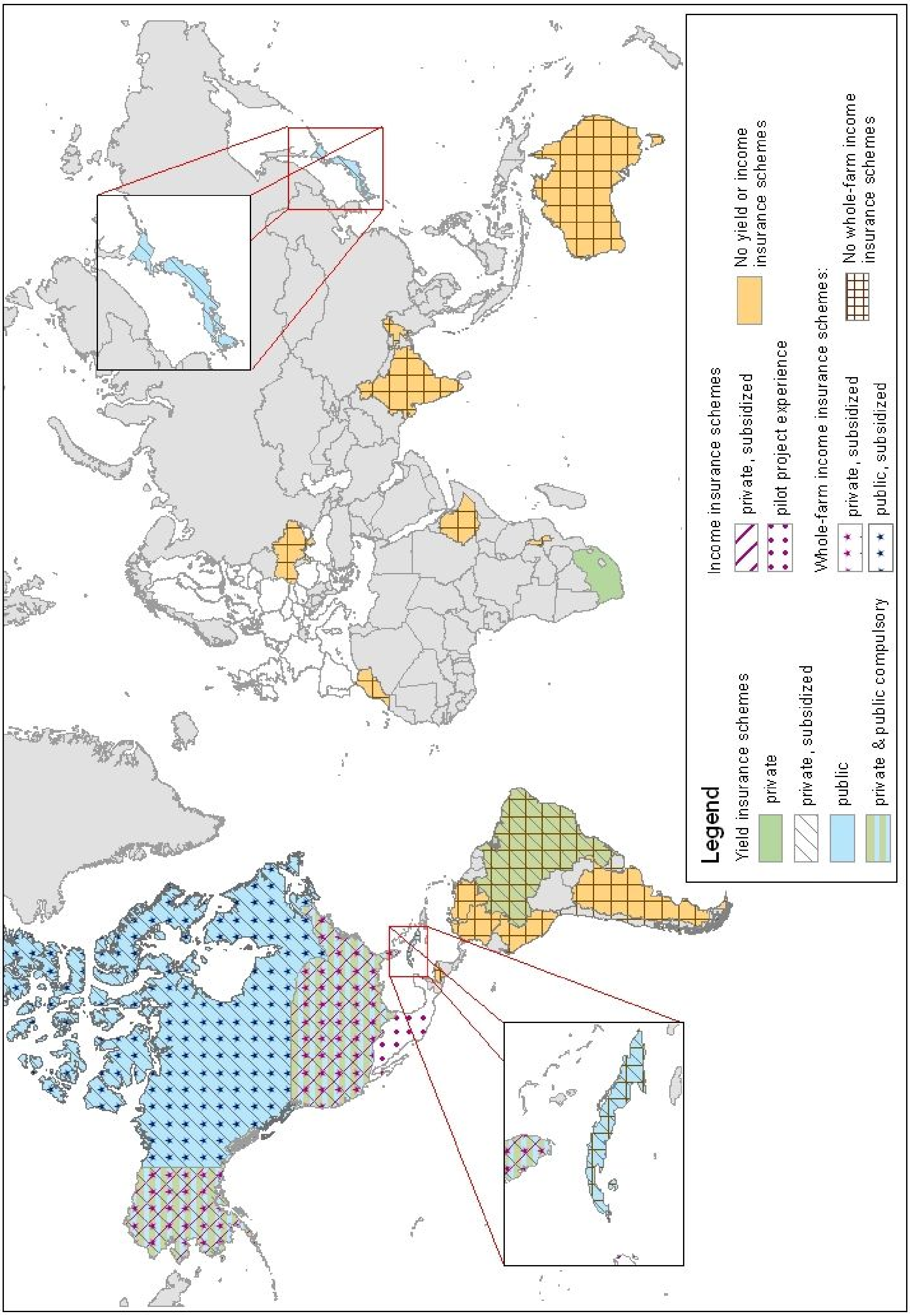



**Figure 49. Yield and revenue insurance schemes in the world**

*Sources:* Authors' elaboration from information in ALASA (1992), ENESA-ID (2004), Ibarra and Mahul (2004), Skees et al. (2005), Skees and Enkh-Amgalan (2002), Skees et al. (2001), Stoppa and Hess (2003) and World Bank (2005).

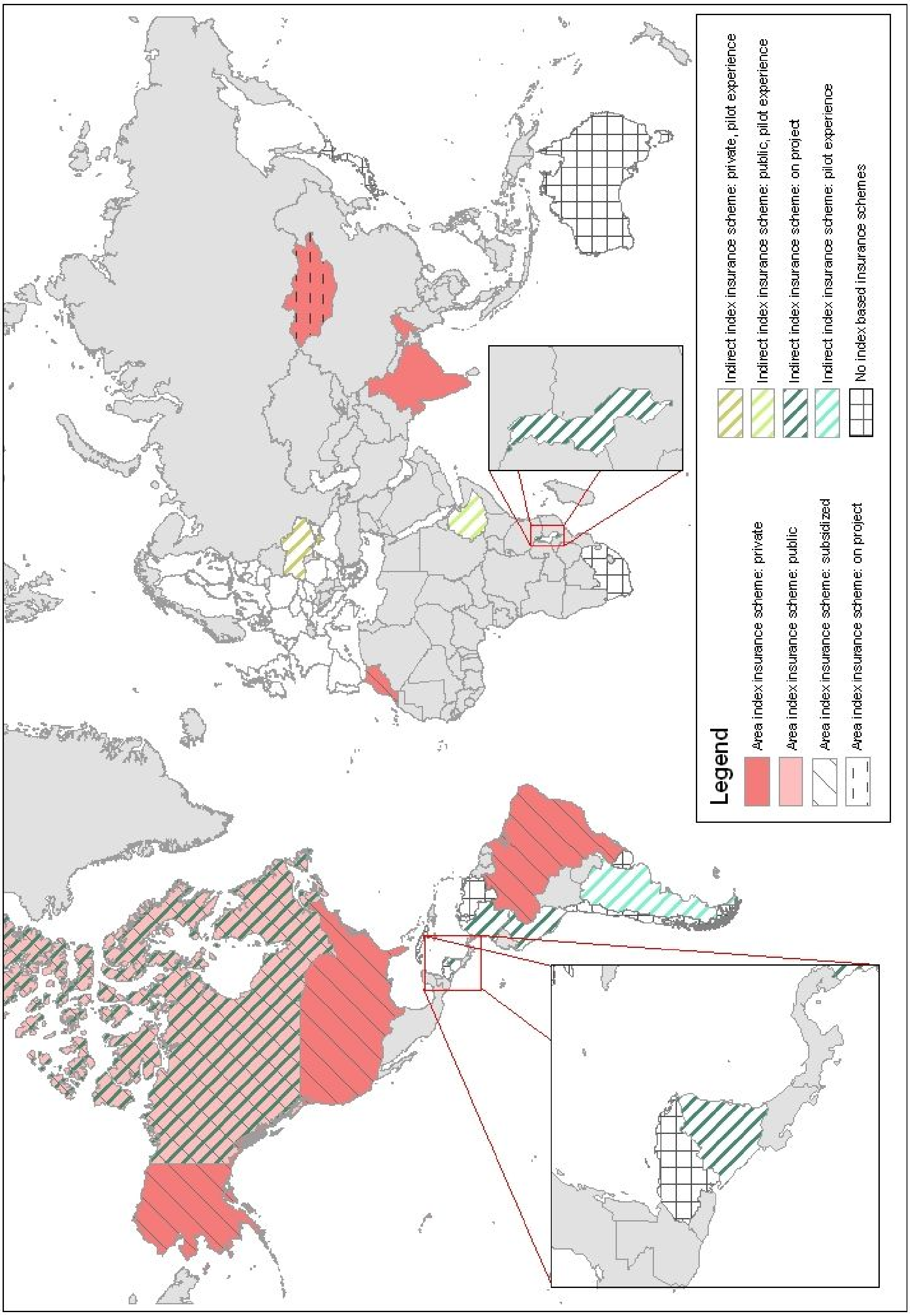



**Figure 50. Index-based insurance schemes in the world**

*Sources:* Authors' elaboration from information in ALASA (1992), ENESA-ID (2004), Ibarra and Mahul (2004), Skees et al. (2005), Skees and Enkh-Amgalan (2002), Skees et al. (2001), Stoppa and Hess (2003) and World Bank (2005).

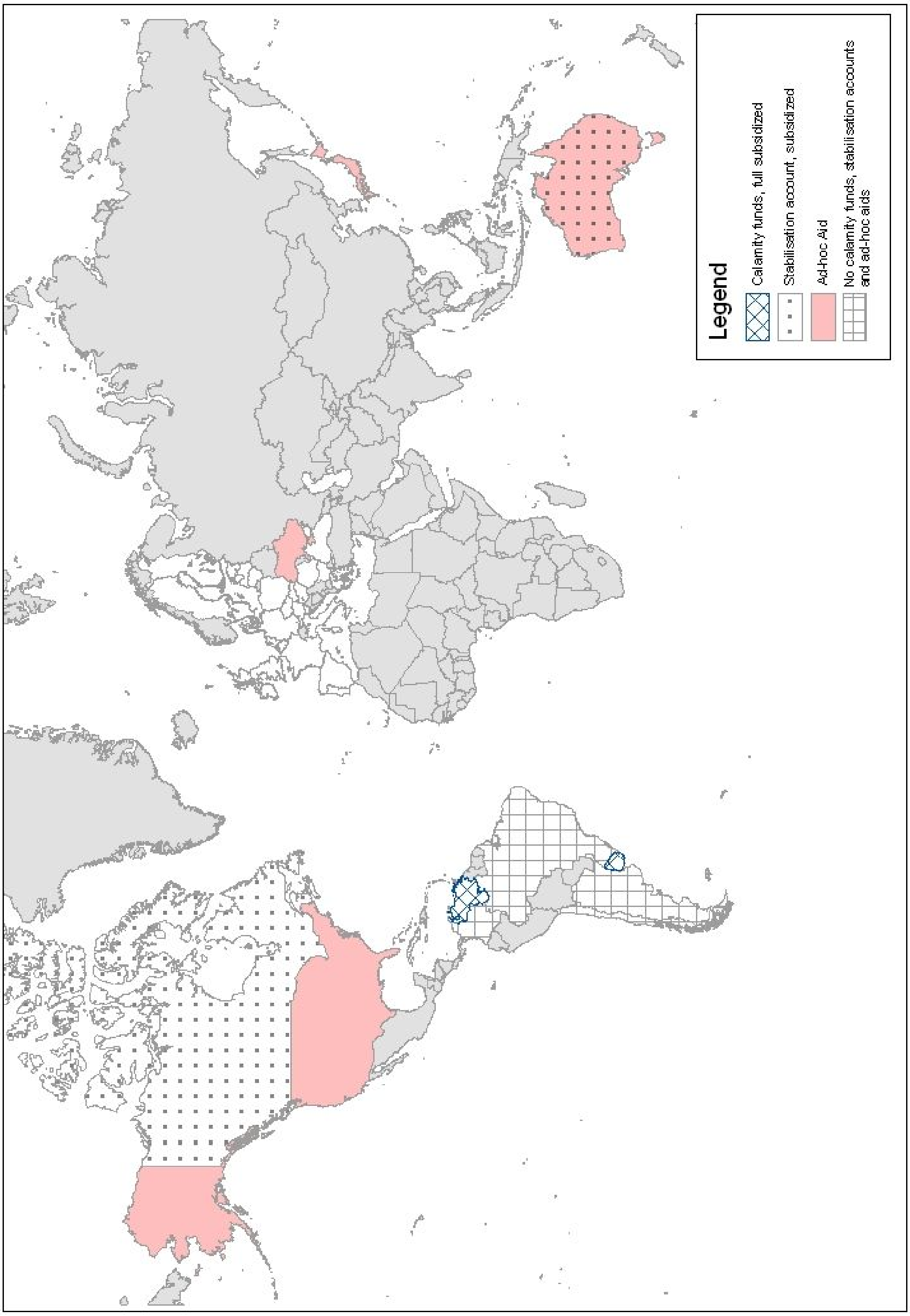



**Figure 51. Calamity funds and stabilisation account-based insurance schemes and ad hoc aid in the world**

*Sources:* Authors' elaboration from information in ALASA (1992), ENESA-ID (2004), Ibarra and Mahul (2004), Skees et al. (2005), Skees and Enkh-Amgalan (2002), Skees et al. (2001), Stoppa and Hess (2003) and World Bank (2005).

**Table 8. Agricultural insurance systems in non-EU countries**

| Country | Single-risk insurance (1) | Combined insurance (2) | Yield insurance (3) | Revenue insurance (4) | Whole-farm yield insurance (5) | Whole-farm income insurance (6) | Area index insurance (7) | Indirect index insurance (8) | Stabilisation accounts (9) | Calamities fund (10) | Ad hoc aid (11) | Date of most recent info available |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Argentina** | P | P | - | - | - | - | - | # | - | - | - | 2002–04 |
| **Australia** | - | - | - | - | - | - | - | - | S | - | GF | 2000 |
| **Brazil** | - | PS | PS | - | - | - | PS | - | - | - | | 2002–04 |
| **Canada** | (P) | - | GS | | | - | GS | ## | S | - | | 2005 |
| **Chile** | PS | | - | | - | - | - | - | - | - | | 2002–04 |
| **Colombia** | - | PS | - | - | - | - | - | ## | - | - | - | 2002–04 |
| **Cuba** | - | G (GS) | GS | - | - | - | - | - | - | - | - | 2002–04 |
| **Ethiopia** | - | - | - | - | - | - | - | G# | | | | 2005 |
| **Honduras** | - | P | - | - | - | - | - | - | - | | | 2006 |
| **India** | - | - | - | - | - | - | P | P# | | | | 2005 |
| **Japan** | | GC+GS | GS | | GS | - | - | - | | | GF | 2000 |
| **Malawi** | - | - | - | - | - | - | - | ## | - | | | 2005 |
| **Mexico** | | P + PS + GS | | #? | | | | | | - | | 2002–04 |
| **Mongolia** | | P (+GC#) | | | | | ## | - | | | | 2005 |
| **Morocco** | P | PS | - | - | - | - | PS | - | - | | | 2005 |
| **Nicaragua** | | | | | | | - | ## | | | | 2005 |
| **Peru** | - | - | - | - | - | - | - | ## | - | | | 2005 |
| **South Africa** | P | P | P | - | | | - | - | | | | 2002–04 |
| **Ukraine** | | P (S#) | - | - | - | - | - | P# | - | | GF | 2005 |
| **Uruguay** | PS | P | Pilot experience in 2002 | - | - | - | - | - | - | GF | - | 2002–04 |
| **USA** | - | - | PS | PS | - | PS | PS | - | - | - | GF | 2005 |
| **Venezuela** | | P | - | - | - | - | - | - | - | GF | - | 2002–04 |

Legend:

| | | | |
|---|---|---|---|
| - | Not existing (empty space means that there was no information about it) | GC | Public compulsory partially subsidised |
| S | Subsidised | GF | Public free |
| P | Private non-subsidised | # | Pilot experience |
| PS | Private partially subsidised | ## | On project |
| G | Public non-subsidised | § | Failed experience |
| GS | Public partially subsidised | | |

Notes:

Due to the differences in denominations in the different countries, we use the following nomenclature.

(1) Single-risk insurance means hail, or hail and fire insurance, or one single peril for livestock.

(2) Combined insurance means a combination of several risks protection. It would be the Italian 'poli-' or 'combined'.

(3) Yield insurance means multi-peril insurance where the main important risks are comprised (also drought), so some countries call it combined.

(4) Revenue insurance covers yield and price risks for a single product.

(5) Whole-farm yield insurance consists of a combination of yield guarantees for the different agricultural productions on a farm; in case of loss, with compensation between each other.

(6) Under whole-farm revenue insurance we include two types of insurance products: those that work as a combination of revenue insurance policies for various crops and/or livestock on the farm (in a similar way to whole-farm yield insurance), and also those products which directly cover the total revenue of the farm.

(7) Area index insurance refers to area yield insurance or area income insurance (indemnities are computed from the decrease on the average yields or income in an area).

(8) Indirect index insurance reports to those indices of yields or vegetation computed from satellite images, weather-based indices, etc.

(9) Stabilisation accounts are individual bank accounts for self-insurance but which are publicly regulated or promoted.

(10) Calamities funds, from single-product funds (crop or livestock) to funds that cover not only agricultural production.

(11) Ad hoc aid is government aid after a calamity or catastrophe.

*Sources:* Authors' elaboration from information in ALASA (1992), ENESA-ID (2004), Ibarra and Mahul (2004), Skees et al. (2005), Skees and Enkh-Amgalan (2002), Skees et al. (2001), Stoppa and Hess (2003) and World Bank (2005).

**Index insurances**

Index insurances differ from the other type of insurances in that the indemnities are not computed from the individual farmer's loss but from a parameter or index external to the farm. They have been divided into two categories: area index insurance (the index is directly an area average yield or income) and indirect index insurance (other kind of indices, such as the vegetation indices computed from satellite images). The reason for this division is that the latter are more complex and so more difficult to understand or to trust for the farmers. Even if all of them have a short history, the area index insurance schemes have been experienced for some years in some countries (Brazil , Canada, India or the USA), while the indirect indices are brand new and are only under study in most countries.

The area index insurance is most often based on the yields of an homogeneous area, so that if the area yield decreases below a given value, all the insured farmers in that area get an indemnity independent of their having a loss or not. An example of this is the group risk plan (GRP) in the USA. There is also another area insurance available in the USA, group risk income protection (GRIP), for which the index is the 'area revenue'; that is the product of the area yield times the price of the specific product. In 2004, area yield and area revenue policies accounted for 7.4 % of total acreage insured but less than 3 % of total premiums.

One particular case has been included in the area indices: Mongolia. The insurance policy that could be implemented in Mongolia in a near future is for livestock, and it is based on area mortality rates. This is possible because Mongolia performs a complete census of every species each year (Skees et al. 2005).

Regarding the indirect indices, the World Bank is promoting this kind of product as a tool for developing countries, sometimes for the individual farmers, sometimes for the governments, so that they get funds to give aid to the rural population when there is a catastrophe. In the case of Nicaragua, a weather index insurance was offered to the government with this purpose, but the government considered it unnecessary because 'they could depend on the global community for assistance when major catastrophes occurred' (World Bank, 2005).

**Stabilisation accounts**

Following the order of the columns in Table 8, stabilisation accounts are present in some countries. As mentioned before, these stabilisation accounts are individual accounts where farmers put an amount of money every year, which they can withdraw in a year of big losses. They can be based on yields, revenues or other indices. These particular accounts are considered because they are not self-insurance accounts created under the farmers' own initiative but they are supported and usually regulated by the government. The support can be given by means of direct subsidies complementing the farmers' contributions to the accounts, and/or by means of fiscal incentives. In the case of Australia, the account has fiscal incentives and the farmer can freely choose when he wants to withdraw the money. As a curiosity, there is also an example of a stabilisation account in Spain. It is available to potato producers in only one province (Alava) and it is based on an area index. It benefits both from fiscal incentives and from subsidies from the regional government.

The Canadian system is mainly led by public insurance agencies, from the provincial governments. It profits from subsidies from both the federal and the provincial governments, which total EUR 425.5 million and which amount to 66 % of the premiums. Besides yield insurance products similar to those in the USA, it has an important income programme: Canadian agricultural income stabilisation (CAIS), which consists on a stabilisation account. It started in 2003 and substitutes two former programmes: net income stabilisation account (NISA) and Canadian farm income program (CFIP), an income disaster assistance programme. CAIS is based on a farm's production margin, or farm revenue minus expenses directly related to a commodity's production (such as fuel, fertiliser, pesticide and feed costs). The CAIS programme is a whole-farm programme available to eligible farmers regardless of the commodities they produce. A programme payment is generated when a producer's current year production margin falls below that producer's reference margin, which is based on an average of the previous five-year programme margins less the highest and lowest. Producers are required to open a CAIS account at a participating financial institution and deposit an amount based on the level of protection they have chosen. For a disaster level of cover (0 % to 70 % of their reference margin) producers must deposit an amount equal to 20 % of their reference margin; the other 80 % is put up by the federal and provincial governments. For a second tier of protection (71 % to 85 % of the reference margin), producers must deposit an amount equal to 30 % (and the governments 70 %). Finally, if producers choose for their protection (86 % to 100 % of their reference margin), they must deposit an amount equal to 50 % (and the governments 50 %). Under the programme, governments pay increasing portions of the payment as the seriousness of the income decline increases. But governments only provide their share of funding when producers withdraw funding from their accounts.

The programme now includes cover for negative margins (programme margins which fall below zero). CAIS participants will be eligible for cover of 60 % of their negative margins should they occur. The negative margins payments will be fully funded by the federal and provincial governments, without the need for further producer deposits.

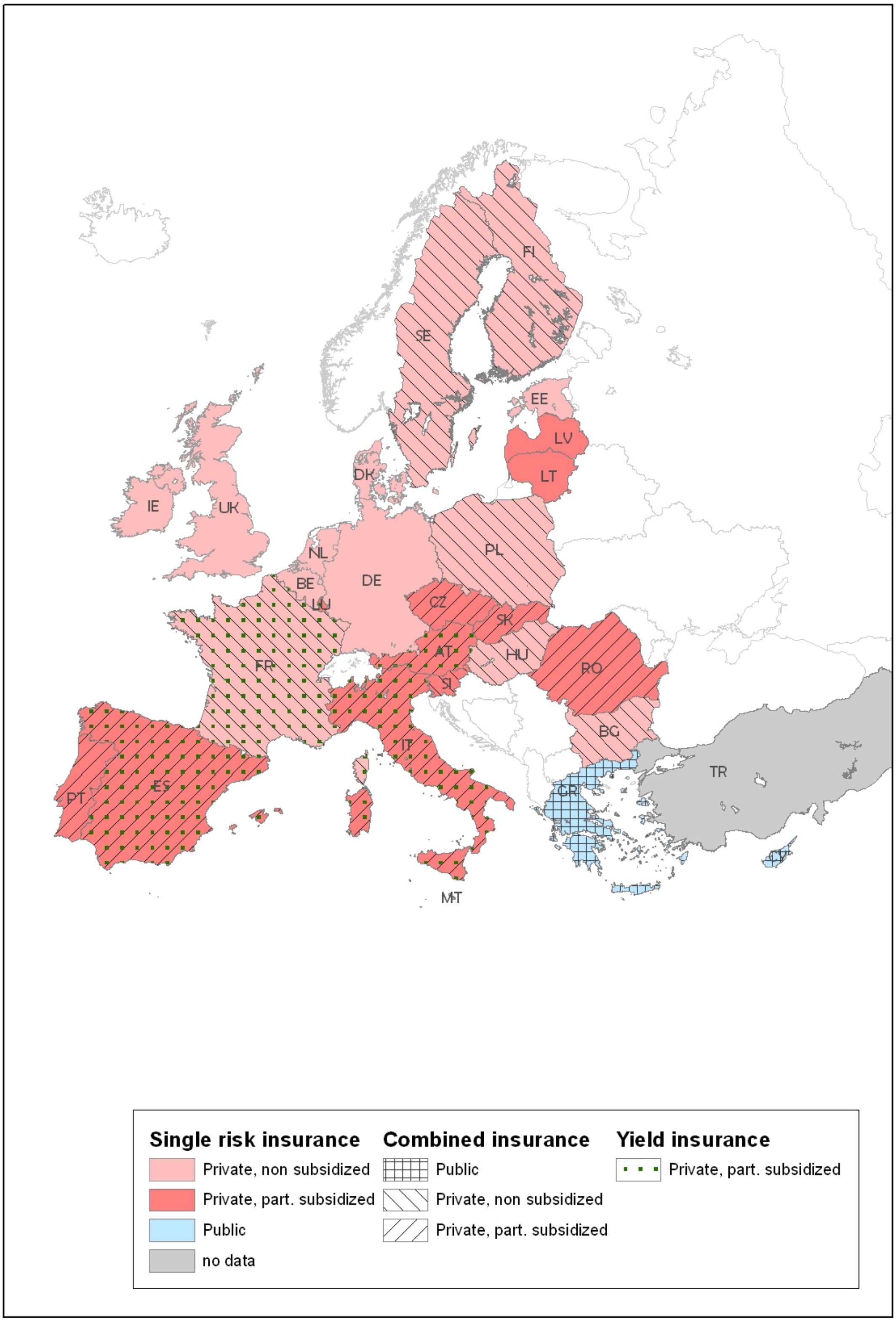
**Calamities funds and ad hoc aid**

The calamities funds and ad hoc aid are all forms of aid given by the provincial governments under the declaration of catastrophes. The ad hoc aid is *ex post* aid which has to be budgeted after a catastrophe has occurred, while the funds are provided every year by the government and they are regulated. The main advantage of the funds over the ad hoc aid is that they avoid big distortions of the government budget. Funds sometimes also receive contributions from the private sector, usually compulsory, in the form of levies on production or levies on insurance premiums.

## 5.3. General overview of agricultural insurance systems in Europe

This section describes in a general way the insurance systems existing in Europe. A more in-depth analysis of the European reality is undertaken in the coming sections. The figures and table shown in this section are similar and can be compared with those shown in Section 5.2 on risk management instruments in the world. The figures show maps corresponding to the same type of insurance products.

On the map shown in Figure 52, the existence of single-risk, combined and yield insurance schemes is illustrated together with the presence of public involvement. The information shown in the map is contained also in Table 9, and is commented on later in the text.




*Source:* Authors' elaboration from fact sheet information.

**Figure 52. Single, combined and yield insurance schemes in Europe**

**Table 9. Agricultural insurance systems in Europe**

| Country | Single-risk insurance | Combined insurance | Yield insurance | Revenue insurance | Whole-farm yield insurance | Indirect index insurance |
|---|---|---|---|---|---|---|
| **Belgium** | P | - | - | - | - | - |
| **Bulgaria** | P | P | - | - | - | - |
| **Czech Rep.** | PS | PS | - | - | - | - |
| **Denmark** | P | - | - | - | - | - |
| **Germany** | P | - | - | - | - | - |
| **Estonia** | P ([1]) | - | - | - | - | - |
| **Ireland** | P | - | - | - | - | - |
| **Greece** | P | GC + GS + G | - | - | - | - |
| **Spain** | PS | PS | PS | #§ ([4]) | - | PS |
| **France** | P | P | PS | # | PS | ## |
| **Italy** | PS | PS | PS | - | - | - |
| **Cyprus** | GC | GC | - | - | - | - |
| **Latvia** | PS | - | - | - | - | - |
| **Lithuania** | PS | - | - | - | - | - |
| **Luxembourg** | PS | PS | PS | ## ([1]) | - | - |
| **Hungary** | P | P | - | - | - | - |
| **Netherlands** | P | - | - | - | - | - |
| **Austria** | PS | PS | PS | - | - | # |
| **Poland** | P (S#) | P (S#) ([3]) | - | - | - | - |
| **Portugal** | PS | PS | - | - | - | - |
| **Romania** | PS | PS | - | - | - | - |
| **Slovenia** | PS ([2]) | P | - | - | - | - |
| **Slovakia** | PS | PS | - | - | - | - |
| **Finland** | P ([1]) | P ([1]) | - | - | - | - |
| **Sweden** | P | P | - | - | - | - |
| **UK** | P | - | - | - | - | § |

Legend:

| | | | |
|---|---|---|---|
| - | Not existing | GC | Public compulsory partially subsidised |
| S | Subsidised | GF | Public free |
| P | Private non-subsidised | # | Pilot experience |
| PS | Private partially subsidised | ## | On project |
| G | Public non-subsidised | § | Failed experience |
| GS | Public partially subsidised | | |

Notes:

([1]) Livestock only.

([2]) A national programme in Slovenia for subsidizing insurance in 2006 for the first time (subsidies from 30 to 50 % of the premium)

([3]) Offered but bought very rarely while no subsidies.

([4]) The failure of this pilot revenue insurance experience in Spain was due to the little interest expressed by the farmers. This insurance product was offered only for one agricultural product (potato) and for only five provinces. It lasted two years.

*Source:* Authors' compilation from fact sheets data provided by the experts in each country in 2006 (Malta is missing).

**Table 10. Agricultural insurance systems in other European countries**

| Country | Single-risk insurance | Combined insurance | Yield insurance | Revenue insurance | Whole-farm yield insurance | Indirect index insurance |
|---|---|---|---|---|---|---|
| **Croatia** | PS | PS | - | - | - | - |
| **Turkey** | PS | PS | PS | - | - | - |

*Source:* Authors' compilation from fact sheet data provided by the experts in each country

### Single-risk insurance

Single-risk insurance for hail is the most developed insurance with a long history and exists in all countries. For several countries, in particular Belgium, Germany, Ireland, the Netherlands and the UK, hail insurance or single-products insurance are the main insurance product available. Probably there is no broad cover provided in these countries because of the missing public support for insurance. Besides, if we look at the risk maps in the chapter on production and income variability in Europe (Chapter 3), we can confirm that these countries, mainly the UK, Ireland, the Netherlands, Denmark or even Germany, correspond to the countries with lower climatic risks (see dry matter, drought, rain at harvest, and freeze maps).

In some northern countries and also in the Baltic States there is less demand on crop insurance or they are starting to develop their systems, as is the case in Poland, Latvia and Lithuania.

### Combined-risk insurance

In Bulgaria, the Czech Republic, Hungary, Poland, Portugal, Slovenia, Slovakia and Sweden, single- and combined-risk insurance is available. Again, if we look at the maps in Chapter 4, we see that these regions in general have higher risks than those considered previously. For example Sweden has high freeze risks, Poland has rain at harvest, freeze and drought risks, and Portugal has drought risks. However, in combined insurance, only hail and a few additional risks like fire, frost, rain and wind are covered. The cover against drought, as one of the most difficult insurable systemic risks (because a large area can be affected), is usually not included in combined-risk insurance, whereas it is usually in the wide cover against all climatic risks of yield insurance.

In Finland, with high risks related to low temperatures, private crop insurance is less developed but a public crop compensation scheme is provided to compensate yield losses after natural disasters.

The schemes in Greece and Cyprus are different: a compulsory insurance system is provided by the public sector.

**Yield insurance**

Yield insurance guarantees the main risks affecting production. So, in the case of crops, the main risks affecting the yield (e.g. drought) are comprised. It exists in Spain, Italy, Austria and since recently in France. Again, as can be verified from the maps in Chapter 3, Spain and Italy are some of the countries with the highest drought and pasture reduction risk levels, and rain at harvest constitutes a risk for Italy, Austria and also Poland. Poland has no yield insurance but insurance is developing fast and subsidies to insurance have recently been introduced (2007). The countries with highest income risk are again Spain, France, Italy, Portugal, and Sweden; so we can see that in general, even if not total, there is a high correspondence between risk and insurance risk cover: countries with higher risk levels correspond to insurance covering more risks; and countries with more public sector involvement in the insurance system correspond to countries with cover of highly systemic risks, such as drought.

The Spanish insurance system is the most developed in Europe: insurance policies cover most risks affecting agricultural yields. The government, farm unions and insurance companies agreed that the farm insurance system defined in a law would be the tool for managing catastrophic damages in the farm sector. One of the specific characteristics of the Spanish agricultural insurance system is that all the insurance companies operate within a pool, which assumes the risk in a co-insurance regime.

In Austria the insurance industry founded one specialised mutual insurance company providing broad cover in yield insurance. Also in Italy, France and Luxembourg agricultural insurance is well developed and most risks are covered, depending on the contracts. Mostly there is basic cover for hail and, in addition, a yield insurance covering the most important risks in the country. In the majority of cases there is also a high level of public support in these countries.

**Income/revenue insurance**

Whole-farm income insurance and area yield/area revenue insurance do not exist in Europe.

**Index insurance**

Area index insurance has been commented on with the examples of GRP and GRIP in the USA and Mongolia in the previous chapter. In Europe this kind of insurance does not exist.

Regarding indirect indices, there are three examples in Europe. From the information gathered through the Member State fact sheets compilation, it appears that probably the first country where indirect indices insurance have been commercialised is Spain, where an insurance product for pastures has been available since 2001 based on vegetation indices computed on coarse resolution satellite images.

In Austria an indirect index insurance based on meteorological data for the cover of arable crops against drought risk was commercialised for the first time in 2007.

In the United Kingdom an index-based insurance programme was launched in 1998 based on the yield statistics of the Home Grown Cereals Authority and prices based upon the LIFFE commodity futures. The cover provided indemnity for a 10 % fall in yield and a 5 % fall in price. Premium rates varied depending on the region from 1.10 % to 3.5 %. Take-up was minimal and the product offer was cancelled in the following season.

## 5.4. Comparison of the EU and US agricultural insurance systems

Insurance in the USA is private but subsidised and benefits from public reinsurance. Currently, 17 companies are involved, and among the main ones are Ace Property and Casualty Insurance Company, Hartford Fire Insurance Company, and Rural Community Insurance. They work in agreement with the government's Risk Management Agency (RMA), which is part of the USDA (United Sates Department of Agriculture).

**Table 11. Comparison of US and EU-25 crop insurance aggregate data**

| | Unit | USA | EU-25 |
|---|---|---|---|
| **Total production value 2004** | Million EUR | 81 560 total crops (of which 50 154 field crops ([1])) | 161 923 |
| **Currently insured production value** | Million EUR | 37 000 | 36 730 |
| **Shared of insured production value on total/insurable** | % | 45/74 | 23/? |
| **Premiums** | Million EUR | 3 300 | 1 538 |
| **Share of premium on insured value** | % | 9 | 4 |
| **Subsidies** | Million EUR | 1 900 | 497 |
| **Share of subsidies on premiums** | % | 58 (72 including administrative costs and reinsurance) | 32 |

Note:

EUR 1 = USD 1 273 (September 2006).

([1]) From a total crop production of EUR 81 560 million, EUR 50 154 million correspond to field crops, which are the crops considered insurable in the USA.

*Sources:* Approximate values calculated from data in CEA (2005) Data, World Bank (2005), Rain and Hail Insurance Society (2005) and AGmanager.info (http://www.agmanager.info/crops/insurance/risk_mgt/rm_html05/ABksLR.asp).

Approximately 45 % of crops produced in the USA are insured while in Europe only approximately 23 %. The average premium rates in the USA (9 %) are much higher than in Europe (4 %), most probably because they correspond in a big proportion to revenue insurance schemes and in a lower proportion to yield insurance schemes, whereas in Europe they correspond to single-risk, multi-risk and yield insurance schemes. The premium subsidies in the USA amount to EUR 1 900 million, which corresponds to 58 % of the total risk premiums. The US government also provides funds for the administrative costs of the insurance companies and reinsurance. The total support thus provided to insurance would amount to 72 % of the total premiums. European subsidies to insurance premiums are around EUR 500 million (32 %).

## 5.5. Main insurance data at country level

Collecting basic information on the situation of agricultural insurance schemes in countries of the EU is not straightforward. Few or no figures at all can be found in the standard statistical sources. Collection has been undertaken by two channels:

— through a series of experts (consultants, insurance companies, public organisations), who have accepted to provide such information in the fact sheets described in the introduction;

— through the members of the Agricultural Risks Insurance Committee from the European Insurance Committee (Comité Européen des Assurances (CEA)). Some information has been extracted from a document entitled ‘European insurance system for agricultural risks’ (CEA, 2005a), which contains a number of very valuable quantitative indications, suitable for comparison of the situation in different Member States. Additional work is certainly needed to complete data, check its comparability and analyse the differences.

### *5.5.1. Insurance demand and market penetration*

One fact interesting to analyse is the demand for insurance, which can be expressed in absolute terms as the number of insured farms, the insured surface or the insured value. It can also be expressed in relative terms — in per cent — as the proportion of insured farms of the total farms, as the insured surface of the total surface or as the insured capital of the total production value. In these cases, we speak of market penetration or of participation rates. Sometimes, the market penetration is not expressed as a percentage of the total value or total surface, but as a percentage of the insurable value or insurable surface. The definition of insurable depends on the country and the insurance system, but often only those crops for which an insurance product exists are considered instead of all crops, and it is similar for livestock (Bielza et al., 2004).

### Table 12. Demand for crop and animal insurance: farms, area and animals

| Country and insurance systems | Years available | Number of farms (number of contracts) | Insured farms of insurable farms (%) | Total area insured (ha) | Insured area of insurable area (%) | Insured area of total agricultural area (%) | Number of animals covered | Insured animals of eligible animals (%) |
|---|---|---|---|---|---|---|---|---|
| **Belgium °** | 1993–04 | - | - | - | - | - | - | - |
| **Bulgaria •♦** (2) | 2000–05 | - | - | 1 275 989 | 52 | - | 14 519 0 00 | 62 |
| **Czech Republic •♦** | 2000–05 | 4 000 | - | 1 072 667 | 35 | 35 | - | 85 |
| **Denmark °♦** | 2001–05 | - | 95 | - | - | 82.5 | - | - |
| **Germany °♦** | 2000–05 | - | - | 7 265 071 | - | 43 | - | - |
| **Estonia ♦** | 2005 | - | - | 0 % | 0 | 0 | 7 136 | 6 |
| **Ireland °** | - | - | - | - | - | - | - | - |
| **Greece compulsory ELGA •♦** | - | - | (100) | - | (100) | - | - | (100) |
| **Greece private •♦♠** (3) | 2000–04 | 987 | < 1 | 5 300 | < 1 | - | - | - |
| **Spain ♣♦♠** (3) | 2001–05 | (477 354) | - | 5 849 598 | - | - | 102 854 756 | - |
| **France ♣** | 1996–04 | 60 000 | 15 | 3 507 186 (6) | - | - | - | - |
| **Italy ♣** (5) | 2001–05 | 84 373 (212 733) | - | 975 667 | - | 8 | - | - |
| **Cyprus •** | 2005 | (49 954) | 100 | 112 173 | 100 | - | 0 | 0 |
| **Latvia °♦** | 2000–05 | 54 | < 1 | - | < 1 | < 1 | - | < 1 |
| **Lithuania °♦** | 2004–05 | 2 062 | - | 9 000 | < 1 | < 1 | 164 647 | < 1 |
| **Luxembourg♣** | 2001–05 | 1 555 | 57 | 26 000 | 45 | 45 | - | - |
| **Hungary •♦** | 1999–05 | 14 108 | - | | 52 | 30 | | |
| **Netherlands°** (4) | - | - | - | - | - | - | Fund | Fund |
| **Austria ♣♦** | 2000–05 | 68 851 (78 418) | 78 | 1 053 991 | 78 | 46 | 270 911 | 14 |
| **Poland °♦** | - | - | 3 (1) | - | 6.6 | - | - | > 4 |
| **Portugal •** | 1998–03 | 77 954 | 40 | 298 329 | 22 | 22 | - | - |
| **Romania •♦** | 2005 | 43 000 | 1 | 812 109 | - | 12 | 141 360 (7) | 8 |
| **Slovenia •♦** | 2000–05 | (65 992) | - | - | 17 | - | - | 16 |
| **Slovakia •♦** | 2000–04 | - | - | - | - | - | - | - |
| **Finland ♦** | 1996–05 | 20 600 | 30 | - | - | - | - | - |
| **Sweden •♦** | 2005 | - | - | 1 500 000 | 60 | | 80 730 7 00 | 91 |
| **UK °♦** | - | - | - | 370 000 | - | 6.9 | 1 280 00 0 | 2.6 |
| **(Croatia) •♦** | 2000–04 | (24 726) | - | - | - | 3 | 61 917 | 13 |
| **(Turkey) °♦** | 1996–06 | (192 390) | - | 439 200 | - | 1.8 | - | 0.3 |

Legend:

| | | | |
|---|---|---|---|
| ° | Hail insurance for crops | ♦ | Livestock insurance |
| • | Combined insurance (possibly single-risk for some crops) | ♠ | Fish/forest insurance |
| ♣ | Yield insurance (possibly single or combined for some crops) | - | Not available |

(1) Only crops. Livestock excluded.

(2) There are no official data about the agricultural insurance market in Bulgaria. For this reason, all data is based on interviews with senior experts from leading insurance companies.

(3) Aquaculture is included in Greece and Spain. In the number of animals, poultry insurance is included in Spain.

(4) Data from the Netherlands are for hail and glasshouse insurance. Most data are not supplied by the companies, for reasons of competition.

(5) Animal insurance data are not available for Italy because they are not subsidised. The insured values and premiums data include crops and structures.

(6) Only the area from subsidised insurance in 2005.

(7) Data only on cows.

Note: All values shown are averages of the last three years from available data.

*Source:* Authors' compilation from fact sheets, with own calculations.

Data on the demand for insurance in the different countries has been provided in the fact sheets. Table 12 shows the demand expressed in number of insured farms, the participation rates on insurable farms, the demand expressed in insured surface, the market penetration in respect of insurable and total surface and, lastly, the number of insured animals and the percentage of insurable animals. Table 14 completes the documentation of the national demands, with the demands and market penetration expressed in value (million euros).

We can see in Table 12 that in Austria the percentage of insured farms and insured area on insurable area is the highest, which is explained by the existence of subsidies given since 1995 covering most risks. Since then there has been a continuous increase on insured area every year. Currently almost 80 % of insurable area is covered against hail as basic cover, but also around 46 % is covered for yield insurance.

The relatively high demand of insurance in Bulgaria (52 %) and around 1.2 million hectares in the absence of subsidies needs to be explained. It can be explained because the government settles buying insurance as a condition for getting some forms of public aid. This applies for crops receiving annual State support. In 2005 those were wheat, maize and sunflower, rape, rice, potatoes, red peppers and tomatoes.

The total area insured in Spain, Austria and Italy, three countries with subsidised insurance, is respectively 6 million, 1 million and almost 1 million hectares. It is interesting to note that only 8 % (nearly 1 million hectares) of the total area is insured in Italy, in a system with the highest level on subsidies to insurance (67 %).

A high level of insured area, with 43 % and more than 7 million hectares, is found in Germany, but no yield insurance is available. So the penetration level refers to single-risk (hail) insurance.

In the Czech Republic the market penetration in crop insurance is about 35 % (more than 1 million hectares, close to the Austrian insured area, 33 % in arable crops, 67 % of hop fields, but only 15 % of the wine area and 20 % of fruits). In livestock insurance (cattle) the degree of penetration is about 85 %.

In Cyprus crop insurance is compulsory in a public system, so it seems to be 100 %, but there is no insurance for livestock available and no complementary insurance in the private sector for crops.

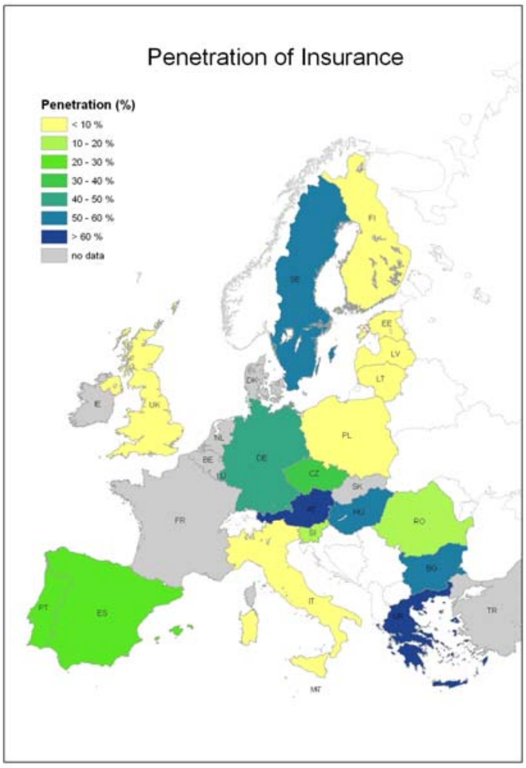
In Finland no commercial crop insurance is available, but almost the whole area is covered by the public crop compensation scheme. For livestock insurance, around 30 % is covered in a model of group insurance.

In the Baltic States (Latvia, Lithuania, Estonia) agricultural insurance has only started to build up. The insurance market penetration is around 1 %. In Estonia only livestock insurance is available.

Again, we find there is a lack of data, even from other countries, such as Greece or France, which subsidise insurance. But the total insured area in France with around 3.5 million hectares is very high.

In Sweden and Hungary there is also a high degree of market penetration (60 % and 52 %) but no yield insurance is available.

Figure 53 presents the penetration in terms of percentage of insured area on insurable area (when available) or on total crop area. For comparison purposes, in Figure 54 we show the most comprehensive insurance schemes in every country, assuming that yield insurance is more comprehensive than multi-peril, and that multi-peril is more comprehensive than single-risk insurance. Also, we show them only if they have some significance, thus omitting pilot schemes and those with a negligible demand. By comparing both figures, we can observe that there are many countries, like the United Kingdom, Finland, Estonia, Latvia and Lithuania, with low market penetration and where only single-risk insurance is developed. However, assuming that a more developed insurance system offers more comprehensive insurance schemes, we can see that a high market penetration is not always associated to a more developed insurance system. For example, in the case of Austria it could be true, but in Italy insurance is very developed and penetration is quite low.




*Source:* Authors' elaboration from fact sheet information and from CEA (2005a) for Spain.

**Figure 53. Market penetration of crop insurance (% of insured area)**


*Source:* Authors' elaboration from fact sheet information.

**Figure 54. Most comprehensive insurance schemes per country**

Additionally, there is a clear example for the case of Germany, where market penetration is higher than in many other countries (Spain, Italy, Slovenia, Czech Republic, etc.) where insurance is more developed. This high market penetration corresponds only to basic cover (mainly hail insurance) while the lower market penetration for the other countries corresponds to a more developed insurance system and, perhaps, to a higher market penetration in terms of value.

From this analysis we can conclude that the percentage of insured area does not give an objective measure to understand the importance or the development of insurance in a country, but it needs to be combined with the cover offered by the insurance schemes and, if available, with the market penetration in terms of insured value.

Table 13 shows the insured capital or liabilities in absolute values and as a percentage of the insurable production and the total production. In general we have to point out that there are a lot of data missing and that these data are difficult to compare, particularly on the livestock sector. Aquaculture has been included in cattle production in Spain and Greece. In Greece's private insurance, aquaculture production accounts for 98 % of the livestock insured value, and for 93 % of the total. The total insured production without aquaculture would be EUR 21.7 million instead of EUR 307 million. In Spain we only have this information disaggregated for 2005, but aquaculture in that year represents less than 0.5 %, more or less the same as forest insurance. Lastly, it seems unavoidable to notice the decreasing trend in private crop and livestock insurance in Greece. The insured value of crops has decreased from 2000 to 2005 in a continuous way from EUR 23 million to EUR 15 million, and that of livestock, from EUR 18 million to EUR 5 million.

The highest insured production values in crop insurance are in France (EUR 12 billion), Germany (EUR 11 billion), Spain (EUR 6 billion), Italy (EUR 3.5 billion) and Austria (nearly EUR 2 billion).

Table 13. Demand for crop and animal insurance: insured value

| Country and insurance systems | Years available | Crop insured value (million EUR) | Livestock insured value (million EUR) | Production value covered crop + livestock (million EUR) | Total insured value on insurable production (%) | Total insured value on total production (%) |
|---|---|---|---|---|---|---|
| **Belgium ◦** | 1993–04 | - | - | - | - | - |
| **Bulgaria •♦** ([2]) | 2000–05 | 111.8 | 151.3 | 263.1 | 20.4 | 9 |
| **Czech Republic •♦** | - | 708 | 1 062 | 1 770 | - | - |
| **Denmark ◦♦** | - | - | - | - | - | - |
| **Germany ◦♦** | 2000–05 | 11 293 | - | | | |
| **Estonia ♦** | 2005 | 0 | - | - | - | - |
| **Greece ELGA •♦** | - | - | - | - | - | - |
| **Greece private •♦♠** ([3]) | 2000–04 | 15 | 292 | 307 | | |
| **Spain ♣♦♠** ([3]) | 2001–05 | 5 659 ([6]) | 4 096 ([6]) | 9 033 | | |
| **France ♣** | 1996–2004 | 12 149 | - | - | | |
| **Italy ♣** ([5]) | 2001–05 | 3 636 | - | 3 636 | 20 | 12.6 |
| **Cyprus •** | 2001–05 | 120.8 | 0 | 120.8 | - | - |
| **Latvia ◦♦** | 2000–05 | - | - | - | < 1 | < 1 |
| **Lithuania ◦♦** | 2004–05 | 3 | 22.6 | 25.6 | - | - |
| **Luxembourg ♣** | 2001–05 | 56 | - | - | - | - |
| **Hungary •♦** | - | - | - | - | - | - |
| **Netherlands ◦** ([4]) | - | - | - | - | - | - |
| **Austria ♣♦** | 2000–05 | 1 739 ([7]) | 267 | 2 006 | 79 ([6]) | - |
| **Poland ◦♦** | - | - | - | - | - | 5.5 ([1]) |
| **Portugal •** | 1998–2003 | 561 | - | 561 | 14 | 14 |
| **Romania •♦** | 2005 | 258 5 | - | 25.5 | - | 6 |
| **Slovenia •♦** | 2000–05 | 59 9 | 64.8 | 124.7 | 16 | - |
| **Slovakia •♦** | 2000–04 | - | - | - | - | - |
| **Finland ♦** | 1996–2005 | - | - | - | - | - |
| **Sweden •♦** | 2005 | - | - | - | - | - |
| **UK ◦♦** | - | 198 | 1 130 | 1 328 | - | - |
| **(Croatia) •♦** | 2000–04 | 179 | - | - | - | - |
| **(Turkey) ◦♦** | 2004 | 371 8 ([7]) | - | - | - | - |

Legend:

| | | | |
|---|---|---|---|
| ◦ | Hail insurance for crops | ♦ | Livestock insurance |
| • | Combined insurance (possibly single-risk for some crops) | ♠ | Fish/forest insurance |
| ♣ | Yield insurance (possibly single or combined for some crops) | - | Not available |

([1]) Only crops. Livestock excluded.

([2]) There are no official data about the agricultural insurance market in Bulgaria. For this reason, all data is based on interviews with senior experts from leading insurance companies.

([3]) Aquaculture is included in Greece and Spain. In the number of animals, poultry insurance is included in Spain.

([4]) Data from the Netherlands are for hail and glasshouse insurance. Most data are not supplied by the companies for competition reasons.

([5]) Animal insurance data are not available for Italy because they are not subsidised. The insured values and premiums data include crops and structures.

([6]) Only 2005.

([7]) Without greenhouses.
Note: All values shown are averages of last the three years from available data.
*Source:* Authors' compilation from fact sheets, with own calculations.

**Livestock insurance market penetration**

In the Netherlands, the existence of a compulsory fund for livestock producers hinders the development of livestock insurance. For Italy and France, animal or livestock insurance data are not available because this type of insurance is not subsidised. Nevertheless, the demand of livestock insurance for those countries, as well as for the UK, seems to be quite residual.

In Greece, insurance is compulsory for livestock, but it is voluntary for pigs and poultry. Pigs and poultry insurance are also offered by the public entity ELGA. In the case of Spain, the number of animals includes also those for poultry insurance which has been offered in 2004 and 2005. If we ignore poultry insurance, the average number of animals insured for the last three years would be reduced from 102 850 000 to 3 800 000. Data on the number of animals would become more meaningful by applying equivalence coefficients to different species, so that everything is expressed in UGBs (*unités gros bétail* = large livestock unit) or LSUs (livestock standard units).

### *5.5.2. CEA data on insured value*

The Comité Européen des Assurances (CEA) had been informed about the existence of the request by the Agriculture and Rural Development DG to have a description of the situation of agricultural insurance schemes in Europe. The Secretariat in Paris took the initiative in December 2005 to send a questionnaire form to their members (national associations of insurers). Replies were received from Austria, Germany, France, Italy, the Netherlands, Poland, Portugal, Spain and Switzerland (CEA, 2005d). The preliminary analysis of the replies indicates that they are, in general terms, too generic and insufficiently specific. Some of this information is used in other sections of the report.

The Agricultural Risks Insurance Committee of the CEA has also provided a document 'European Insurance system for agricultural risks' (CEA, 2005a), which summarises the responses by CEA members to another questionnaire launched by CEA in 2004 (CEA, 2004). The analysis and tables below are based in this document.

Table 14 and 15 and report the information regarding insured value. The provided data are incomplete for the EU but the listed nine countries in Table 14 account for 81 % of the total EU-25 crop production value.

The 'total production value (Eurostat) 2004' data refer to crop and livestock outputs at basic prices. This information was collected in order to provide market penetration measures. We have to take into account that the percentage of insured production value reclusively considered is not an indicator of the development of agricultural insurances, because it also depends on the existence of only single-risk insurance or also combined insurance. The ‘insurable production value (CEA)’ is data from the 2004 CEA questionnaire and in it CEA members try to estimate the insurable production value in the countries. Looking at the percentage data of insurable production value to the total production value, it seems that around 60 % to 70 % of the total production value is a realistic percentage of the insurable production value for the countries with well developed insurance systems. It is surprising that the percentage of insurable production value in France is only 33 %. A possible reason for this low insurable production rate could be the existence of a calamity fund which can reduce the offer of insurance products. In contrast, if we compare this high possible level of penetration of 60 % to 70 % with the development of insurance in Spain over time, where insurance is offered practically for all products and for most risks, it seems to be too high. One of the possible reasons for the 72 % value in Spain could be the differences in accounting for values. For example, in the Eurostat production value, olive oil is considered, while in the insurable production, the value of the olives is accounted, which is much lower. Another example of these discrepancies can be found in the Netherlands, where the insurable production value is lower than the total production value.

**Table 14. CEA data: production value and insurance (crops)**

| | Total production value (Eurostat) 2004 (million EUR) | Insurable production value (CEA) (million EUR) | Currently insured production value (million EUR) | Insurable production value/total (Eurostat) (%) | Currently insured pv/insurable pv (%) | Currently insured pv/total (Eurostat) (%) |
|---|---|---|---|---|---|---|
| **Austria** ([1]) | 2 639 | 1 700 | 1 739 | 80 | 83 | **66** |
| **Denmark** | 3 227 | 2 613 | 2 613 | 81 | 100 | **81** |
| **France** ([1]) | 36 508 | 12 000 | 9 477 | 33 | 79 | **26** |
| **Germany** | 22 848 | 16 742 | 11 120 | 73 | 66 | **49** |
| **Greece** ([1]) | 8 378 | 6 317 | 6 317 | 75 | 100 | **75** |
| **Italy** ([1]) | 29 405 | 27 333 | 3 384 | 93 | 12 | **12** |
| **Netherlands** | 9 915 | 10 677 | 1 736 | 108 | 16 | **18** |
| **Portugal** ([1]) | 3 964 | 1 178 | 634 | 30 | 54 | **16** |
| **Spain** ([1]) | 28 403 | 20 328 | 5 310 | 72 | 26 | **19** |

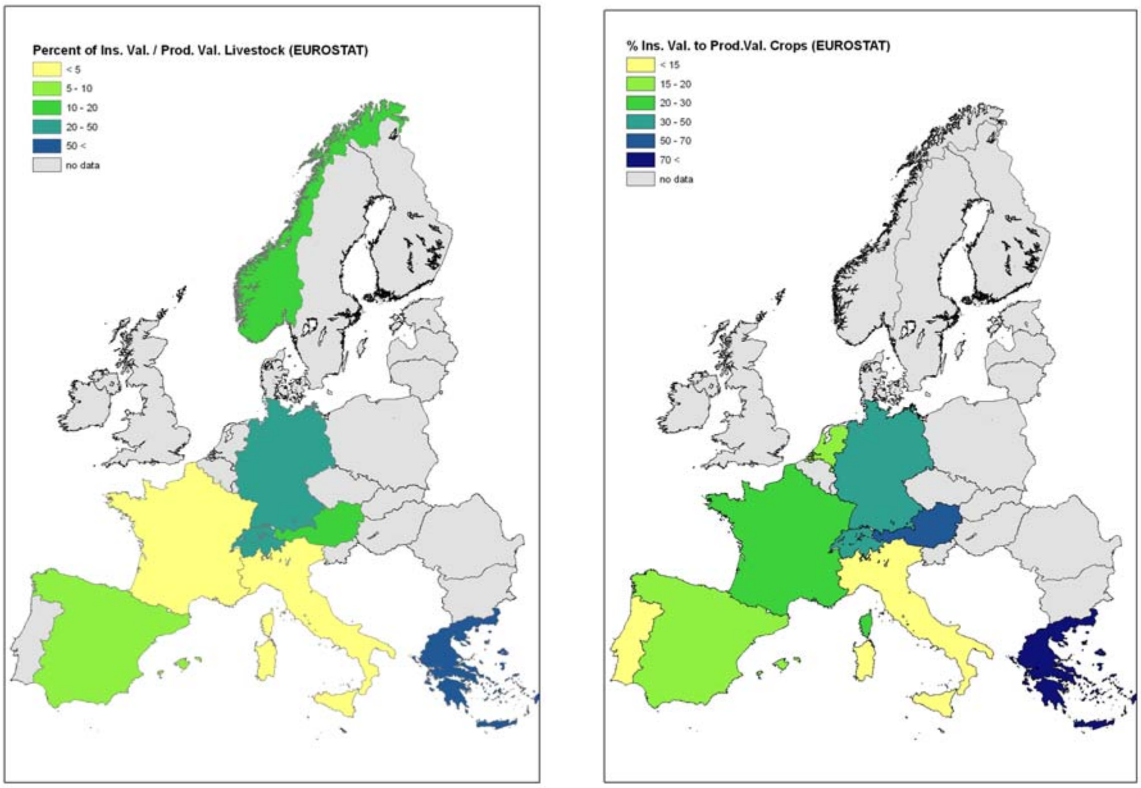
([1]) Countries with combined or yield insurance.

*Source:* Authors’ elaboration from CEA (2005a) data.

**Table 15. CEA data: production value and insurance (livestock)**

| | Total production value (Eurostat) 2004 (million EUR) | Insurable production value (CEA) (million EUR) | Currently insured production value (million EUR) | Insurable production value/total (Eurostat) (%) | Currently insured pv/insurable pv (%) | Currently insured pv/total (Eurostat) (%) |
|---|---|---|---|---|---|---|
| **Austria** | 2 614 | 1 100 | 267 | 42 | 24 | **10** |
| **Denmark** | 4 880 | 10 451 | 10 451 | 214 | 100 | **214** |
| **France** | 23 903 | 8 000 | 633 | 33 | 8 | **3** |
| **Germany** | 19 784 | 6 094 | 8 993 | 31 | 148 | **45** |
| **Greece** | 2 877 | 2 007 | 2 007 | 70 | 100 | **70** |
| **Norway** | 1 683 | 279 | 278 | 17 | 100 | **17** |
| **Spain** | 13 871 | 4 427 | 997 | 32 | 23 | **7** |

*Source:* Authors' elaboration from CEA (2005a) data.




*Source:* Authors' elaboration from fact sheet information.

**Figure 55. Production value (Eurostat 2004) to insured value (CEA 2005a) separated for crops and livestock in Europe**

Also in the case of livestock (Table 15) there are important discrepancies about the production value. For example in Denmark, the total production value is much lower than the insurable value. This needs to be clarified, mainly for the German livestock, where the discrepancy is not minor. The rates over 100 % are of course a

consequence of the discrepancy of the figures of production value, insurable production and currently insured production value. The reason could be that different bases by product prices have been used. Another explanation could be the fact that the same production value can be insured within several insurance schemes (against several individual risks).
It should also be verified as to why in Denmark the insured values equal the insurable values. In contrast, in the case of Greece, this can be explained because the Greek insurance system is compulsory for farmers.

### *5.5.3. Premium amount, subsidies and indemnities*

Table 16 attempts to summarise the main data collected from the fact sheets. The first four columns show the main types of insurance schemes available in every country, as shown previously in Table 9. Then it shows the insured area and market penetration, also commented on before. The last columns deal with premiums, indemnities and subsidies. This can help the reader to understand and explain the differences in the figures, which are sometimes marked by the differences in insurance systems.
First we can point out that there is no comprehensive yield insurance without public support available in Europe. It seems that for non-systemic risks like hail the private sector offers suitable insurance schemes, but for insurance products offering a wide cover in yield insurance, there is a direct relationship between development of the system and public support. In countries where there is no subsidy, insurance companies do not supply broad cover. The amount of support provided by EU Member States to subsidise insurance premiums varies depending on the country's policy to promote some particular type of cover.
Premiums expressed as a percentage of the insured value in Table 16 are also shown on the map in Figure 56. On looking at these premium rates, we find very different levels, from a low level around 1.5 % corresponding to private insurance in the Czech Republic, Greece and France, to the highest level around 6 to 7 % in Cyprus, Italy, Portugal and Spain. First we must point out that these rates are the total amount of premiums expressed as a percentage of the total national insured value in crop or livestock production, so they do not constitute premium rates on risk level. More detailed information on premium rates can be found in Section 5.6 'Technical aspects of agricultural insurance at product level' where some examples are given for specific insurance systems in Member States. It is shown for particular cases because the magnitude of premium rates depends on the insurance type (risks covered, type of crops covered and other technicalities). Further examples of premium rates for single-, combined- and yield insurance can be found can be found in Table 41 (Section 8.7).

**Table 16. Summary of data provided from fact sheets**

| Country | Single-risk ins. | Com-bined ins. | Yield ins. | Market pene-tration (%) | Insured area (1 000 ha) | Premium amount (million EUR) | Premium /insured value (%) | Average indem-nities (million EUR) | Loss ratio (%) | Insurance subsidies (million EUR/%) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Belgium** | P | - | - | n.d. | n.d. | 49.0 | n.d. | n.d. | 65 ([1]) | 0 |
| **Bulgaria** | P | P | - | 52 | 1 276 | 6.6 | 4.8 | 4.5 | 65 | 0 |
| **Czech Rep.** | PS | PS | - | 35 | 1 074 | 32.0 | 1.8 | 24.0 | 73 | 7/30 |
| **Denmark** | P | - | - | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | 0 |
| **Germany** | P | - | - | 43 | 7 265 | 129.2 | 1.2 | 104.5 | 83 | 0 |
| **Estonia** | P ([2]) | - | - | < 1 | n.d. | 0.1 | n.d. | n.d. | n.d. | 0 |
| **Ireland** | P | - | - | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | 0 |
| **Greece** | P | GC + GS + G | - | (100) | n.d. | n.d. | 2.5–3 | 218.0 | n.d. | n.d. |
| **Spain** | PS | PS | PS | 26 | 5 850 | 564.7 | 6.3 | 388.3 | 69 | 232/41 |
| **France** | P | P | PS | n.d. | 3 507 | 211.0 | 1.7 | n.d. | n.d. | 5/2.4 |
| **Italy** | PS | PS | PS | 8 | 976 | 271.2 | 7.4 | 166.2 | 63 | 180/67 |
| **Cyprus** | GC | GC | - | (100) | 112 | 8.7 | 7.2 | 4.5 | 95 | 4.4/50 |
| **Latvia** | PS | - | - | < 1 | n.d. | 0.1 | n.d. | n.d. | n.d. | 0.05/50 |
| **Lithuania** | PS | - | - | 1 | 9 | 1.1 | 4.3 | 1.1 | 100 | 0.55/50 |
| **Luxembourg** | PS | PS | PS | 45 | 26 | 1.3 | 2.3 | 1 | 86 | 0.65/50 |
| **Hungary** | P | P | - | 52 | n.d. | 43.5 | n.d. | 30.7 | 74 | 0 |
| **Netherlands** | P | - | - | n.d. | n.d. | 75.0 | n.d. | 30.7 | 41 | 0 |
| **Austria** | PS | PS | PS | 78 | 1 054 | 52.0 | 2.6 | 32.0 | 72 | 24/46 |
| **Poland** | P(S#) | - | - | 7 | n.d. | 9.9 | n.d. | 6.3 | 64 | 0 |
| **Portugal** | PS | PS | - | 22 | 298 | 46.9 | 8.4 | 30.2 | 60 | 32/68 |
| **Romania** | PS | PS | - | 12 | 812 | 14.0 | n.d. | 4.4 | 32 | 7/50 |
| **Slovenia** | PS ([3]) | P | - | 17 | n.d. | 9.5 | 7.6 | 13.8 | 148 | 4.3/45 |
| **Slovakia** | PS | PS | - | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | -/50 |
| **Finland** | P ([2]) | P ([2]) | - | < 1 | n.d. | 1.8 | n.d. | 1.1 | 67 | 0 |
| **Sweden** | P | P | - | 60 | 1 500 | n.d. | n.d. | n.d. | n.d. | 0 |
| **UK** | P | - | - | 7 | 370 | 11.1 | 0.8 | n.d. | n.d. | 0 |
| **Total** | | | | | | **1 537** | | **1 061** | | **497** |
| **(Croatia)** | PS | PS | - | 3 | n.d. | 12.6 | 4.1 | 11.5 | 91 | 2.6/25 |
| **(Turkey)** | PS | PS | PS | 1.8 | 439 | 20 | n.d. | 16 | 67 | n.d./50 |

Legend:

| | | | |
|---|---|---|---|
| S | Subsidised | GC | Public compulsory partially subsidised |
| P | Private non-subsidised | GF | Public free |
| PS | Private partially subsidised | # | Pilot experience |
| G | Public non-subsidised | - | Not existing |
| GS | Public partially subsidised | n.d. | No data |

Notes:

Loss ratio is not computed from the three-year average of premium shown in the table, but of the longest period available!

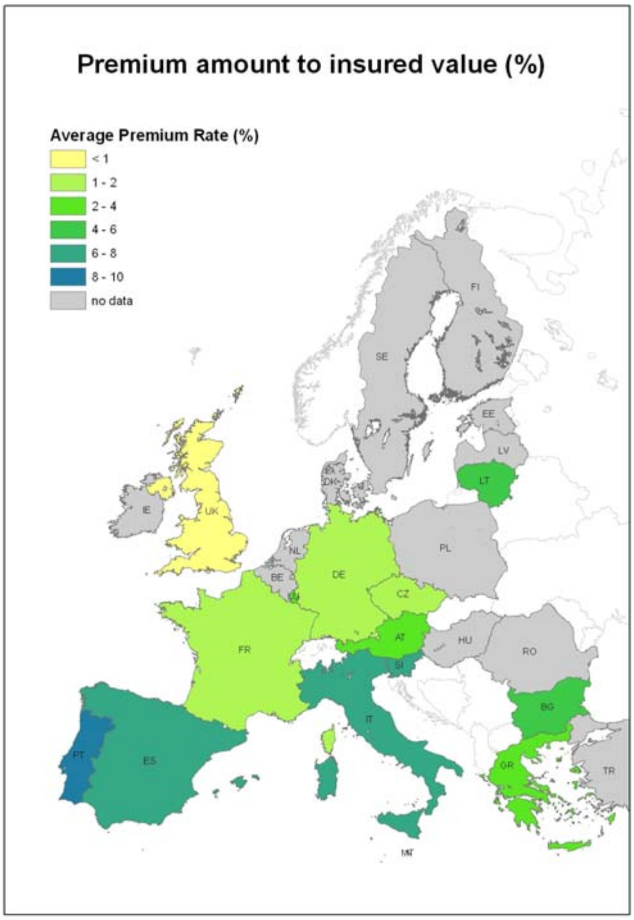
([1]) Loss ratio is computed only for a small part of hail insurance.

(2) Livestock only.

([3]) A national programme in Slovenia for subsidies insurance, in 2006 for the first time (30 to 50 %).

*Source:* Authors' compilation from fact sheets, with own calculations.

Secondly, it is necessary to specify that the Greek ELGA premiums do not follow the actuarial rule of insurance premiums: they are not calculated on the basis of the risk of loss for the covered events. The rates fixed by ELGA are the same for all crops (or livestock) throughout the country, so we will not take them into account in further analysis of potential European scenarios.



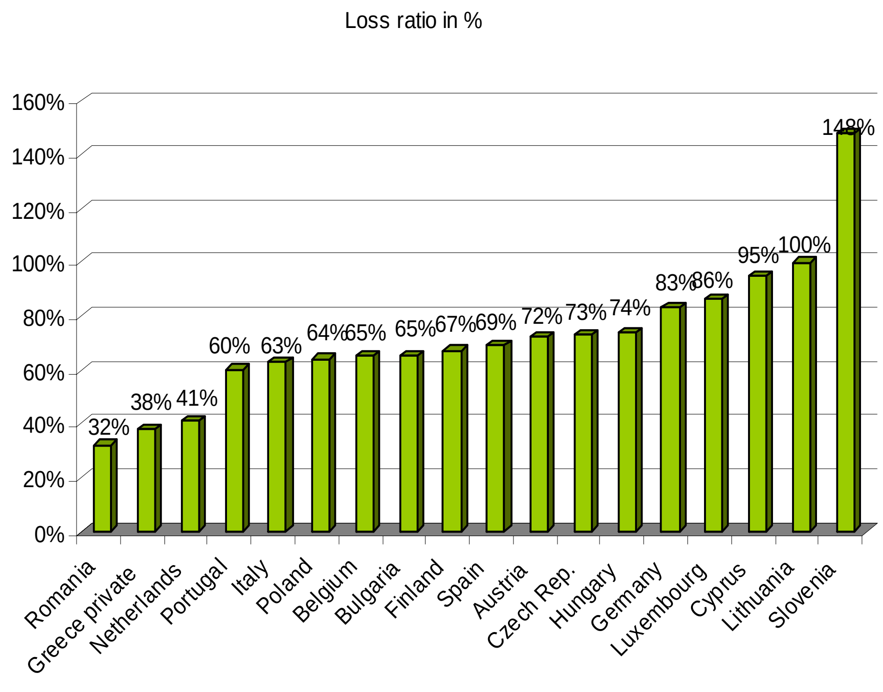

*Source:* Authors' elaboration from fact sheet information.

**Figure 56. Premium amount to insured value**

For further understanding of the data on premiums, we must indicate that the French 1.7 % corresponds to hail and windstorm insurance only, not subsidised by the government. Multi-peril insurance is not included, because it started in 2005; this explains the low rate. The high values in Spain and Italy can be explained mainly by the higher number of perils covered, apart form the effect of the potentially higher risks in those countries.

In Greece's private insurance, 89 % of the premiums and 80 % of the indemnities come from aquaculture. Greek private insurance has such low premium rates because of the low rates of aquaculture insurance. The rates for aquaculture insurance are around 1.6 % while the rest of rates would average 2.5 %, very similar to the Austrian premium rates. The low risk of aquaculture also diminishes the proportion of the indemnities on the insured value from 1.9 % to 0.7 %. Lastly, the loss ratio if we did not include aquaculture would be 60 % instead of 38 %.

Loss ratios in the summary table express the proportion between indemnities for a series of years and premiums paid during that period. They are graphed in Figure 57. Because we are not referring to a yearly loss ratio, but to a long-term average, for an insurance system to be 'actuarially sound', the loss ratios should be lower than 1, so that the premiums would be greater than the indemnities in a quantity enough to pay the administrative costs, costs for reinsurance and loss adjustment costs.




*Source:* Authors' elaboration from fact sheet information.

**Figure 57. Average loss ratio graph**

It should be taken into account that the average indemnities and the loss ratios are not calculated for the last three years but for the longest period of time available (mostly from 2000 to 2005), because in this way they are more representative of the soundness of the insurance systems. However, available timetables of data varied from country to country, so these ratios are not suitable to be compared.

It is interesting to find the lowest values for Romania, for the Greek private insurance and for the Dutch non-subsidised insurance. In Greece it is explained by the particular case of aquaculture. For the Netherlands and for Romania, the available data do not allow for the actual reasons to be identified. In Romania, it could be explained by the fact that a big proportion of the farmers buying insurance do so for asking for banking credits, financing from the European Union or ad hoc aid from the government which is conditioned to being insured, so that this could result in the risks of the insured population being lower than the average. But this is just a hypothesis; another possible reason could simply be a lower number of calamities during the time period considered.

In general we can say that in most countries the average loss ratio is between 0.60 and 0.75. The highest loss ratio is found in Slovenia with 1.48 (from 2000 to 2005), followed by Lithuania with 1. Germany and Luxembourg also have a high loss ratio, of more than 0.8.

### *5.5.4. CEA data on premium amounts*

In Table 17 we can see data provided from CEA (2005a) about premiums for crops, livestock and crops plus livestock. The first columns show the 2004 premium amount and the second columns the average premium rates, that is, the premium amount expressed as a percentage of the insured value.

The total premium amount of CEA data (EUR 1 395 million) corresponds more or less to the premium amount of the fact sheets (around EUR 1 500 million) if we take into account that CEA data do not correspond to EU-27, and that they include the Greece public sector, for which there was no data in the fact sheets.

If we compare the premium rates from the fact sheets (Table 16) and those from the CEA (Table 17) we can see that the order of magnitude is coherent between both databases. They are in both databases around 1 % for Germany, 2 % for France, 3 % for Austria and, in another order of magnitude, around 6 % for Spain and 7.5 to 8 % for Portugal and Italy. The Greek premium rate from the CEA is relatively low (1.4 %) because it probably corresponds only to private insurance, while the public insurance collects a premium close to 3 % for more comprehensive cover of risks.

According to the CEA information, the premium rates in Denmark, Germany and the Netherlands are very low. Potential casuals for low premium rates can be that mainly single-risk insurance exists, that not many high risk hazards or sensitive crops are insured and that sensitive crops (vegetables), in the northern countries, are mostly produced in greenhouses. The greatest premium rates are for Italy, Portugal and

Spain, the systems where more perils are covered and also where there are high-risk productions such as fruits and vegetables. In France, the premium rate should be greater with the last reforms, but not with the system existing until 2004.

**Table 17. CEA data on premiums (2004)**

| | Crops | | Livestock | | Crops and livestock | |
|---|---|---|---|---|---|---|
| | **Premium amount (million EUR)** | **Average premium rate (%)** | **Premium amount (million EUR)** | **Average premium rate (%)** | **Premium amount (million EUR)** | **Average premium rate** |
| **Austria** | 49 | 3.3 | 1.3 | 1.15 | 50.0 ([2]) | *3.2* |
| **Denmark** | 18 | 0.7 | 104.5 | 1 | 122.5 | *0.94* |
| **France** | 203 | 2.14 | 19.0 | 3 | 222.0 | *2.2* |
| **Germany** | 124 | 1.12 | 38.7 | 0.43 | 163.2 | *0.8* |
| **Greece** | 88 | 1.4 | 30.0 | 1.5 | 118.0 | |
| **Italy** | 274 | 8.1 | | | 274.0 | *8.1* |
| **Netherlands** | 15 | 0.89 | | | | |
| **Norway** | | | 4.8 | 1.7 | | |
| **Portugal** | 50 | 7.86 | 0.3 | | 50.0 | |
| **Spain** | 286 | 5.4 | 55.3 | 5.55 | 341.7 | *5.4* |
| ***Switzerland*** | *34* | *2.5* | *20* | *2* | *54.0* | *2.3* |
| **Total ([1])** | **1 141** | | **273.9** | | **1 395.6** | |

Notes:

([1]) Total includes Switzerland.

([2]) Without greenhouses.

*Source:* Authors' compilation from CEA (2005a) data with own calculations.

It is interesting to see that the Spanish livestock insurance premium rates are the highest. In Austria the livestock premium rate is also very low, but in this system the livestock insurance is combined with the insurance against hail and flood in grassland (so the total premium rate for the insurance product is higher).

Some of the data collected in the from the CEA (2005a) document are estimated values sent by CEA members of the losses under a hypothetical scenario where yield insurance existed for all crops and all farmers were insured. Our document does not explain how these losses were estimated. We can see in Table 18 the data for this scenario in the case of crops (there is not enough data to give a good view of the possible scenario for livestock). The projected average annual amount of losses does not include cover and deductibles and for their calculation it is assumed that all crops and all operators are insured.

**Table 18. CEA scenario of yield insurance with maximum demand (crops)**

| | Losses | Risk rate |
|---|---|---|
| | **Projected average annual amount of losses (CEA) (million EUR)** | **Average annual amount of losses/crops production value** ([1]) **(%)** |
| **Germany** | 711 | 3.1 |
| **Austria** | 108.7 | 4.1 |
| **Spain** | 1 237.71 | 4.4 |
| **France** | 2 949 | 8.1 |
| **Greece** | 80.5 | 1.0 |
| **Netherlands** | 110 | 1.1 |
| **Portugal** | 131.2 | 3.3 |
| ***Switzerland*** | *163.2* | 9.6 |
| **Total** ([2]) | **5 491.31** | |

Notes:

([1]) Production value from Table 14 and Table 15.

([2]) Total includes Switzerland.

*Source:* Authors' elaboration with own calculations from CEA (2005a) data.

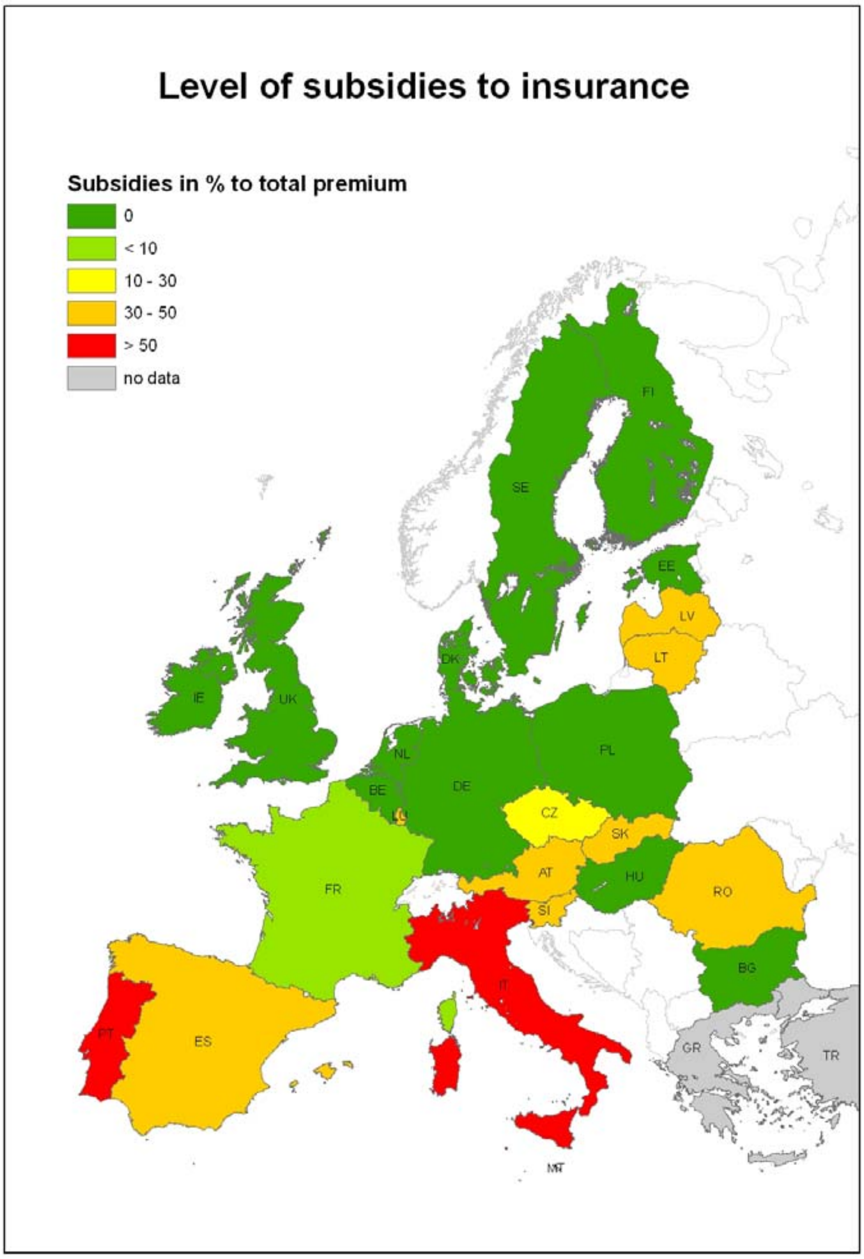
The risk rates (average losses/total production value) shown in the last column of Table 18 should give an idea of the risks in each country. We see that there are great differences. In France the risk rates are the highest among the countries for which data is available, followed by Spain and Austria. It can be deduced that the rates calculation are biased by the characteristics of the current insurance systems in the different countries. Besides, given that the assumptions made for the calculation of the data for the Greek complex insurance system, where currently private insurance coexists with a public compulsory system, it seems useless to try to explain the low risk rate for Greece.

Given that the risk rates should be indicative of the potential value of the premium rates in the scenario simulation, it can be interesting to compare these projected or potential risk rates with the actual average premium rates from Table 17. We have to take into account that, given that the actual situation there is a big proportion of single-risk insurance, the average premium rates should be greater for the case of all yield insurance. According to this reasoning, we see as can be expected, an increase in the rates for many countries: a moderate increase for Germany, Austria and the Netherlands, and a really big increase for France and Switzerland from premium rates around 2 to 2.5 % to risk rates of 8 to 9 %. This can be explained because until now in these countries mainly hail insurance has existed, and yield insurance for some crops such as fruit trees can be expensive. This magnitude of risk rate of 8 % is close to the current average premium rate of Portugal (8.4 % facts sheets source, and 7.86 % CEA (2005a) source), which is however much lower than that of Spain, where currently a broad cover exists for many products. In fact, we observe that for Spain there is a small decrease from the current premium rate to the potential risk rate. Even if this is not very realistic for a risk rate, it could be for a premium rate. If already high risks and sensitive crops are insured, an adjustment downward of premium rates may be possible, because if the insurable production value is insured to a certain percentage the risks will be more widespread. However, for the case of Portugal, with a decrease from 7.8 % to 3.3 % from our point of view it is difficult to find an explanation. Either the high premium rate corresponds mainly to sensitive crops insured (fruits and vegetables) and the new scenario with insurance of cereals or other crops could make the risk rate decrease, or there is some mistake in the calculations or in the simulation assumptions.

### *5.5.5. Level of subsidies to insurance*

In some countries public support has been provided to agricultural insurance for a long period of time. This has a number of advantages. For example, the insurance industry has had the time to develop their systems and to provide wide cover. Countries with public insurance systems or with support to the private insurance sector sometimes have integrated it as an essential agriculture policy instrument for the stabilisation of agriculture income. With such a support to the insurance premium, it seems easier to encourage farmers to take an active role in risk management and participate in insurance systems. From the economical point of view, these tools have the advantage over public *ex post* or ad hoc payments that they allow for better planning and continuity (see Babusiaux, 2000). But they also can have disadvantages when compared with ad hoc payments, as they can be the lower economic efficiency in terms of net gain received by the farmer per unit spent by the government (see Bielza et al. 2004).

From data provided in the fact sheets, the total amount of subsidies to insurance in Europe is around EUR 500 million, which represents 32 % of the total premium amount. However, differences in average subsidies from one country to other can be very big, as can be observed in Figure 58.




*Source:* Authors' elaboration from fact sheet information.

**Figure 58. Level of subsidies to insurance in Europe**

Subsidies are available only in a number of countries. Belgium, Bulgaria, Denmark, Germany, Estonia, Ireland, Hungary, the Netherlands, Poland, Finland, Sweden and the United Kingdom do not offer any subsidies to insurance premiums. The countries in which premiums are subsidised are:

— Portugal: around 68 % of total premiums, subsidies vary from 35 % to 75 %;

— Italy: around 67 % of total premiums, 64 % for the multi-peril yield-type product;

— Slovakia: 50 %;

— Latvia and Lithuania: 50 %, but there is a very low market penetration of insurance;

— Cyprus: 50 % for all insurable risks in the compulsory scheme;

— Luxembourg: 50 % for all insurable risks;

— Romania: 50 % since 2005, 20 % before 2005;

— Spain: around 49 % of total premiums including the regional subsidies;

— Austria: around 46 % of total premiums, 50 % for hail and frost;

— France: the 2.5 % average of three years is due to a majority of non-subsidised single-risk insurance; since 2005 new yield products have been launched with subsidies of 35 % (40 % for young farmers);

— Slovenia: in the year 2006, subsidies of insurance premiums in crop production were available for the first time; the level of subsidy was set at 30 to 50 % for the basic risk cover (hail, fire and thunderstorm);

— Czech Republic: subsidies from 15 % for livestock insurance and 30 % for crop insurance;

— (Croatia): up to 75 % including national (25 %), county and municipality subsidies (since 2003);

— (Turkey): 50 % since 2006.

Even within a country, the subsidies can vary a lot depending on the country's policy to promote some particular type of cover, to help some agricultural subsector or to give facilities to some types of farms from a sociological point of view. For instance less-developed areas, young farmers or women farmers, associations or cooperatives, can apply for higher subsidies in some countries.

Looking at the subsidies, it can be observed that the average subsidy rates in Italy and Portugal are the highest in Europe. In Portugal, the subsidy varies from 35 % to 75 % depending on the risks covered, on the crop, on the reference premium rate, on the location, on the preventive measures used and on the type of contractual agreement. In Italy, single-risk insurance products receive a subsidy of 50 %, while combined and yield insurance products get 80 %. The subsidy is a percentage of a risk parameter fixed by the government per crop and per geographic area. This percentage depends on the characteristics of the contract.

— If the threshold is greater than 20 %, the subsidy is 80 %.

— If the threshold is lower than 20 %, the subsidy is 50 %.

— If the contract considers also other events, for example animal diseases, the subsidy is 50 %.

The threshold of 20 % is interesting for fruits and vegetables, which have big losses, so the threshold is easily passed, and as the premiums are high they need a high subsidy. In contrast, for cereals, a lower threshold and lower subsidy is preferred.

The Austrian, Luxembourgish and Spanish subsidies amount to almost 50 % of the premiums (including the regional support). In Austria only hail and frost is subsidised, with 50 %. In Luxembourg all insurable risks are subsidised at 50 %. In these countries subsidies have been provided for a long time and the insurance system is well developed with most risks and crops covered.

In France, the average subsidy rate is very low (2.5 % of the total premium amount) because hail insurance has no subsidy and, until 2004, only some insurance for specific products and specific regions were granted a subsidy. There is a 35 % subsidy for new products, but it only applies to the insurance premiums with a deductible of 25 %. If the deductible is lower than this, then the subsidy only applies to the part of the premium which corresponds to this deductible, the rest not being subsidised. Subsidies were mainly given for fruits and vegetables insurance.

Other countries with subsidy levels of up to 50 % are Cyprus, Latvia, Lithuania, Romania and Slovakia, . These countries have in common a short history in the EU, and it could seem that they have adapted their subsidies to what is allowed by the EC guidelines. Most of them have young histories also for insurance development, especially Latvia and Lithuania, where the systems have only started to build up. In Latvia the subsidies are limited per unit (hectare, livestock). In Romania initially the subsidy represented 20 % of the insurance premium but beginning with 2005 the level of subsidy rose to 50 %. Particular is The case of Cyprus is particular in that there is a compulsory crop insurance system.

In Slovenia in 2006, subsidies for insurance premiums in crop production were available for the first time. The level of subsidy was set at 30 % of the insurance premium including the tax on insurance transactions. The maximum level of subsidy, when a municipality programme of the same purpose exists, is 50 % of the insurance premium including tax. However, only the basic risk cover (hail, fire and thunderstorm) is eligible for co-financing. This seems to be an initiation to more systematic public–private cooperation in agricultural risk management in Slovenia. In the period 2004–06 about half the municipalities (102 from 210) notified a State aid measure to co-finance insurance premiums to farmers.

There are lower subsidy levels but with a longer history in the Czech Republic and Hungary. In the Czech Republic crop insurance was subsidised with 30 % and livestock insurance with 15 % in 2005. In Hungary, from 1996, the State has contributed to the agricultural insurance premiums (for crops and livestock) paid by farmers by 30 %. This measure facilitated the increase of agricultural insurance contracts. If no claims were reported the farmers had to pay an even lower proportion of the insurance premiums: around 40 %. In 2004 this State subsidy was abolished, which resulted in a great fallback in agricultural insurance as many producers cancelled their policies. Along with these cancellations their risk of losses increased considerably. In 2003, revenues of insurance companies from agricultural insurance reached around EUR 78.8 million, while in 2004 it hardly exceeded EUR 26.2 million.

This collapse was the direct result of the termination of subsidies (Hungarian Financial Supervisory Authority, 2005).
We can point out that in countries where public support has been provided for a longer time, the insurance systems are developed to comprehensive cover against adverse weather conditions. Governments of many Member States apply a 50 % subsidy to agricultural insurance but since only a few years, and it needs a long time to change the mentality and behaviour of farmers to use these supported instruments for risk management.

### *5.5.6. Market conditions*

Information with reference to the market conditions was collected in the facts sheets; more precisely, whether the agricultural insurance market is wholly competitive, partially competitive (it sometimes happens that the premium rates are not competitive but companies can compete in the services offered) or monopolistic; if there is one company or a few dominant companies; and the percentage of the market of the dominant company/ies. The information provided by the national experts is shown in Table 19.
We can see that in most countries, there is competition both in prices and in services. However, we find five monopolistic markets, with very different characteristics (Cyprus and Greece with governmental systems, Austria and Luxembourg with subsidised systems, and Ireland with no subsidies and also little importance of the market).

**Table 19. Agricultural insurance market conditions**

| Country | Is there competition on prices? | Is there competition on quality of services? | Is there a dominant company? | Percentage of the market of the dominant company, if any |
|---|---|---|---|---|
| **Belgium** | Yes | Yes | KBC, AXA, OFH | - |
| **Bulgaria** | Yes | Yes | No. There are three or four leading companies | - |
| **Cyprus** | No | No | Agricultural insurance organisation (public, compulsory) | 100 % |
| **Czech Republic** | Yes | Yes | Ceska pojistovna<br>Generali pojistovna | 86.1 %<br>11.3 % |
| **Denmark** | Yes | Yes | Five companies | 45 %, 28 %, 13 %, 10 %, 2 % |
| **Germany** | Yes | Yes | Vereinigte Hagelversicherung VVaG | Approx. 60 % |

| Country | Is there competition on prices? | Is there competition on quality of services? | Is there a dominant company? | Percentage of the market of the dominant company, if any |
|---|---|---|---|---|
| **Estonia** | - | - | IF Eesti Kindlustus<br>Ergo | 47 %<br>24 % |
| **Ireland** | No | No | FBD Insurances plc | 100 % |
| **Greece** | No. For compulsory insurance by ELGA premium rates are fixed by law.<br>Free competition for aquaculture insurance | No<br>Free competition for aquaculture insurance | There is only one insurance company, the Agrotiki Insurance SA, operating in the field of crop and livestock insurance | Almost 100 % of crop and livestock insurance not covered by ELGA |
| **Spain** | No. Tariffs are fixed by the pool Agroseguro SA. It must justify changes in rates to ENESA and the farmers' organisations | Yes on attention to the client and quality of service, but not on the guarantees offered nor on the damages estimation. | Agroseguro is a pool of all the insurance companies which provide agricultural insurance (33 companies) | Agroseguro 100 %<br>Mapfre holds the 22.5 % of Agroseguro |
| **France** | Yes | Yes | Groupama | Approx. 50 % to 60 % (traditional policies) |
| **Italy** | Yes, but companies tend to tailor their tariffs to the subsidy reference parameter fixed by ISMEA | Yes | FATA Assicurazioni, which has belonged to Generali Group since 2000 | Both in terms of sums insured and premiums collected,<br>FATA 13 %<br>Generali Group 22 % |
| **Latvia** | (Yes) | No priority | IJSC Balta<br>IJSC BTA | 50 %<br>25 % |
| **Lithuania** | Not in crop insurance | (Yes) | 1 crop insurer<br>7 livestock insurers | 100 %<br>One with 60 % |
| **Luxem-bourg** | No | No | Vereinigte Hagelversicherung VVaG | 100 % |
| **Hungary** | Yes | Yes | Allianz-Hungaria<br>Garancia<br>Generali | 46.9 %<br>26.6 %<br>15.8 % |
| **Nether-lands** | Yes for crops<br>Not for livestock, fund financed by levies | Yes for crops | No | - |
| **Austria** | No | No | Die Österreichische Hagelversicherung VVaG, founded by 17 | 100 % |

| Country | Is there competition on prices? | Is there competition on quality of services? | Is there a dominant company? | Percentage of the market of the dominant company, if any |
|---|---|---|---|---|
| | | | insurance companies as a mutual organisation | |
| **Poland** | Yes | Yes | The former State company, PZU SA | About 67 % |
| **Portugal** | Yes | Yes | Yes | 45 % |
| **Romania** | Yes | Yes | Agras<br>Asirom<br>Generali<br>Allianz Tiriac | 25 %<br>28 %<br>19 %<br>17 % |
| **Slovenia** | Yes | Yes | Yes | Two thirds of premiums |
| **Slovakia** | Yes | Yes | Allianz Slovakia<br>Uniqa<br>Generali | |
| **Finland** | Yes | Yes | Làhivakuutus<br>Tapiola-group | 40 to 45 %<br>40 to 45 % |
| **Sweden** | Theoretically yes | Theoretically yes | Agria (Lansforsakringar) | 75 % in crop insurance<br>90 to 100 % livestock insurance |
| **United Kingdom** | Yes | Yes | National Farmers Mutual Insurance Society | 75 % |
| **(Croatia)** | Yes | Yes | Croatia Osiguranje | 70 % |
| **(Turkey — since 2006)** | No | Yes | Basak (part of the main agricultural credit bank)<br>Guven | 50 %<br>20 % |

*Source:* Authors' compilation from fact sheets.

The countries which do not have competition in prices but do have competition in services are few too, and of very different characteristics: Lithuania for crop insurance, Spain and Turkey. All the rest of the countries have a theoretically free and competitive agricultural insurance market. However, if we look in detail, we see that these markets are often in the hands of few companies. From the 22 cases in this situation, we find 10 cases where there is only one main company (including Croatia and the private insurance in Greece). There are four countries with two main companies, and three with three main companies; there are only five cases with more than three insurance companies in the market, the extreme cases being livestock insurance in Lithuania, with seven companies, and the Netherlands, where apparently there is no dominant company.

In conclusion, we can see a most diversified situation, with the common characteristic that in most countries there are few market players, with one or two dominant companies on this very specific sector of agricultural insurance.

## 5.6. Technical aspects of agricultural insurance at product level

In this section, we enter into more details about technical aspects of the individual insurance products. These technicalities will permit us to have an insight and understanding of the information provided in the fact sheets about the different insurance products existing in the different countries. The technical characteristics of agricultural insurances should aim to provide an actuarially sound system. Their proper use in insurance design can avoid moral hazard and adverse selection ([51]) problems. It can also make risks in agriculture — in particular systemic risks ([52]) — on the one hand insurable to the insurer and on the other hand affordable to the farmers.

The most important technical aspects of agricultural insurance are:

— risks covered by the insurance,
— products that are included in the cover,
— triggers and deductibles,
— premium rates and rating system,
— level of subsidies,
— bonus/malus system,
— loss assessment,
— loss ratios,
— reinsurance.

### *5.6.1. Agricultural insurance products and insured risks in Europe*

Most of the insurance types have already been defined before. Single-risk insurance (especially hail insurance) has a long tradition and is well developed in Europe. Some insurance policies cover also against the risk of frost or against a limited number of meteorological events. These are known as combined-risk insurance or as pluri-risk insurance. Comprehensive cover insurance (multi-peril insurance or yield insurance) systems are developed only in a few countries. Usually, private companies insure

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([51]) See the glossary for definitions of moral hazard and adverse selection.

([52]) See the glossary for a definition of systemic risk.

only hail and fire or a limited number of risks and, as the government involvement in insurance increases, more comprehensive cover against all climatic risks can be provided. The cover against drought, as one of the most difficult insurable climatic risks in agriculture (because a large area can be affected), is not usually included in combined-risk insurance, whereas it is usually included in the wide cover against all climatic risks of yield insurance.

However, looking at the technical aspects, it seems necessary to clarify that, from a technical point of view, there are several type of insurance that have been classified under “yield insurance”. They are sometimes referred to as yield insurance but also as multi-peril insurance. The common characteristic to all of them is that they provide cover for the yield against all the main climatic hazards that can affect yields (plant diseases and plagues are not covered in most cases). These types of insurance work in a different way from the US multiple peril crop insurance (MPCI). MPCI is a yield insurance which provides cover against all possible natural risks that can cause a decrease in yields, including plagues and diseases. In MPCI damages are calculated simply as the difference between the guaranteed yield and the actual yield. In contrast, in the Spanish and in general the European yield insurances, to determine the losses it is necessary to ascertain which was the risk that caused the loss, that the damage has an area character (that is, that the risk has not affected only one individual farmer) and it is also necessary that the insured or guaranteed yield can be corrected according to the productive conditions of the insured farm. This difference is important: the European model has higher loss-adjustment costs, but it helps to avoid moral hazard, which constitutes one of the big problems for the US insurance system.

Table 20 summarises the available information on a large number of insurance types in different countries of the EU, specifying the risks covered and for which products. The number of different insurance types is very high, for example in Spain there are nearly 150. Types have been grouped in order to make the information digestible ([53]).

([53]) For more details on the particular Member States’ insurance products, refer to the fact sheets, available from authors upon request.

**Table 20. Insurance products and insured risks in Europe**

| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| **Belgium** | Fire group insurance (single-risk) | Field crops, vegetables, vineyard, fruits and livestock farms | Fire, windstorm, flood, earthquakes, theft, working conflicts |
| | Hail insurance (single-risk) | - | Hail |
| **Bulgaria** | Crops (combined) | Winter cereals, maize, sunflower, fruit trees and vineyards | Hailstorm, thunderstorm, torrential rain, fire on roots, ground frost, flood (sludge, freezing and withdrawal for winter cereals) |
| | Livestock (combined) | Cows and buffalos, sheep, goats, poultry | Death and compulsory slaughter from: fire and natural catastrophes; parasitic and infectious diseases (OIE list B and others) |
| **Czech Republic** | Crop insurance (single-risk) | All crops | Hail, fire |
| | Crop insurance (combined) | Crops except fruits | Hail, fire, storm, flood, landslide, spring frost and frost |
| | Livestock insurance | Livestock | Contagious diseases, death by electrical injury, flood, poisoning, overheating, individual losses (non-infectious) |
| **Denmark** | Aggregated insurance (single-risk) | Acreage and crops, livestock, operating equipment and buildings | Crops: fire, theft, water and hail damages<br>Livestock: fire, theft, water, operating losses, accident and a few diseases (such as botulism)<br>Machines: fire, theft, water and operating losses (damage to running machinery as supplement) |
| **Germany** | Hail | Arable crops, wine, fruits, vegetables | Hail |
| | Livestock | n.a. | n.a. |
| **Estonia** | Cattle insurance | Cattle | Fire and natural disaster, accident, theft, diseases |

| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| **Ireland** | Farm insurance (single-risk) | Farm dwelling, outbuilding and stock, employers, product and public liability (livestock in transit, pedigree livestock, growing trees, etc. optionally) | Fire, lightning, storm, flood, attack of dogs on sheep |
| **Greece** | Public hail (combined cover, but is not insurance) | All crops | Hail, windstorm, frost, snow, excessive heat, rains, flood, seawater, bears and wild boars |
| | Public livestock (is not insurance) | All farm animals (voluntary for pigs and poultry) | Climatic, wild animals, diseases (long list) |
| | Private hail (single-risk) | All crops | Hail, complementary to the ELGA policy |
| | Private livestock | Bovines, poultry (also sheep/goats and pigs available) | All-risk mortality |
| | Private aquaculture | All fish. Additional: for fish stock in transit, equipment, vessels, etc. | All-risk mortality, theft, escape |
| **Spain** | Combined | Almost all vegetal production: COP, fruits, olives, etc. | Hail, fire, flood, rains, frost, wind and others |
| | Yield geographic basis (yield) | Winter cereals, proteins, grapes and Lanzarote onion | Hail, fire, flood, rains, frost, wind, drought, heat |
| | Yield individual basis (yield) | COP, olives, wine grapes, almonds, sugar beet, some fruits | Hail, fire, flood, rains, frost, wind, drought, heat |
| | Fixed costs for associations and cooperatives | Fruits, citrus, grapes | The same as those covered by the individual farmers' insurance policies |
| | Livestock farms | Cattle, horses, sheep/goats<br>Poultry | Accidents<br>Also: for cattle, epizooties<br>for poultry, asphyxia and panic |

| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| | Dead animals disposal | Cattle, horses, sheep/goats, pigs, poultry, rabbits | All |
| | Index insurance | Cattle, horses, sheep/goats, apiculture | Increase of feeding costs<br>Apiculture: also fire, flood and rains |
| | Aquaculture | Meteorologic exceptional happenings, chemical pollution, lightning, sea storm, flood, oil spill.<br>Additional guarantees: diseases | Gilthead bream, bass, turbot, meagre, trout, mussel |
| | Forest production | All forest trees within projects for reforestation on agricultural land | Fire, flood, torrential rain |
| **France** | A: Hail | All vegetal productions | Hail and wind |
| | B1: Hail and frost on fruits (combined) | Revenue from fruit production | Hail, wind and frost |
| | B2: Hail and frost on wine grapes (combined) | Wine grapes | Hail, wind and frost |
| | C: Combined on COP (combined) | Cereal, oilseed and protein crops | Hail, wind, frost, flood |
| | D: Combined on tobacco (combined) | Tobacco | Hail, wind, frost, flood |
| | E1: Combined all crops (yield) | All crops except forage land | Hail, wind, frost, flood, drought, etc. |
| | E2: Whole-farm combined (whole-farm yield) | All crops except forage land | Hail, wind, frost, flood, drought, etc. |
| **Italy** | Crops single-risk | All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants | Hail, wind, black and hoar frost, flood, excess rain, drought, plant diseases |

| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| | Crops combined risks (combined) | All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants | Two or more of the events covered by single-risk insurance |
| | Structures combined risks (combined) | Greenhouses with metal framework, tunnels and anti-hail nets | Hail, wind, black and hoar frost, flood, excess rain, drought, plant diseases |
| | Crops multi-peril (yield) | All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants | Hail, wind, black and hoar frost, flood, excess rain, drought, plant diseases |
| | Stock farms (combined) | Cattle and buffalo (value, cost of disposing of animals, lack of revenue for period of farm stoppage) | FMD, brucellosis, pleuropneumonia, tuberculosis and enzootic leucosis |
| **Cyprus** | Crop insurance (combined) | Fruits | Hail, frost, rain, windstorm |
| | | Citrus | Hail, frost windstorm, water spot, dry wind |
| | | Grapes | Hail, frost, heatwave, rain, windstorm, dry wind |
| | | Cereals | Hail, rust, drought |
| | | Potatoes | Hail, frost, flood |
| | | Beans | Hail, frost, flood, warm dry air |
| | | Artichokes | Hail, frost |
| **Latvia** | Crop insurance (single-risk) | Arable crops, flax, fruits | - |
| | Livestock insurance | Cattle, sheep, goats, horses, pigs, fur animals, bees, poultry | Disease, accidents, damages caused by natural disasters, fire, flash of lightning, explosion, illegal activities of third parties |
| **Lithuania** | Crop insurance (single-risk) | Crops | Hail, rainfall, storm (spring frost, winter killing optional) |
| | Livestock insurance | Livestock, horses, sheep, goats, pigs; several companies also include bees, birds, fish | No communicable diseases, infectious diseases, natural forces or accidents, theft or vandalism |

| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| **Luxembourg** | Hail | Arable crops, wine, fruits, vegetables | Hail |
| | Frost (combined) | Wine | Hail, frost |
| | MPCI (yield) | Main arable crops | Hail, winter kills, stagnant water, frost, storm, heavy rainfall, drought, outgrowth |
| **Hungary** | Crop insurance (yield)<br>Individual insurance schemes tailored to the demands of customers are available, **see the annex to the fact sheet** | Arable and horticultural crops including: autumn spicate crops, autumn feed mixture, autumn cole seed, string hemp, tobacco, sugar beet, feed beet seed, sunflower, some legumes, winter apple, winter pear, maize, forest | Yield, quality, stock can be insured.<br>There is one all-risk (MPCI) insurance, the 'Yield insurance of arable crops'<br>Storm, hail, fire, snow break, ice break, drought, insects, sandblast, soil alligatoring, frost riving, sore, thunder stroke, landslip, flood, standing water, snow pressure |
| | Livestock insurance<br>Individual insurance schemes tailored to the demands of customers are available, **see the annex to the fact sheet** | Cattle, swine, sheep, goats, horses, geese, chicken/hens, turkeys, guinea fowl, pheasants, mallards | Value of livestock is insured<br>Disease and accident except for:<br>— 'Natural disaster and elemental loss livestock insurance' where perils are fire, thunder stroke, storm, hail, flood, earthquake, landslip, stone fall, earth fall, cave of an unknown hole, breakdown of water and steam pipes<br>— 'Cost completive livestock insurance' where extra costs deriving from diseases are covered<br>— 'Insurance of high value horses' where the value is insured<br>— Coverable diseases: BSE, foot-and-mouth disease, aphthous stomatitis, oriental rinderpest, cattle infectious lung inflammation, Rift Valley fever, blue-tongue disease, lyssa, SVD, African swine plague, infectious swine paralysis |
| **Netherlands** | Hail private insurance | Crops | Hail |

| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| **Austria** | Hail | All crops | Hail |
| | Multi-peril (yield) | Arable crops | Hail, storm, frost, flood, rain, drought, drift, sprouting, pests, etc. |
| | Wine (combined and quality) | Wine | Hail, frost and additional expenditure after hail |
| | Fruits (hail and quality) | Fruits | Hail |
| | Grassland (combined) | Grassland and silo foils | Hail, flood |
| | Livestock (combined) | Cattle | Stillbirth and death (epidemic disease excluded) |
| **Poland** | Hail | Crops | Hail |
| | Livestock | Cattle, horses, swine (separate insurance schemes also exist for fur-bearing animals, apiary and fish) | Death and forced slaughter due to non-epidemic diseases, accidents and natural events |
| **Portugal** | Basic cover (single-risk) | Almost all vegetal production | Hail, fire, lightning and explosion |
| | Complementary cover (combined) | Almost all vegetal production | Tornado, waterspout, frost, snow |
| | Total cover (combined) | Almost all vegetal production | All risks in the other contracts (+ damages on cherry fruits + persistent rains on industry tomato) |
| **Romania** | Crop insurance | Almost all vegetal production | Standard risks: hail, heavy rain, storm, late spring frost, early autumn frost, land erosion, fire caused by natural forces<br>Special risks: winter frost, flood, drought, excessive rain at harvesting |
| | Livestock insurance | Animals, birds, bees, fish | Surgical diseases, obstetrics and internal diseases, wild animal attacks, fire, thunderstorm |
| **Slovenia** | Crop insurance (combined) | All crops | Hail, fire, thunderstorm (flood, spring frost, etc. optional) |

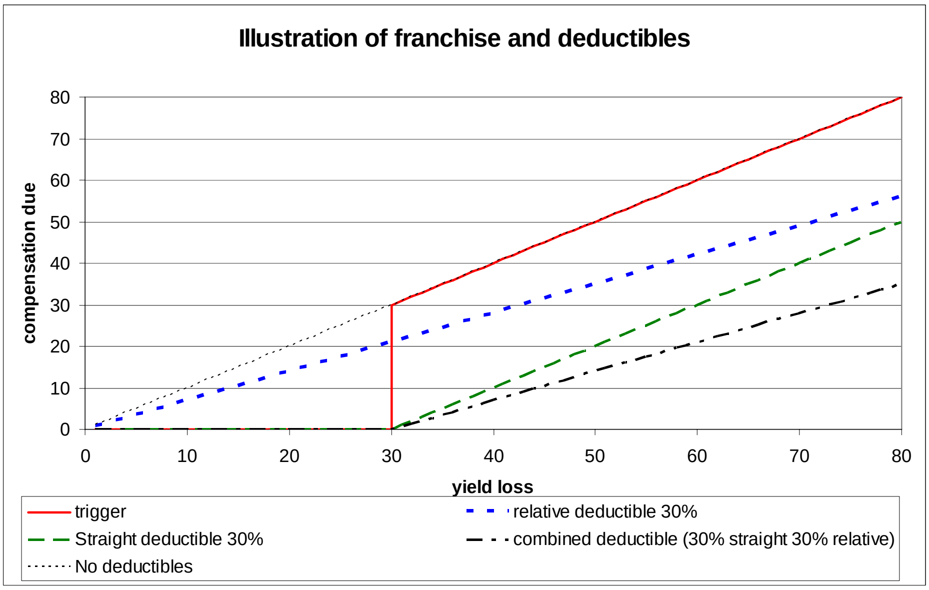
| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| | Animal insurance | Animals | Ruin from disease or accident, emergency slaughter, slaughter for economic reasons |
| **Slovakia** | Crop insurance | Almost all vegetal production | Hail, fire, storm, cold burst, flood |
| **Finland** | Salmonella insurance (group insurance) | Pigs, poultry, hatcheries, milk and beef cattle | Damages covered include costs due to eradication of salmonella and losses in production for a period of six months |
| | Group insurance for pig diseases | Pigs | Salmonella, PRRS (porcine reproductive and respiratory disease syndrome), enzootic pneumonia, swine dysentery, scab and atrophic rhinitis |
| | Livestock insurance | Livestock | — Death of an insured animal<br>— Severe illness or accident, which according to a veterinary specialist, results in the inevitable and premature culling of the animal<br>— Animal is lost or stolen for a longer time period than one month |
| | Extra security: livestock insurance | Livestock | — Basic insurance compensates damages when an animal dies or it needs to be emergency slaughtered<br>— Slaughter value insurance for cattle compensates damages when an animal dies or it needs to be emergency slaughtered<br>— Slaughter value and business interruption insurance<br>— Accident insurance for cows covers damages due to accident<br>— Catastrophe insurance for production animals |
| **Sweden** | Crop insurance (combined) | Arable crops, potatoes and various vegetables | Hail and re-planting costs due to drought, crust formation or soil erosion |
| | Animal insurance | Cattle, sheep, pigs, deer | Slaughter, death, theft (optional add-ins: veterinary treatment; milk production breakdown due to viral diarrhoea) |
| **United Kingdom** | Crop insurance (single-risk) | Crops, fruits, hops | Hail |

| Country | Insurance product name (type) | Products covered | Risks covered |
|---|---|---|---|
| | Livestock insurance | Livestock | Foot-and-mouth disease, tuberculosis, brucellosis, classical swine fever |
| **(Croatia)** | Crop insurance | All crops | Hail, fire |
| | Livestock insurance | Livestock | Death due illness or accident, emergency slaughtering, euthanasia |
| **(Turkey)** | Hail and fire insurance (until 2005) | Field crops, fruits and vegetables | Hail and fire |
| | Plant products insurance (combined) (2006) | Field crops, fruits and vegetables | Hail, fire, storm, tornado, landslide and frost |
| | Greenhouse insurance (2006) | Plastics- and glass-made greenhouses and the products grown within | Hail, fire, storm, tornado and landslide |
| | Livestock life insurance (2006) | Dairy cows | All types of accidents, natural disasters, fire or explosion and all diseases, pregnancy, birth or surgical operations. Contagious diseases compulsory to declare are excluded |
| | Poultry life insurance | Poultry produced in closed systems (chickens/hens, turkeys, ostriches) | All types of accidents, natural disasters, fire or explosion and all types of poultry diseases. Contagious diseases compulsory to declare are excluded |
| | Aquaculture | | |

*Source:* Authors' compilation from fact sheets.

### 5.6.2. *Deductibles in agricultural insurances*

This section deals with some of the insurance characteristics in relation to cover and the avoidance of moral hazard problems. These are the cover level, the franchise deductible, threshold or trigger, and other deductibles ([54]). The cover level refers to the proportion of the insured value that is effectively covered by insurance. The threshold or trigger is the percentage of the insured value the losses must exceed in order to trigger the payment. Once this value is exceeded, the payment of the indemnity can take place for the entire loss or only for a part of it. The straight deductible is the fixed amount of the loss as a percentage of the sum insured that will always be assumed by the insured. In fact, a cover level of 80 % would have the same effect on insurance as a cover of 100 % plus a straight deductible of 20 %. The relative deductible is the percentage of the loss that is not covered by the insurer but is assumed by the insured. It can be observed that most insurance types have at least one of these characteristics, either a cover level lower than 100 %, or straight deductible or another type of deductible. This avoids moral hazard because this means than whenever there is a loss the insured will have to assume at least a part of it. In this way, there are fewer incentives for increasing the risk exposure due to insurance.




*Source:* Authors' elaboration.

**Figure 59. Illustration of different deductibles**

Figure 59 illustrates the types of deductibles used in agricultural insurance schemes. The dotted line shows the indemnities or compensations provided by 100 % cover

([54]) See definitions of deductibles in the glossary.

insurance with no deductibles. The solid line corresponds to the same insurance when a trigger or threshold of 30 % exists. This means, if the loss exceeds the trigger of 30 % the entire loss is paid by the insurer. The short-dashed line shows a relative deductible of 30 % (30 % of the loss) without threshold. The long-dashed line shows a 30 % threshold plus a 30 % straight deductible. Lastly, we can see a combined straight-relative deductible additional to a trigger (threshold) represented by the dash-dot line.

The losses on which the different deductibles are to be applied can be evaluated per field, per crop (all fields with the same crops on the farm), or even per farm in whole-farm insurance products. In some cases, mainly in single-risk insurance products such as hail insurance, the losses and deductibles are calculated per field.

Looking at Table 21 we can see a variety of different deductibles with a range from 0 to 40 % and more. But some generalities can be pointed out.

— The higher the risk, the higher the deductibles. This can mean that the risk is high (high frequency in time or affecting a large area) or the covered products have a high sensitivity (e.g. fruits, vegetables).

  *Examples:*

  - Hail is a very local risk, different to drought which can affect a whole country in one growing season.
  - Table apples for instance are very sensitive against hail; they are only saleable to an apple-juice factory after even moderate hail.

— To create individual insurance schemes tailored to the demands of customers, different deductibles are used, so it is on the farmers' judgment to choose a higher deductible and pay a lower premium.

— In general, new insurance products, for which there is low or no insuring experience, have higher deductibles.

**Table 21. Deductibles**

| Country | Insurance product name (type) | Cover | Franchise or trigger | Deductible (% of insured value) |
|---|---|---|---|---|
| **Belgium** | Fire group insurance (single-risk) | 100 % | - | - |
| | Hail insurance (single-risk) | 100 % | 5 % | 5 % |
| **Bulgaria** | Crops (combined) | 100 % | 5 % | 5 % |
| | Livestock (combined) | 100 % | Infectious diseases: 10 %<br>Non-infectious diseases: 30–40 % | Infectious diseases: 10 %<br>Non-infectious disease: 30–40 % |
| **Czech Republic** | Crop insurance | 100 % | 8–10 % of sum insured per damaged field | 8–10 % of sum insured per damaged field |
| **Denmark** | Aggregated insurance | - | - | - |
| **Germany** | Hail: arable crops, wine | 100 % | 8 % | 8 % |
| | Hail: fruits, vegetables | 100 % | Standard: 10 %<br>Optional: 0–25 % depending on loss ratio | Standard: 10 %<br>Optional: 0–25 % depending on loss ratio |
| **Estonia** | Cattle insurance | - | - | - |
| **Ireland** | Farm insurance (single-risk) | 100 % | EUR 100 | EUR 100 |
| **Greece** | Public hail<br>(combined cover, but it is not insurance) | 75 % | 20 %<br>(some exceptions) | Straight deductible: 13.2 %<br>+ relative deductible: 12 % (some exceptions) |
| | Public livestock (is not insurance) | 80 %<br>(100 % for damages caused by bears) | 0–12 % | Straight deductible: 2.4–20 %<br>+ relative deductible: 0–20 % |
| | Private hail | 25 % | 15 % | 15 % |
| | Private livestock | 100 % | 1–2 % | 1–2 % |
| | Private aquaculture | | | |
| **Spain** | Combined | 100 % | 10–30 % | 10–30 % |
| | Yield geographic basis (yield) | Hail and fire: 100 % cover<br>Other risks: 65 % cover | Hail and fire: 10 %<br>Other risks: 35 % | Hail and fire: 10 % of loss relative deductible<br>Other risks: 35 % straight deductible |

| Country | Insurance product name (type) | Cover | Franchise or trigger | Deductible (% of insured value) |
|---|---|---|---|---|
| | Yield individual basis (yield) | Hail and fire: 100 % cover<br>Other risks: 70 % cover | Hail and fire: 10 %<br>Other risks: 35 % | Hail and fire: 10 % deductible (% of loss)<br>Other risks: 35 % straight deductible |
| | Fixed costs for associations and cooperatives | 100 % of fixed costs | 20 % | 20 % |
| | Livestock farms | 100 %<br>Fattening cattle: 90 % | 10 % | 10 %<br>For some risks or for some farmers it can be up to 50 % |
| | Dead animals disposal | 100 % | 0 % | 0 % |
| | Index insurance | 100 % | 0 % | 0 % |
| | Aquaculture | 100 % | Up to 20 % | Up to 20 % |
| | Forest production | 100 % | 10 % of surface | 0 % |
| **France** | A: Hail | 100 % | 15 % average | 15 % average |
| | B1: Hail and frost on fruits (combined) | 100 % | 15 % average | 15 % average |
| | B2: Hail and frost on wine grapes (combined) | 100 % | 15 % average | 15 % average |
| | C: Combined on COP (combined) | 100 % | 15 % average | 15 % average |
| | D: Combined on tobacco (combined) | 100 % | 15 % average | 15 % average |
| | E1: Combined all crops (yield) | 100 % | 15 % average | 15 % average straight deductible (25 % for subsidy) |
| | E2: Whole-farm combined (whole-farm yield) | 100 % | 15 % average | 15 % average straight deductible (20 % for subsidy) |
| **Italy** | Crops single-risk | 100 % | 10–30 % | 10–30 % |
| | Crops combined risks (combined) | 100 % | 20 % | 20–30 % |
| | Structures combined risks (combined) | 100 % | - | 10–30 % |
| | Crops multi-peril (yield) | 100 % | 20 % | 20–30 % |
| | Stock farms (combined) | | - | - |
| **Cyprus** | Crop insurance (combined) | - | hail, frost, wind: 15 %<br>rust, flood, heatwave, dry wind, | hail, flood, drought: 12 %<br>wind, heat, rain, water spot, dry wind, |

| Country | Insurance product name (type) | Cover | Franchise or trigger | Deductible (% of insured value) |
|---|---|---|---|---|
| | | | warm air: 20 %<br>water spot: 35 %<br>drought: 40 % | warm air: 15 %<br>rust: 25 %<br>drought: 30 % |
| | Livestock insurance | - | 0 % | 0 % |
| **Latvia** | No information | - | - | - |
| **Lithuania** | Crop insurance | - | 10–12 % (rape, flax)<br>6–7 % (cereals) | 10–12 % (rape, flax)<br>6–7 % (cereals) |
| | Livestock insurance | - | 10–30 % | 10–30 % |
| **Luxembourg** | Hail arable crops | 100 % | 8 % | 8 % |
| | Hail fruits, vegetables | 100 % | 10 % | 10 % |
| | Frost wine | 100 % | 10 %<br>(min. 2 %, max. 5 % per farm) | 10 %<br>(min. 2 %, max. 5 % per farm) |
| | MPCI | | 8 % frost, storm, flood<br>Drought 20–40 % depending on loss ratio<br>Outgrowth 20 % (fixed indemnity) | 8 % frost, storm, flood<br>Drought 20–40 % depending on loss ratio<br>Outgrowth 20 % (fixed indemnity) |
| **Hungary** | Crop insurance | 100 % | General 5 %<br>Yield insurance 10 % | General 5 %<br>Yield insurance 10 % |
| | Livestock | | General 0 %<br>Specific products where the dying off of animals exceeds 1 % (cattle), 4 % (sheep) and 2 % (goats) of the quarterly average number of animals | General 0 %<br>Specific products where the dying off of animals exceeds 1 % (cattle), 4 % (sheep) and 2 % (goats) of the quarterly average number of animals |
| **Netherlands** | Hail private insurance | | Depends on the insurance company | Depends on the insurance company |
| **Austria** | Hail | 100 % | 8 % | 8 % |
| | Multi-peril (yield) | 100 % | 8 % hail, other risks fixed by crops (as yield/hectare) | 4 % hail, other risks fixed indemnities/hectare |
| | Wine (combined and quality) | 100 % | 8 % for hail and 35 % for frost | 8 % for hail and 35 % for frost |
| | Fruits (hail and quality) | 100 % | From 10 % to 30 % depending on the last 10 years loss ratio | From 10 % to 30 % depending on the last 10 years loss ratio |
| | Grassland (combined) | 100 % | Hail: 8 %<br>Flood: 0 % | Hail: 8 %<br>Fixed indemnity for flood |

| Country | Insurance product name (type) | Cover | Franchise or trigger | Deductible (% of insured value) |
|---|---|---|---|---|
| | | | | (max. EUR 440/cut/ha) |
| | Livestock (combined) | 100 % | 0 % | From EUR 0 to EUR 15/cattle on farm, depending on farm loss ratio<br>Fixed indemnities depending on the age of the animal |
| **Poland** | Hail | 100 % | 10 % | 10 % |
| | Multi-peril | 100 % | 10 % | 10 % |
| | Livestock | | 20 % | 20 % |
| **Portugal** | All three types | 100 % | 0 | Relative deductible: 20 % of loss |
| **Romania** | Crop insurance<br>Livestock insurance | - | 10 % | 10–15 % |
| **Slovenia** | Crop insurance | - | Mostly 5 % | Mostly 5 % |
| | Animal insurance | - | - | No franchise for death from accident<br>Death from illness: 15 % franchise<br>Slaughter of irreproachable animal (accident): 50 % franchise<br>Slaughter of irreproachable animal with minor restrictions: 40 % franchise<br>Slaughter with total restriction: 15 % franchise<br>Slaughter for economic reasons: 60 % franchise |
| **Finland** | Salmonella insurance (group insurance) | - | EUR 1 000 and 5–20 % of the amount of damage | EUR 1 000 and 5–20 % of the amount of damage |
| | Group insurance for pig diseases | - | EUR 1 000 and 5–20 % of the amount of damage | EUR 1 000 and 5–20 % of the amount of damage |
| | Livestock insurance | - | Variable<br>e.g. 3 % of cows lost within 10 days, EUR 200 per event | Variable<br>e.g. 3 % of cows lost within 10 days, EUR 200 per event |
| | Extra security: livestock insurance | - | Variable<br>0–50 %<br>See annex to fact sheet | Variable<br>0–50 %<br>See annex to fact sheet |
| **Sweden** | Crop insurance | 100 % | 0 % except:<br>‘hail’ vegetables: 15 % | 0 % deductible except:<br>‘hail’ various vegetables: 15 % |

| Country | Insurance product name (type) | Cover | Franchise or trigger | Deductible (% of insured value) |
|---|---|---|---|---|
| | | | 're-planting' carrots: 15 % | 're-planting' carrots: 15 % |
| | Animal insurance | - | - | -<br>For milk production breakdown insurance: 10 % deductible (covers 90 % of the loss due to viral diarrhoea) |
| **United Kingdom** | Hail: crops, hops | 100 % | 0 % | 0 % |
| | Hail*:* fruits | 100 % | 10 % applied to the whole production | 10 % applied to the whole production |
| | Livestock*:* foot-and-mouth disease, classical swine fever | 25 % of the government compensation to provide 'consequential loss' cover to the farmer following compulsory slaughter; limited to GBP 250 000 per farm | 0 % | 0 % |
| | Livestock*:* tuberculosis, brucellosis, | 25 % of the value of the animal to provide 'consequential loss' cover to the farmer following compulsory slaughter; limited to GBP 250 000 per farm | 0 % | 0 % |
| **(Croatia)** | Crop insurance | 100 % | 5 % | 5–15 % |
| **(Turkey)** | Combined insurance (2006) | 100 % | 10–25 % | 10–25 % |
| | Greenhouse insurance (2006) | 100 % | Glass 2 %<br>Plastic 5 % | Straight deductible: 2 % glass and 5 % plastic<br>Relative deductible: 10 % glass and 20 % plastic |
| | Livestock life insurance | 100 % | 2.5–5 % | Straight deductible: 2.5–5 %<br>Relative deductible: 20 % |
| | Poultry life insurance | 100 % | 3 % (5 % ostrich) | Straight deductible: 3 % (5 % ostrich)<br>Relative deductible: 20 % |

*Source:* Authors' compilation from fact sheets.

### 5.6.3. Premium rates at product level

We have previously talked about premium rates, when referring to the country-level average rates. In this section, we analyse the premium rates specific to an insurance type or product. These premiums are presented in Table 24 for several countries, and are shown together with the granted subsidies and used deductibles. Amongst others, the altitude of premium rates in crop insurance generally depends on:

- the frequency of risks in time and on area,
- the type of risk (e.g. hail as a very local risk, drought as a large area risk),
- the sensitiveness of crops,
- the number of risks covered (single-risk, multi-risk insurance),
- the number of insured, to spread the risks,
- other technicalities like deductibles.

Besides the geographical variability inside each country, there is a high variability of the insurance products across Europe, depending on the risks and products (type of crops) covered. So we find low premium rates for hail insurance (2.3 % in Greece) for some livestock insurance, depending on the risks that are covered (1 % for poultry in Greece) and for aquaculture (1.5 %). The insurance policies for hazards causing greater or more frequent losses can be of 7–8 % (Italian multi-peril or yield insurance) and of 8 % for livestock (cattle in Greece). The premium rates for hail in Austria are around 2.8 % for arable crops, 6.5 % for wine and on average 14 % for fruits. Unfortunately these rates have not been provided for Spain. Multi-peril (yield) insurance premiums in France are quite low. This is due to the fact that the main production insured under this policy are field crops (cereals and oilseeds).

Table 22 and Table 23 are more summarised tables, grouped in types of crops. The premium rates vary a lot, depending on the insurance system and other technicalities, so it is only possible to give examples of them.

Looking at the previous tables covering insurance products and covered risks in Europe, we can see high variability of insurance products, which explains the difficulties in comparison of premium rates on the one hand and in computing average premium rates on the other hand. But an approximate average level can be given, as shown in Table 22.

**Table 22. Average premium rates**

| | **Average premium rates** |
|---|---|
| Arable crops | 1–3 % limited cover |
| Arable crops | 3–7 % wide cover |
| Wine grapes | 6–8 % |
| Vegetables | 5–9 % |
| Fruits | 8–14 % |

*Source:* Authors' calculations from fact sheet data.

**Table 23. Premium rates per insurance product**

| Crop | Covered risks | Country | Premium | Deductible | Subsidy |
|---|---|---|---|---|---|
| **Arable crops** | Hail | Austria | 2.8 % | 8 % | 50 % |
| | Hail or frost or other | Italy | 2.6 % | 10–30 % | 65 % |
| | Hail, fire | Portugal | 2.2 % | 20 % relative | Average: 68 % |
| | Hail, storm, frost, flood, rain, drought, others | Austria | 3.6 % | 4 % hail<br>Other risks: fixed indemnity (40 %) | Hail and frost: 50 %<br>Other risks: 0 % |
| | Hail, wind, frost, flood, excess of water | France | 7 % | 15 % average | 0 % |
| **Wine grapes** | Hail, frost | Austria | 6.5 % | 8 % hail<br>35 % frost | 50 % |
| | Hail, fire, flood, rain, frost, wind and others | Spain | 10 % | 10–30 % | 41 % |
| | Hail, wind, frost, flood, excess rain, drought, plant diseases | Italy | 6.5 % | 10–30 % | 78 % |
| **Fruits** | Hail, frost, wind | France | 8.6 % | 15 % | 0 % |
| | Hail, fire, flood, rain, frost, wind, others | Spain | 11 % | 10–30 % | 43 % |
| | Hail, fire | Portugal | 18 % | 20 % | 68 % |
| | Hail or frost | Italy | 13.8 % | 10–30 % | 54 % |
| | Hail (storm for protection net) | Austria | 14 % | 10–30 % | 50 % |
| **Olives for oil** | Two or three perils combined | Italy | 4.4 % | 10 % | 69 % |
| **Vegetables** | Hail, fire, flood, rain, frost, wind, others | Spain | 4.8 % | 10–30 % | 37 % |

*Source:* Authors' calculations from fact sheet data.

**Table 24. Premium rates and subsidies for some insurance products in selected countries**

| Country | Insurance product name (type) | Products covered | Risks covered | Premium | Subsidies |
|---|---|---|---|---|---|
| **Belgium** | Fire group insurance (single-risk) | Field crops, vegetables, vineyard, fruits and livestock farms | Fire, windstorm, floods, earthquakes, theft, working conflicts | - | 0 % (Taxes but not personal income taxes: 15 %) |
| | Hail insurance (single-risk) | - | Hail | - | 0 % |
| **Bulgaria** | Crops (combined) | Field crops, fruit trees and vineyards | Hailstorm, thunderstorm, torrential rain, fire on roots, ground frost, flood (sludge, freezing and withdrawal for winter cereals) | 4.8 % | 0 % |
| | Livestock (combined) | Cows and buffalos, sheep, goats, poultry | Death and compulsory slaughter from: fire and natural catastrophes; parasitic and infectious diseases (OIE list B & others) | 0.8 % | 0 % |
| **Ireland** | Farm insurance (single-risk) | Farm dwelling, outbuilding and stock, employers, product and public liability (livestock in transit, pedigree livestock, growing trees, etc. optionally) | Fire, lightning, storms, floods, attack of dogs on sheep | - | 0 % |
| **Greece** | Private hail | All crops | Hail, complementary to the ELGA policy | 2.3 % | 0 % |
| | Private livestock | Bovines<br>Poultry (sheep/goats and pigs also available) | All-risk mortality | Cattle: 8.3 %<br>Poultry: 1 % | 0 % |

| Country | Insurance product name (type) | Products covered | Risks covered | Premium | Subsidies |
|---|---|---|---|---|---|
| | Private aquaculture | All fish.<br>Additional: for fish stock in transit, equipment, vessels, etc. | All-risk mortality, theft, escape over | 1.5 % | 0 % |
| **France** | A: Hail | All vegetal productions | Hail and wind | Average: 2 %<br>Fruits and vegetables: 7.6 % | 0 %<br>(Fruits and vegetables until 2006: 7.5 %) |
| | B1: Hail and frost on fruits (combined) | Revenue from fruit production | Hail, wind and frost | 8.6 % | 0 %<br>(Until 2006: 25 %) |
| | B2: Hail and frost on wine grapes (combined) | Wine grapes | Hail, wind and frost | 2.15 % | 0 %<br>(Until 2006: 10 %) |
| | C: Combined on COP (combined) | Cereal, oilseed and protein crops | Hail, wind, frost, flood or too much water | 7 % | 0 %<br>(Until 2006: 10 %) |
| | E1: Combined all crops (yield) | All crops except forage land | Hail, wind, frost<br>Flood or too much water, drought, etc. | 1.6 % | 35 % (young farmers 40 %) for a franchise of 25 % |
| **Italy** | Crops single-risk | All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants | Hail, wind, black and hoar frost, floods, excess rain, drought, plant diseases | 7.7 % | 54 %<br>(50 % of ministerial parameter) |
| | Crops combined risks (combined) | All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants | Two or more of the events covered by single-risk insurance | 6.1 % | 59 %<br>(80 % of ministerial parameter) |

| Country | Insurance product name (type) | Products covered | Risks covered | Premium | Subsidies |
|---|---|---|---|---|---|
| | Crops multi-peril (yield) | All crops, fruit trees, shrubs and nurseries, trees for wood and seed plants | Hail, wind, black and hoar frost, floods, excess rain, drought, plant diseases | 11.4 % | 64 %<br>(80 % of ministerial parameter) |
| | Stock farms (combined) | Cattle and buffalo (value, cost of disposing of animals, lack of revenue for period of farm stoppage) | FMD, brucellosis, pleuropneumonia, tuberculosis and enzootic leucosis | - | 50 % of ministerial parameter |
| **Cyprus** | Crop insurance (combined) | Fruits<br>Citrus<br>Grapes<br>Cereals<br>Potatoes<br>Beans<br>Artichokes | Hail, frost, rain, windstorm<br>Hail, frost, windstorm, water spot, dry wind<br>Hail, frost, heatwave, rain, windstorm, dry wind<br>Hail, rust, drought<br>Hail, frost, flood<br>Hail, frost, flood, warm dry air<br>Hail, frost | 7.2 % | 50 % |
| **Austria** | Hail | Arable crops | Hail | 2.8 % | 50 % |
| | Multi-peril (yield) | Arable crops | Hail, storm, frost, flood, rain, drought, others | 3.6 % | Hail and frost: 50 %<br>Other risks 0 % |
| | Wine (combined and quality) | Wine | Hail, frost and additional expenditure after hail | 6.5 % | 50 % |
| | Fruits (hail and quality) | Fruits | Hail | 14 % | 50 % |
| | Grassland (combined) | Grassland and silo foils | Hail, flood | 1.5 % | Hail: 50 %<br>Flood: 0 % |

| Country | Insurance product name (type) | Products covered | Risks covered | Premium | Subsidies |
|---|---|---|---|---|---|
| | Livestock (combined) | Cattle | Stillbirth and death (epidemic disease excluded) | | 0 % |
| **Portugal** | Average three products:<br>Basic cover<br>+ Complementary cover<br>+ Total cover | Almost all vegetal production | Hail, fire, lightning and explosion<br>+ Tornado, waterspout, frost, snow<br>+ All risks in the other contracts (+ damages on cherry fruits + persistent rains on industry tomato) | Average: 8.66 % | Average: 67.7 % |

*Source:* Authors' compilation from fact sheets, with own calculations.

### *5.6.4. Geographical level for rating*

From the information provided in the fact sheets, we could observe that the unit used for the calculation of the premiums in most cases is an area unit, like a commune, a zone or a typical agricultural production area. If the farms within this area are not very homogeneous, and are subject to different risks, then the premiums will not correspond to the average indemnities paid. The area-based rating means that most insurance policies are prone to have adverse selection problems, because the same premium rate applies for all the farmers within the same area, so those with higher relative risks will get insured, and those with lower risks will not. Only in the Spanish yield insurance product do we find the farm level as the basis for the premium rating.

### *5.6.5. Bonus/malus system*

The bonus/malus system or system of deductions and penalties on the premiums due to former results is also used to avoid moral hazard and adverse selection problems. It is applied in Bulgaria, Germany, Estonia, Spain, Lithuania, Luxembourg, Hungary, the Netherlands, Austria, Romania and Finland. In Greece this does not exist for the compulsory public insurance, but it does for private insurance. There is no bonus/malus system in Denmark, Ireland, Portugal and the United Kingdom, or in Turkey. In Belgium, there is no bonus/malus system applied by the Belgian companies, but it is applied by the Dutch company OFH, which is the main insurer for apples and pears. For France and Italy no information was provided about it, and in Poland Slovenia and Sweden it seems not to be applied in crop insurance but it is applied in livestock insurance.

### *5.6.6. Compulsory insurance at crop level*

In most countries and for most insurance products, it is compulsory to insure all the fields with the same crop, so as to avoid that only those with higher risks are insured (another type of adverse selection). However, there are some exceptions, for example the French hail insurance and the Polish insurance products.

### *5.6.7. Loss assessment*

Usually the loss assessment is done by loss adjusters in the field. To estimate the loss, standardised directives are used which have been developed for different crops. These directives are discussed at annual meetings organised by the AIAG (International Association of Hail Insurers). Thus it can be assumed, that loss assessment for single-risk insurance is internationally comparable.

Contrary to the classic insurance, the loss assessment in index insurances is not made in the field but is based on independent indices. These insurance products have not yet reached the operational stage in Europe.

There are two different approaches for the assessment of loss.

1. Based on loss:
   In single-risk (hail) insurance, the loss adjuster estimates a percentage of the loss. For the loss-adjusting procedure samples are taken in the field and standardised directives are used for different crops. Then, the estimated percentage reduced by the deductible, is applied to the insured value (sum insured) and the result is the indemnity.
2. Based on yield:
   The loss adjuster estimates the yield by taking some samples in the field or in another way, for example in indirect index-based insurances where the yield is estimated by meteorological or vegetation indices. The estimated yield will be referred to an average yield at farm or area level.

In the second case the loss refers to an average reference yield. In the first case the loss refers to the expected yield in the current year. This makes a difference, because a loss of 50 % in the second case always result in a yield of 3 000 kg, if the reference yield for instance is 6 000 kg, whereas a loss of 50 % can be a different yield from year to year in the first approach.

The losses on which the different deductibles are to be applied can be evaluated per field, per crop (all fields with the same crops in the farm), or even per farm in whole-farm insurance products.

However, in other cases, mainly in combined and yield products, losses and deductibles are calculated per crop. Examples of this are the combined insurance products in France, or the yield insurance in Spain

Lastly, the whole-farm insurance scheme in France evaluates the losses and deductibles at farm level (addition of all crops produced on the farm). A particular case is the insurance of ‘Fixed costs for associations and cooperatives’ in Spain, which calculates the deductibles on the losses of all the farmers in the association.

**Table 25. Loss estimation**

| Country | Insurance | Loss estimation |
|---|---|---|
| **Czech Republic** | Hail and combined | Per field |
| **Germany** | Hail and combined | Per field |
| **Greece** | Public and private hail | Per field |
| **Spain** | Combined | Per field |
| | Yield | Per crop |
| | Fixed costs for farmers' associations and cooperatives | Per association |
| **France** | Hail | Per field |
| | Combined and yield | Per crop |
| | Whole-farm yield | Per farm |
| **Austria** | Hail and combined | Per field |
| **Poland** | Hail and combined | Per field |

*Source:* Authors' compilation from fact sheets.

The payment of the indemnities is known to be much faster in insurance than in other ad hoc payments from the government, which often take several (two to four) years. Table 26 shows the time elapsed from the happening of the loss until the payment of the indemnity.

**Table 26. Indemnities payment delays**

| Country | Time from damage to payment | Comments |
|---|---|---|
| **Greece public** | Maximum 3 months after harvest | |
| **Greece private** | Average 1 month | |
| **Spain** | Maximum 2 months | For livestock, maximum 40 days |
| **France** | Average 1 month | For whole-farm insurance, average 1 month after harvest of all insured crops<br>For some types of insurance products, the indemnities have to wait for the availability of harvest declarations or farm accountancies. |
| **Austria** | Maximum 2 weeks after harvest | |
| **Poland** | Average 1 month | |

*Source:* Authors' compilation from fact sheets.

## 5.7. The role and cost of reinsurance

### *5.7.1. Private or public reinsurance*

In most countries, reinsurance is undertaken by private companies. The main reinsurance companies throughout Europe are Munich Re, Swiss Re, Hannover Re, Partner Re, SCOR, Mapfre and some others. However, there are some exceptions in which insurance is partially or even totally managed by the government or public companies. This is the case for Portugal and to a minor extent Spain and Italy.

In Portugal, the main part of reinsurance is made through a public reinsurance system. It undertakes 85 % of the losses above a certain threshold. The adhesion to this mechanism is voluntary but, until now, all the insurance companies selling crop insurance have adhered to this system.

In Spain, there is compulsory public reinsurance, undertaken by the Consorcio de Compensacion de Seguros. The CCS is a public company but it functions as a reinsurance company from a financial point of view. This public company is itself reinsured by international private companies. Also, private companies can freely reinsure the share of risk they assume through the international reinsurance market.

In the case of Italy, there is a public fund of reinsurance. It was introduced in order to help the development of the new multi-risk insurance products (and for pluri-risk with more than a couple of perils included); so it only works for these types of insurance. It appeared in the 2000 budget law, but its first year of implementation was 2004 (this delay was due to the notification to the EU). It works within the Reinsurance Plan (ministerial decree general for all reinsurance).

### *5.7.2. Types of reinsurance: quota-share and stop-loss reinsurance*

There are two main types of reinsurance: non-proportional reinsurance and proportional or pro-rata reinsurance.

1. **Non-proportional reinsurance:** The cover of the reinsurer is based on the loss. The reinsurer takes charge of the loss above a certain threshold of the loss. It is similar to insuring with a straight deductible.

   **Stop-loss:** The reinsurer takes charge of the losses above a fixed threshold of the annual balance (annual loss or loss ratio) of the insurance company.

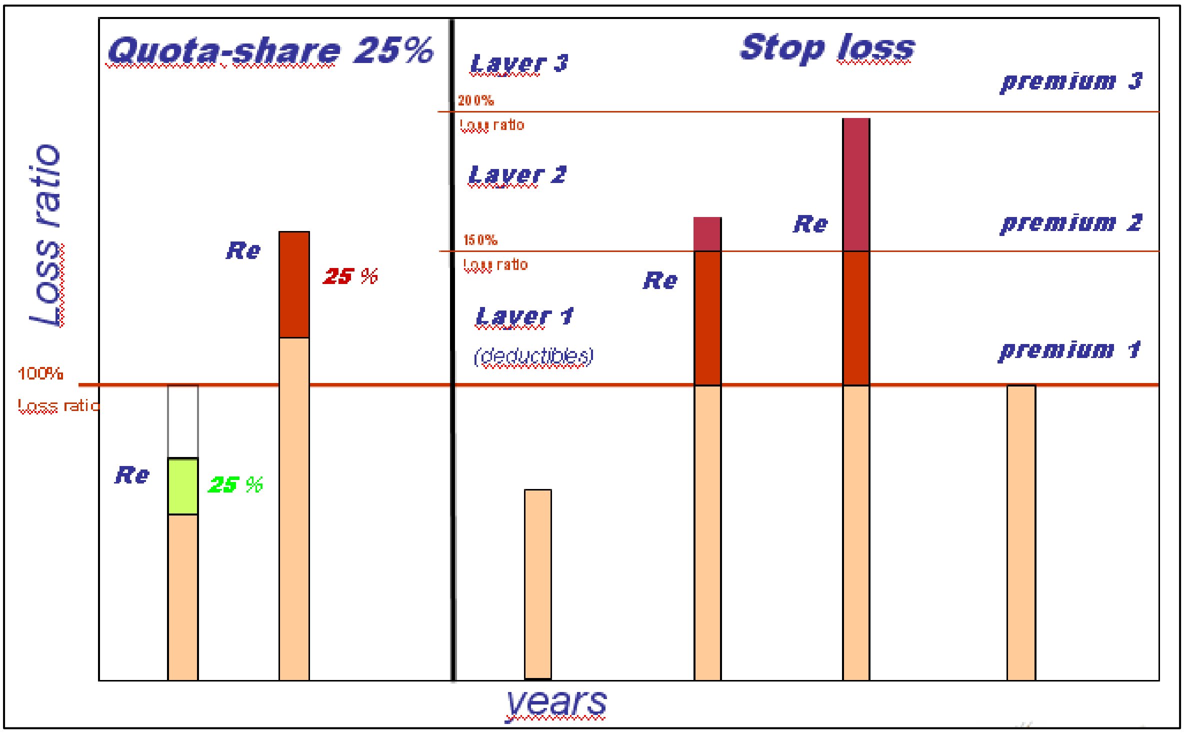
   **Loss excess:** The reinsurer takes charge of the losses above a fixed amount of loss. It can be done per contract or cumulated, for all the contracts covering some hazard.
2. **Proportional reinsurance:** The cover of the reinsurer is based on the sum insured. It is more similar to insuring with a relative deductible. There are four main types of proportional insurance structure: quota-share reinsurance, variable

quota-share reinsurance, surplus reinsurance and surplus reinsurance with a table of lines. Quota-share reinsurance is the most common in agricultural insurance.

**Quota-share reinsurance**: The reinsurer assumes a set percentage of risk (covered sum insured) for the same percentage of the premium, minus an allowance for the ceding company's expenses. Or, giving a similar result, the reinsurer takes charge of a percentage of the loss of the company, and the same share on the profit.

Quota-share reinsurance is also used to improve the capital ratio of the insurer (e.g. new or small insurance companies) because in this type of reinsurance the insurer quotes a more or less high amount of the covered sum insured to the reinsurer, that decreases the liable equity of the insurer.

Stop-loss and quota-share reinsurance are the two most used systems in agricultural insurance schemes. Figure 60 illustrates stop-loss and quota-share as a proportion of the companies' losses and profits, in a simplified way. Quota-share reinsurance at 25 % means that when the premiums are bigger than indemnities, the reinsurance company gets 25 % of the gains. In years when the indemnities paid exceed the total premiums gathered, the reinsurance company pays 25 % of the excess of indemnities. For stop-loss reinsurance, different layers can be established and a different premium rate is calculated for each layer. Sometimes, for the first layer, a relative deductible is also used because the frequency of loss is higher.




Source: Authors' elaboration.

**Figure 60. Quota-share and stop-loss reinsurance**

### 5.7.3. Types of reinsurance in European countries

The main reinsurance types and characteristics in European countries are shown in Table 27. We can go more in-depth in the explanation of the types of reinsurance agreements of a few countries for which we obtained more detailed information. One is an example of a completely private reinsurance system (Austria), two of them are mixed systems (Italy and Spain), and Portugal provides the example of a purely public reinsurance system.

In Austria there is proportional reinsurance from the insurer companies founding the agricultural insurance as a mutual organisation. By this proportional reinsurance agreement, the founder companies get 25 % of the profits on the years when the loss ratio is lower than 1, and on those years when the loss ratio is above 1 they assume 25 % of the losses exceeding 100 %. In all cases an additional provision (the premium that the insurer gets from the reinsurer for the administrative costs, around 20 %) is to be considered (from the profit or from the losses). The annual loss ratios (including the expenses of damage survey) vary from 38 % in 2001 to 140 % in 2000. The average of the last 10 years is approximately 74 %.

In Italy, there are both private and public stop-loss reinsurance schemes. Private stop-loss reinsurance applies to 40 % of the risks taken directly by the companies, that is, the share that is not passed over to the reinsurers as quota-share reinsurance. In a general way, companies pay indemnities every year up to a maximum of the money they get from premiums (which can be 110 %, so that the quantities over this 110 % are assumed by the stop-loss reinsurance). They also have an upper threshold of EUR 5 million for hail policies. Public reinsurance in Italy applies only to the new insurance products. It works in a different way for the multi-peril and for the pluri-peril insurance products. The pluri-peril schemes have the right to stop-loss reinsurance and the multi-peril schemes to quota-share. But, in general, 80 % of public reinsurance is stop-loss. The percentage reinsured is different for each company. In Spain, there is public stop-loss and quota-share reinsurance of the pool of insurance companies by CCS, and also private stop-loss reinsurance for the share of risk assumed directly by the companies.

In Portugal, the companies pay to the government a percentage of their premiums as reinsurance premiums. Reinsurance is stop-loss with a relative deductible. The trigger for the stop-loss is a percentage of the premiums, which varies from 65 % to 110 %, depending on the crops and regions. When the indemnities are above this percentage, the public reinsurance systems assume the 85 % of the indemnities above the trigger.

**Table 27. Reinsurance in European countries: types and characteristics**

| Country | Private or public | Main reinsurers | Reinsurance type and rates |
|---|---|---|---|
| **Belgium** | Private | Swiss Re and Munich Re | - |
| **Bulgaria** | Private | - | Proportional and stop-loss |
| **Czech Republic** | Private | Swiss Re, others | - |
| **Denmark** | Private | - | - |
| **Germany** | Private | Munich Re, Swiss Re Germany, Axa Re, Partner Re, GE Frankona, etc. | Quota-share and stop-loss |
| **Estonia** | - | - | - |
| **Ireland** | - | - | - |
| **Greece** | Private for Agrotiki (ELGA not reinsured) | Munich Re, Mapfre | Hail stop-loss (rates around 4.5 % until 2002, 14.5 % in 2003) |
| **Spain** | Public by CCS<br>+ Complementary insurance by international companies<br>+ Private reinsurance of CCS | CCS (Consorcio de compensación de seguros)<br>+ Partner Re<br>+ Swiss Re (reinsures CCS) | CCS: 10 % quota-share and stop-loss (rates: special policies 23 % or 19 % and classic policies 14 % or 2 %)<br>+ Complementary insurance stop-loss (rate 2 %)<br>+ Stop-loss for Swiss Re (rate 6 %) |
| **France** | Private | Swiss Re, Munich Re, Scor, etc. | - |
| **Hungary** | Private | - | Stop-loss |
| **Italy** | Private<br>+ Public for new insurance products | ?<br>+ FRR (Risks Reinsurance Fund).<br>A reinsurance consortium is in project | 60 % quota-share and stop-loss<br>+ Stop-loss for combined risks and quota-share for multi-peril (80 % is stop-loss) |
| **Cyprus** | - | - | No reinsurance |
| **Latvia** | - | - | - |
| **Lithuania** | Private | International reinsurance | - |
| **Luxembourg** | Private | Munich Re, Swiss Re Germany, Axa Re, Partner Re, GE Frankona, etc. | Quota-share<br>40 % for fruits<br>20 % for wine and vegetables<br>Stop-loss |
| **Netherlands** | Private for hail insurance (public for some pilot experience) | Munich Re, Swiss Re, Hannover Re, Scor, Mapfre, Partner Re, GE Frankona, Lloyds, etc. | - |

| Country | Private or public | Main reinsurers | Reinsurance type and rates |
|---|---|---|---|
| **Austria** | Private | 12 national companies + International market: Munich Re, Scor Germany, Hannover Re, Swiss Re Germany, Sirius Re, etc. | 25 % proportional and stop-loss (rates 5 % to 8 %) |
| **Poland** | Private | Swiss Re, Partner Re | - |
| **Portugal** | Public–private | Government | Stop-loss with deductible (rates 6.3 % to 10.8 % of the premiums) |
| **Romania** | Private | International reinsurance | |
| **Slovenia** | Private | - | Stop-loss |
| **Slovakia** | - | - | No information |
| **Finland** | Private | - | Group insurance |
| **Sweden** | Private | - | - |
| **UK** | Private | - | Stop-loss |
| **(Turkey)** | Private (possibility of public reinsurance since the 2005 law) | Since 2004 only Milli Re | 70 % proportional (more common) and stop-loss (total rates: approx. 5 % of the premiums) |

*Source:* Authors' compilation from fact sheets.

# 6. Other risk management tools in Europe

## 6.1. Chapter synthesis

This chapter describes other risk management systems in general, including funds, public systems, ad hoc aid, and futures markets existing in Europe. This helps to better understand the evolution of the insurance systems in Europe. In fact, the development of the insurance system depends very strongly on the presence of other risk management tools or from the public role and its ad hoc aid measures.

There are public compensation schemes through ad hoc aid or calamity funds in most countries (in Ireland, Luxembourg and the UK for livestock only). From the information received, it can be seen that public compensation through any of these forms total more than EUR 1 000 million as a yearly average in the EU-27. Of this, 35 % corresponds to the UK for livestock diseases and the same approximate amount corresponds to France (25 %), Italy (10 %) and Germany (10 %) for different agricultural (and to a minor extent livestock) perils.

Futures markets constitute a potentially useful private tool for managing price risks. However, they have not developed well in Europe, mainly among the farm sector, possibly due to several factors, among which the CAP and the lack of homogeneity in product prices.

## 6.2. Ad hoc aid and funds

When there are no market-based instruments available to manage risks such as futures markets, insurance or mutual funds, or even if complementary to these market instruments ad hoc aid is given from the public budget in order to help farmers in the event of calamities or natural catastrophes, in some countries, most of the risk management protection for crops is provided privately while there is most often government intervention for animal diseases (this is the case for the Netherlands, Ireland, the United Kingdom, etc.). The rest of the countries give all of their compensation to agricultural catastrophic losses by means of ad hoc aid or through calamity funds.

Ad hoc aid or assistance in the case of a calamity or natural disaster usually cause big distortions in the national budget. For this reason, many countries create specific funds for risk management in agriculture. Usually these funds have the purpose of accumulating money every year to be prepared in case of unexpected situations in which it is necessary to provide assistance for a calamity or a natural disaster happening. Some countries feed the funds entirely from the public budget while others have more 'private' funds, usually fed from levies on some products. Tables 28, 29 and the map in Figure 61 show non-insurance schemes, such as calamity funds, stabilisation accounts and ad hoc aid.

**Table 28. Other risk management tools in the European Union**

| Country | Stabilisation accounts | Calamities fund | Ad hoc aid | Date of information |
|---|---|---|---|---|
| **Belgium** | - | GF and GC | - | 2006 |
| **Bulgaria** | - | GF | GF | 2006 |
| **Cyprus** | - | - | GF | 2006 |
| **Czech Republic** | - | - | GS? | 2006 |
| **Denmark** | - | P+ GC | GF | 2006 |
| **Germany** | | GC (1) | GF | 2006 |
| **Estonia** | - | - | - | 2006 |
| **Ireland** | - | - | GF (1) | 2006 |
| **Greece** | - | - | GF | 2006 |
| **France** | - | GS | - | 2006 |
| **Italy** | - | GF | - | 2006 |
| **Latvia** | - | GF | GF | 2006 |
| **Lithuania** | - | GF | GF | 2006 |
| **Luxembourg** | - | - | GF (1) | 2006 |
| **Hungary** | - | - | GF | 2006 |
| **Netherlands** | - | GC | - | 2006 |
| **Austria** | - | GF | GF | 2006 |
| **Poland** | - | GF | GF | 2006 |
| **Portugal** | - | GS | - | 2006 |
| **Romania** | - | - | GF | 2006 |
| **Slovenia** | - | - | GF | 2006 |
| **Slovakia** | - | ? | ? | 2006 |
| **Spain** | S | - | GF | 2005 |
| **Finland** | PS | - | GF | 2006 |
| **Sweden** | S | - | GF | 2000 |
| **UK** | - | - | GF (1) | 2006 |

Legend:

| | | | |
|---|---|---|---|
| - | Not existing (empty space means that there was no information about it) | GC | Public compulsory partially subsidised |
| S | Subsidised | GF | Public free |
| PS | Private partially subsidised | ? | Unknown |
| GS | Public partially subsidised | | |

Note: Malta is missing.

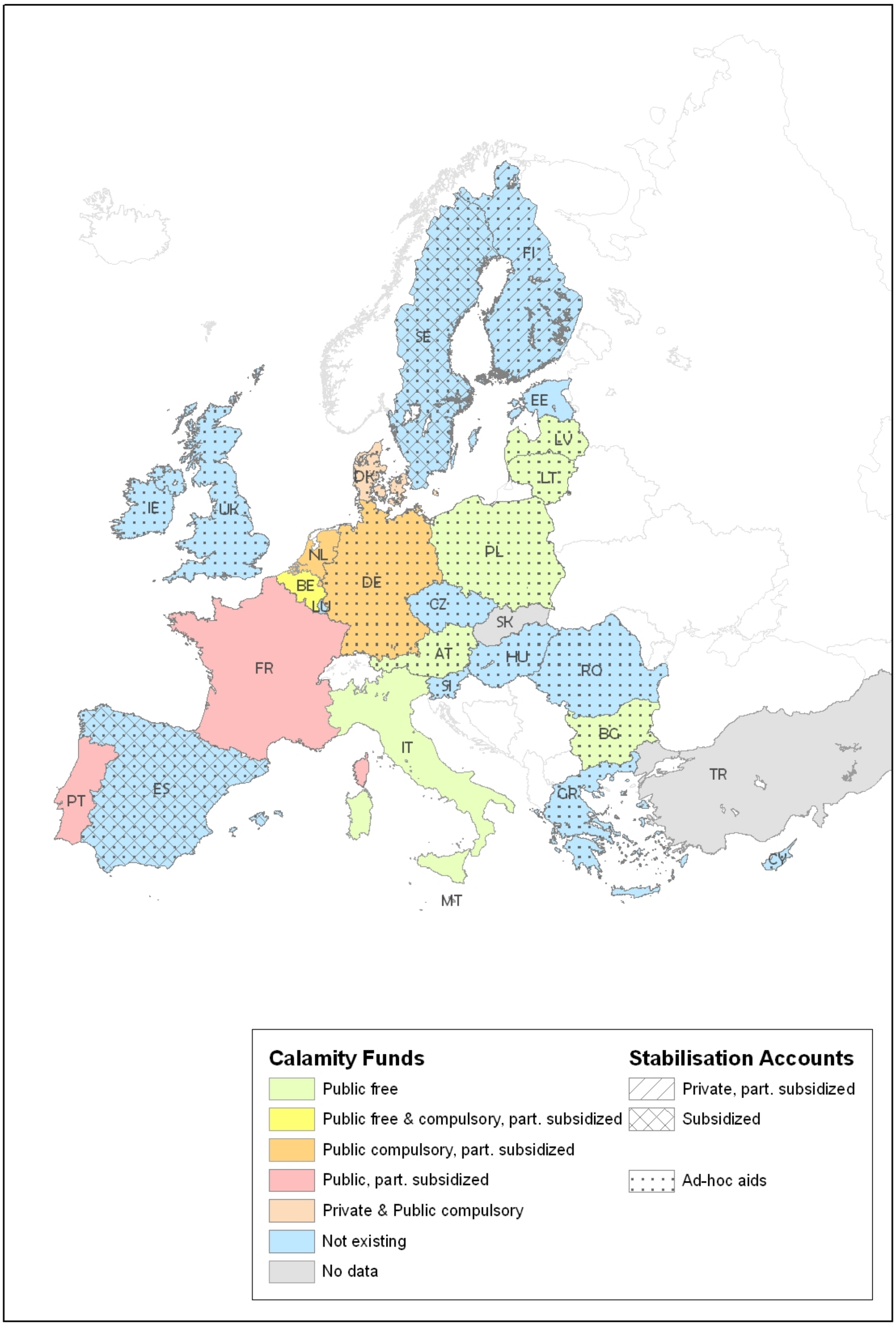
(1) Livestock only.

*Source:* Authors' compilation from fact sheets.

**Table 29. Other risk management tools in other European countries**

| Country | Stabilisation accounts | Calamities fund | Ad hoc aid | Date of information |
|---|---|---|---|---|
| **Croatia** | - | - | GF | 2006 |
| **Turkey** | - | GF (1) | GF | 2006 |

*Source:* Authors' compilation from fact sheets.




*Source:* Authors' elaboration from fact sheet information.

**Figure 61. Calamity funds, stabilisation accounts and ad hoc aid in Europe**

As already presented in the previous chapter, in some countries, as an alternative or complementary to ad hoc aid or aid via funds, there is public participation either in:

— the provision of subsidies to private insurance;

— the direct provision of reinsurance; or

— the provision of a security net (this is the case for Greece and Cyprus).

Most often, support to agricultural insurance schemes comes directly from the national budget. In some of these countries, it is not directly the government by means of a ministry, but a public institution that manages the agricultural insurance-related affairs. The names of these institutions are shown in Table 30.

**Table 30. Public institutions related with agricultural insurances**

| Country | Institutions |
|---|---|
| Greece | ELGA (Hellenic Agricultural Insurance), public insurer |
| Spain | ENESA (Entidad Estatal de Seguros Agrarios) — Ministry of Agriculture |
| Italy | ISMEA (Istituto di Servizi per il mercato agricolo alimentare), not only for insurance |
| Cyprus | AIO (Agricultural Insurance Organisation) |

*Source:* Authors' compilation from fact sheets.

However, in those countries that also have funds, the funds and insurance support are most often closely related, a part of the fund being used for subsidising insurance premiums (this is the case for Austria, Italy and the Czech Republic since 2004 and, to a minor extent, in France).

**Table 31. Funds related to subsidies and *ex post* aids**

| Country | Public/private | Fund |
|---|---|---|
| **Belgium** | Public | Caisse Nationale des Calamites (since 1976) |
| | Mixed | Fonds de mutualisation des animaux (since 1998)<br>Fonds de mutualisation des végétaux (since 1993) — Potato |
| **Bulgaria** | Public | Fund for insect pest control (against Moroccan locust) |
| **Czech Republic** | Public | Support and Guarantee Fund for Farmers and Forestry (PGRLF) |
| **Germany** | Mixed | Tierseuchenkassen (livestock diseases) |
| **Denmark** | Private | Fund for floods, not agri-specific. Privately fed by charges on fire insurance premiums (1991). |
| | Mixed | Compensation scheme for slaughtering of animals in response to disease outbreaks. This compensation is, under certain |

| Country | Public/private | Fund |
|---|---|---|
| | | circumstances, supplemented by compensation from funds established by the agricultural industry. |
| **Estonia** | - | - |
| **Ireland** | Private | Potato pool (potato producers fund) (ENESA 2004) |
| | Mixed | Fund for animal disease eradication (mixed 50 %) |
| **Greece** | - | - |
| **Spain** | - | - |
| **France** | Mixed | Fonds National de Garantie des Calamites Agricoles (FNGCA) (50 %) |
| **Italy** | Public | FSN (National Solidarity Fund) (since 1970) and<br>FSNPA (National Solidarity Fund for Fisheries and Aquaculture) (since 2004) |
| **Cyprus** | - | - |
| **Latvia** | - | - |
| **Lithuania** | Public | Calamity fund |
| **Luxembourg** | Public | Vineyard solidarity fund |
| **Hungary** | - | - |
| **Netherlands** | Mixed | Compulsory livestock fund |
| | Public | Non-agri-specific fund (*source:* ENESA 2004) |
| **Austria** | Public | Austrian catastrophe fund |
| **Poland** | Public | Fund for epidemic diseases |
| **Portugal** | Mixed | Fundo de Calamidades |
| **Romania** | - | - |
| **Slovenia** | - | - |
| **Slovakia** | - | No information |
| **Finland** | - | - |
| **Sweden** | Public | (Programme for livestock infectious diseases) Swedish Board of Agriculture |
| **UK** | - | - |

*Source:* Authors' compilation from fact sheets.

In Belgium there are three funds. The Caisse Nationale des Calamitées (calamities fund) is exclusively fed from the public budget. It gives aid in the case of calamities which are defined in the Law of 12 July 1976 (see Section 4.3 on 'disaster' and 'crises' definitions). Besides this, there are two mutual funds: the budgetary fund for the health and quality of animals and animal products (Fonds des animaux) since 1998, and the budgetary fund for the production and protection of crops and crop products (Fonds des végétaux). The activity of the latter is limited to the potato sector. These two funds are co-financed on a basis of 50 % by the producers through compulsory levies and, after the recent crisis, up to 50 % by the European Union. However, besides these funds, ad hoc aid is given in very special cases, by the federal government (dioxin intervention 1999) and or by the administrative regional governments (avian flu 2005, by the Flemish Region).

In the Czech Republic, insurable risks can only be covered by the private sector. Since 2004, the Support and Guarantee Fund for Farmers and Forestry (PGRLF) has offered premium subsidies for both crop and farm animal insurance.

In Denmark, there is a compensation scheme for slaughtering animals in response to disease outbreaks. This compensation is, under certain circumstances, supplemented by compensation from funds established by the agricultural industry. Manufacturers are obliged to pay an amount to such schemes within the agricultural industry according to a percentage of their production or turnover.

In Germany, there are special public programmes after natural disasters, but usually emergency aid is part of the federal states' responsibility, as there is no public calamity fund. In cases of outbreaks of animal diseases, animal keepers are compensated under the Animal Disease Act in the version promulgated on 11 April 2001. The Act lays down that a pecuniary compensation shall be paid for animals whose destruction has been officially ordered, as well as in cases in which animals have died after the destruction had been ordered or even for dead animals in which a notifiable disease has been detected post-mortem (Tierseuchenkassen, animal disease fund, institution under public law).

In Ireland, the fund compensates farmers for the commercial value of compulsorily slaughtered animals. The farming community as a whole contributes to the farm in the form of a levy. These 'disease eradication' levies are imposed at the point of slaughter of all cattle and on milk products. The levies are adjusted regularly, with the objective of ensuring that 50 % of the cost of compensation is met from the levies.

In France, the Fonds National de Garantie des Calamités Agricoles (FNGCA) covers non-insurable risks. The financing of FNGCA is granted by farmers and by the public budget on a parity base (50 %). The contribution of farmers arises from taxes levied on premiums paid to cover the whole set of farm risks (13 % in fire insurance premiums, 5 % in farmers' car insurance premiums and 7 % in the rest of agricultural insurance premiums). At the same time, the FNGCA subsidises a small part of the insurance premiums, depending on the insurance product. After the official declaration of natural disaster, indemnities are paid to farmers that bought insurance on at least one insurable risk and that suffered losses above a certain threshold.

In Cyprus, the public agricultural insurance organisation, the basic objective of which is the formation of a comprehensive system of agricultural insurance that will cover all agricultural crops against all natural hazards, provides subsidies (50 %) to the compulsory insurance system. Complementarily, the system provides ad hoc government financial assistance to farmers who suffer loss of income from the perils caused by natural hazards to compensate the farmers' damages which are not included in the insurance scheme or from crops which are not considered in the range of crops covered by the insurance scheme or when the reserves were not adequate to cover the claims.

In Latvia, State-guaranteed compensation is given, particularly in animal epizooty cases, from the State funds intended for unforeseen events. There is compensation for losses caused by unfavourable weather conditions, natural disasters and animal diseases and similar, in compliance with the particular political resolutions. Subsidies are granted in the amount of 50 %, but limited per unit (hectare, livestock).

In Lithuania, there is a calamity fund for loss of farm buildings, agricultural technique, animals and birds due to natural disasters, adverse weather conditions and animal epidemic diseases. Compensation of up to 60 % of losses is given to those who had insured the aggrieved assets and compensation of up to 20 % to those who had not. In the case of extraordinary disasters, the government approves ad hoc support for farmers. Compensation varies according to the extent of the loss, e.g. in 2005 those who suffered 100–80 % of losses got 50 % compensation, those who suffered 80–50 % got 30 %, and those who suffered 50–30 % got 15 %. Usually the compensation was paid within the period of one year. There is also partial support for insurance premiums up to 50 %; this started in 1992.

In Austria, the catastrophe fund is used mostly for preventive measures, and a small part is used for subsidies in crop insurance (25 % of the hail and frost insurance premiums). This subsidy is provided on the condition that the regional government also provides 25 % of the insurance premium. In the case of adverse weather conditions like hail or frost, no payments are allowed from the national fund because these events are caused by insurable risks. Sometimes the government makes additional ad hoc payments after natural disasters and non-insurable events.

In Portugal, for the past 10 years, measures have been taken to face events caused by calamities not covered by crop insurance, in most cases, through the Fundo de Calamidades (calamity fund). The fund is financed through a contribution from the government budget and by a contribution from the farmers. Farmers have the right to get compensation from the fund only if they have bought a crop insurance policy during the campaign in which the calamity occurs. They also have to pay a contribution to the fund equal to 0.2 % of the insured value. The fund compensation is given, in most cases, as a bonus to credit interests and, exceptionally, as direct subsidies.

In Romania, the agricultural producers benefit from the stipulation of Law 381/2002 if they are affected by natural phenomena and if they are located in a calamity area declared by governmental decision, and if their crops, plantations, animals, fowl or fish are insured by an insurance company approved by the Ministry of Agriculture.

Insurance premiums were subsidised initially by 20 % but in 2005 the level of subsidy rose to 50 %. There is no public fund for natural disasters.

In Slovenia, there is a range of ad hoc measures applied in agriculture by the government to compensate for extraordinary disasters. Compensation of damage from natural disasters includes State aid in thee of drought, hail and frost. In the past decade (1994–2004) the average annual expenditure was EUR 8.2 million; however, after 2000 expenditure increased dramatically, as the average for 2000–04 was EUR 15.6 million. In terms of total budgetary expenditure, disaster aid to agriculture represents about one tenth in past five years (the average for 2000–04 is 10.5 %). Only in the 2006, for the first time, was a national programme available for insurance premium subsidies to crop producers. This seems to be an initiation to more systematic public–private cooperation in agricultural risk management in Slovenia.

In Finland, cover is available free of charge for all farmers, given that they follow certain guidelines. The cover comes from the public crop damage compensation scheme (based on the Crop Damage Compensation Act) and compensation is also paid for the prevention of certain animal diseases (limited cover, based on the Animal Disease Act). Commercial insurance schemes are not subsidised in Finland. Insurance companies are generally not willing to offer insurance for such events (except livestock), because extreme damage is compensated for by the State.

In Sweden, there is a public programme to combat and compensate damages from infectious diseases, while for other disasters in agriculture, such as contaminated feed, plant pests or radioactive fall-out, compensation is made on a rather ad hoc basis. In the infectious diseases programme, farmers do not have to pay a premium but are obliged to take certain measures (such as slaughter or decontamination) in the case of an outbreak of any of the regulated diseases. In the case of epizootic disease, farmers are fully compensated (100 %) for the value of animals and costs of decontamination, and by 50 % for production losses. In the case of zoonoses (salmonellosis), farmers are compensated for up to 70 % of the costs in connection with the disease.

In the United Kingdom, ad hoc payments are given from the government for compensation in the case of an ‘Order’ for slaughtered animals (this was notable in 2001 with around EUR 1 640 million for foot-and-mouth disease).

As can be seen in Table 32, in the case of France ad hoc payments are very high (2000–05) compared with Spain (2000–05). Instead, in Spain, the subsidies for insurance are higher (see Table 16). This example demonstrates a different approach for the use of public payments (see Table 3).

**Table 32. Ad hoc and funds payments in the recent years**

| Country | Years available | Total payment (million EUR) | Average payments /year (million EUR) | Comments |
|---|---|---|---|---|
| **Belgium** | 1985–2002 | 29.4 | 1.6 | Frost, drought, rain, pests |
| **Belgium** | 1999 | 280 | - | Livestock: dioxin |
| **Bulgaria** | 2000–04 | 2 | 0.4 | Insect pest control fund and others |
| **Czech Rep.** | 1995–2004 | 369.3 | 36.9 | Flood, drought, frost |
| **Denmark** | - | - | - | Storm and forest storm damage |
| **Germany** | 2004–06 | 337 | 112.3 | Flood 2004 more than EUR 240 million; livestock diseases including preventive measures |
| **Estonia** | - | 0 | 0 | No payments |
| **Ireland** | 1999–2004 | 400.6 ([1]) | 66.8 ([1]) | Livestock disease |
| **Greece** | 1995–2004 | 701.0 | 70.1 | - |
| **Spain** | 2000–05 | 22.2 | 3.7 | Frost, drought, rain |
| **France** | 1996–2005 | 1 555.8 ([1]) | 155.6 ([1]) | Drought 67 %, frost 19 %, rain 13 % |
| **Italy** | 2001–06 | 680.0 | 113.3 | Drought and others not covered by insurance |
| **Cyprus** | 2001–04 | 28.6 | 7.2 | - |
| **Latvia** | 2000–05 | 19.3 | 3.2 | Frost, drought, rain |
| **Lithuania** | 2000–05 | 15.7 | 2.6 | Frost, drought, rain |
| **Luxembourg** | - | - | - | No ad hoc aid for crops. No other data |
| **Hungary** | 1999–2002 | 48.8 | 12.2 | Frost, drought |
| **Netherlands** | 1998 | 250.0 | - | Excessive rain. No longer allowed |
| **Austria** | 1995–2004 | 55.9 | 5.6 | Frost, drought, flood |
| **Poland** | - | 10.0 | 10.0 | Epidemic diseases |
| **Portugal** | Last 10 years | 30.0 ([2]) | 3.0 ([2]) | - |
| **Romania** | Last 5 years | 56.8 | 11.4 | Drought, frost, floods |
| **Slovenia** | 1995–2004 | 97.8 | 9.8 | Drought, hail, frost |
| **Slovakia** | - | - | - | No data |
| **Finland** | 1996–2005 | 114.2 | 11.4 | Crop damage compensation scheme |
| **Sweden** | - | - | - | Infectious diseases |
| **UK** | 2001–05 | 1 897.7 | 379.5 | Livestock disease |
| **Total** | | | **1.062.3** | |
| **(Croatia)** | 1997–2004 | - | 2.5 | EUR 54 million in 2003 for drought |
| **(Turkey)** ([3]) | 1996–2005 | 52.67 | 5.26 | Animal disease control aids not included |

Notes:

([1]) 50 % of this amount comes from private contributions from the sector, either 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.

([3]) Exchange rate considered: EUR 1.674.000 = TRL 1 (former Turkish lira, 2005)

*Source:* Authors' compilation from fact sheets and own calculations.

**Table 33. Average annual public payments in Spain and France**

| Country | Subsidies to insurance (million EUR) | Ad hoc payments (million EUR) |
|---|---|---|
| **Spain** | 230 | 4<br>drought, frost, rain |
| **France** | 5 | 156<br>drought, frost, rain |

*Source:* Authors' compilation from fact sheets, and own calculations.

## 6.3. Ad hoc aid versus insurance: law barriers

A key point for the development of agricultural insurance schemes is whether or not the law forbids that ad hoc measures or disaster funds to compensate for damages which could have been insured. In Greece, Spain, Austria, Portugal and Sweden there are no payments from a public fund if there is insurance available. In France, payments include those damages for which there is no insurance at all or that insurance has not reached yet a significant diffusion level. In Italy, only subsidised risks are excluded from public ad hoc payments after natural disasters. In Romania, payments from the public budget are only given to farmers in the case of natural disasters if they have insured risks called 'standard risks' like hail. In other countries it seems that there are no explicit regulations.

**Table 34. Law barriers to aid**

| Country | Law barrier |
|---|---|
| **Belgium** | The definition of the phenomena that can be covered by the calamities fund implies that the usually insurable risks cannot perceive aids from the fund. According to the Law of 1976, only hail is considered as normally insurable and so cannot be covered by the fund. |
| **Bulgaria** | There are no law barriers for payments from public funds for natural disasters which could be covered by insurance. |
| **Czech Republic** | The law does not forbid ad hoc measures and disaster funds compensating insurable damages. But changes are taking place regarding the condition for State compensation, so farmers have to insure against these risks. |
| **Denmark** | No, there are no limitations. |
| **Germany** | There are no law barriers for ad hoc measures to compensate damages that could have been insured. |
| **Estonia** | No barriers, because insurance is not developed. |
| **Ireland** | The law does not forbid compensation for losses which could have been insured. |
| **Greece** | In Article 4 ('exclusions') of the 2006 regulation, it is stated that ad hoc compensation is not paid:<br>'9. To the owners of agricultural (crop, livestock or aquaculture) exploitations |

| Country | Law barrier |
|---|---|
| | they have not insured with an insurance body (all or some of the) main components of their exploitation for at least one insurable risk.'<br><br>(It is not clear what is meant by 'insurance body' but it is understood that, in practice, the ELGA services tend to consider both ELGA and private insurers as 'insurance bodies').<br><br>'11. For losses covered partially or totally by insurance programmes of the legal entities providing protection services for the agricultural activity in the framework of the system "Hesiodus" …'<br><br>(The legal entities providing 'protection services for the agricultural activity' in the framework of the system 'Hesiodus' are, according to L.2945/01, ELGA as well as the insurance companies and the farmers' mutual organisations participating in the 'annual programme of agricultural insurance'. At present, no such programmes are offered by private insurers and mutual organisations. Therefore, paragraph 11 above should be read: 'For losses covered by ELGA'.) |
| **France** | The new 2006 legal dispositions establish that the agricultural calamity regime can only include those damages for which there is no insurance at all or that insurance has not yet reached a significant diffusion level. In this latter case of partial diffusion of insurance, only those farmers that are not insured yet can profit form the indemnities regime. The legal framework also establishes that, once a particular insurance product has reached a certain diffusion threshold (in terms of insured surface in relation to the national surface) all farmers, whether they are insured or not, will be excluded from the public regime for the particular damage. |
| **Italy** | Damages to production and structures eligible for subsidised insurance are excluded from the compensation intervention (Legislative Decree of 29 March 2004, No 102, Art. 5.4). For that reason, every year, the specific regions will specify, limited to their own territory, the guarantees, the products and the municipalities that they intend to include in the subsidised insurance system and, so, to exclude from eventual compensation intervention. |
| **Cyprus** | The insuring of the crops and the perils specified in the basic law and the subsequent amendment of the Agricultural Insurance Law in Cyprus is compulsory. Consequently all crops and perils which were considered by law as insured now have to be insured.<br><br>The crops which cannot be insured or are not covered for all perils rely on the government to compensate them when they suffer damages. Usually the compensation is given to farmers belonging to an organisation. |
| **Latvia** | There is no specified law, but under certain circumstances losses caused by any risk may be recompensed from State funds, which diminishes the motivation for farmers to have their risks insured and delays development of the insurance market. |
| **Lithuania** | The State compensates damage to all aggrieved farms, but the compensation rate for those insured is different to that for those who are uninsured. Compensation of up to 60 % of losses is given for those who had insured the aggrieved assets and compensation of up to 20 % for those who had not. |
| **Luxembourg** | No ad hoc aid is given for climatic damages. Insurance is subsidised. |
| **Hungary** | In the case of subsidies which can be accessed based on natural disasters, losses have to meet the criteria laid down in Article 7 of Act LXXIX of 1991 on land taxation. There are ad hoc payments for insurable risks. |
| **Netherlands** | There are no ad hoc measures for crops, and for animals there is no private insurance, but a compulsory fund system fed by the sector. |

| Country | Law barrier |
|---|---|
| **Austria** | Sometimes, the national or regional governments take ad hoc measures. These measures are forbidden for insurable risks but sometimes ad hoc payments are made for uninsurable risks. |
| **Poland** | An ad hoc measure is granted regardless of whether the given farmer is insured or not. |
| **Portugal** | Within the SIPAC framework (Sistema Integrado de Protecção contra Aleatoriedades Climáticas — DL 20/96, 19 March and DL 23/2000, 2 March), the calamities fund compensates the farmers for damages produced by risks exclusively not covered by crop insurance |
| **Romania** | In a case where the loss is caused by calamities stipulated in Law 381/2002, the agricultural producer is compensated by the State (when the calamity status is declared by GD), but only if the producer has insured the 'standard' risks (insurable risks). |
| **Slovenia** | There is no legal inhibition to eligibility for any kind of support from disaster aid in Slovenia on conditions of insurability, although the State aid compensation level is higher for claimants who prove compensation for the same loss from a commercial insurance company that exceeds a specified level of officially evaluated loss (Board of Evaluators). In the case of State aid for damage on agricultural production, the level of compensation is increased by 20 percentage points (from 40 % to 60 %) if payments from insurance exceed 30 % of total damage. |
| **Slovakia** | No information |
| **Spain** | The legal frame is composed by the Law 87/1978 of 28 December and the Royal Decree 2329/1979 of 14 September. Also, every year there is a legal yearly farm insurance plan. This plan includes the explicit compromise from the government of not granting extraordinary aid to farmers affected by insurable risks. |
| **Finland** | There are no law barriers for ad hoc measures to compensate damages that could have been insured. Ad hoc measures like the public crop damage compensation scheme is the most used system. |
| **Sweden** | There is no aid for insurable risks; the government considers there are no obvious market failures in insurance, except in the case of salmonella. |
| **UK** | The Animal Health Act 1981 provides for the introduction of 'Orders' under the Act, which can provide for or amend compensation payments for slaughtered animals. Insurance is also available for these direct losses. |
| **(Turkey)** | Article 17 of the 2005 law states that disaster aid shall not be given for insurable risks. |

## 6.4. Derivatives markets

Derivatives markets were introduced in the second chapter. Organised trading in agricultural derivatives markets dates back to the mid-1860s with the opening of the Chicago Board of Trade in the USA. Since then, the trading volume as well as the variety of futures contracts available for trading has increased dramatically.

A list of the major exchanges offering agricultural futures contracts worldwide is presented in Table 35.

**Table 35. World futures and options markets in agricultural commodities**

| Exchanges | Location and date of establishment | Agricultural products offered |
|---|---|---|
| Euronext.liffe | London, Paris, Amsterdam, Lisbon and Brussels; 2000 | Cocoa, Robusta coffee, white sugar, feed wheat, milling wheat, rapeseed, corn, potatoes |
| Warenterminborse Hanover AG (WTB). | Hanover; 1998 | Hogs, piglets, potatoes, wheat, brewing barley |
| Budapest Commodity Exchange (BCE) | Budapest; 1989 | Corn, wheat, feed barley, rapeseed, soybean, sunflower seed |
| Poznan Commodity Exchange | Poznan, Poland; 1991 | Corn, wheat, sugar |
| Chicago Board of Trade (CBOT) | Chicago; 1848 | Corn, soybeans, soybean oil, soybean meal, wheat, oats, rough rice, mini corn, mini soybeans, mini wheat, Dow AIG Index ([1]) |
| Chicago Mercantile Exchange (CME) | Chicago; 1874 | Beef, dairy, e-livestock, fertiliser, hogs, lumber |
| New York Board of Trade (NYBOT) | New York; 1998([3]) | Cocoa, coffee, cotton, FCOJ, sugar |
| Kansas City Board of Trade (KCBOT) | Kansas; 1856 | Wheat |
| Minneapolis Grain Exchange (MGE) | Minneapolis; 1881 | Wheat, three classes of wheat indices ([2]), national corn index (NCI), national soybean index (NSI) |
| South African Futures Exchange (SAFEX) | Sandown; 1988 | White maize, yellow maize, wheat, sunflower seed, soybeans |
| Sydney Futures Exchange (SFE) | Sydney; 1960 | Wool, New Zealand broad wool, MLA/SFE cattle |
| Winnipeg Commodities Exchange | Winnipeg; 1972 | Canola, barley, flaxseed, feed wheat |

([1]) Dow Jones AIG Commodity Index Futures (AI)

([2]) Hard winter wheat index (HWI), soft red winter wheat index (SRI) and spring wheat index (SWI).

([3]) It originated in 1870 as the New York Cotton Exchange (NYCE). In 1998, the New York Board of Trade became the parent company of both the New York Cotton Exchange and the Coffee, Sugar and Cocoa Exchange (CSCE) (founded in 1882).

*Source:* Battley (1999).

In the European markets, agricultural derivatives have been traded since 1929 with the establishment of the London Commodity Exchange (LCE) [55]. Recently, there have been considerable efforts in Europe to develop agricultural futures and options markets. At least four new commodity exchanges that offer futures and options based on agricultural commodities have been established since 1988. Some examples of these are: the olive oil futures market of Jaén (Spain); the Blagovna Borza maize and barley futures of Ljubljana (Slovenia); the cereals, sunflower, beans, timber, rice and sugar futures in the Sofia Commodity Exchange (Bulgaria); the maize, wheat and sunflower options and futures contracts and feed barley futures contracts in the Budapest Commodity Exchange (Hungary), since 1989; the wheat and cotton futures exchanges in Turkey (since 2005).

Although many of the new European agricultural futures and options markets are not actively traded, changes in economic and agricultural policies over the past 10 to 15 years appear to have created more favourable conditions for the development of futures and options markets. In particular, many of the new agricultural derivatives markets were introduced after the implementation of reductions in price supports for major commodities due to the 1992 and Agenda 2000 reforms, as well as implementation of the 1995 WTO Agreement on Agriculture. This has resulted in the launch of a number of new commodity and agricultural exchanges in central and eastern Europe as well as the introduction of at least 38 new agricultural futures and options contracts. These new contracts include futures and/or options for wheat, maize, live hogs, rapeseed, rapeseed meal and rapeseed oil. On the whole, it seems that, consistent with the trends in European agricultural policy towards reduced market intervention, most new European agricultural futures contracts have been designed to reflect the needs of producers and are more in line with agricultural commodities produced and consumed within Europe.

**Evaluation of derivatives markets**

The growth in derivatives trading over recent years reflects the increased economic benefits [56] which futures markets provide to market agents. These benefits are mainly price discovery, market transparency and risk management through hedging. Price discovery is the process of revealing information about current and expected spot prices through the futures and forward markets. Risk management refers to hedgers using derivatives contracts to control their spot price risk. The dual roles of price discovery and hedging provide benefits that cannot be offered in the spot market alone and are often presented as the justification for futures trading. Futures market prices are used as the reference for all the US revenue insurance products.

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([55]) The London International Financial Futures Exchange (LIFFE) merged with London Commodity Exchange (LCE) in 1996. Later in 2001, Euronext acquired LIFFE and was renamed to Euronext.liffe.

([56]) For further information see FOA 2005.

Besides these benefits, there is a basic benefit from the policy perspective: if farmers can manage market risks effectively by using derivatives markets, there will be less pressure for taxpayer-funded support prices or emergency aid packages.

In summary, derivatives markets could provide a theoretically sound agricultural risk management method for farmers (as well as processor, merchandiser or others). Yet European agri-businesses were slow in the uptake of derivatives products; for instance, only about 11 % of UK grain producers have been reported to employ agricultural derivatives products. The low participation in the market can also by judged by the number of futures contracts traded relative to the physical base. In the UK for instance, the volume in the futures market is equivalent to the level of physical activity. In contrast, in the USA, futures volume is on average 10 times the level of physical activity while, in South Africa, the ratio in 2003 was at about the same level as in the USA. Lack of correlation and basis risk, the presence of the common agricultural policy, inadequate information and training, liquidity risk, transaction costs and affordability, and availability of other risk management tools may have contributed to the low participation of agricultural producers in the European derivatives markets ([57]).

([57]) For further information see FOA 2005.

# 7. Livestock sanitary risks and crises

## 7.1. Chapter synthesis

This chapter is a collection of ideas developed in several studies made during the past few years with the intention of analysing the costs and impacts of recent livestock epidemic outbreaks in Europe. Furthermore, it aims to analyse different methods of addressing the economic impacts of animal disease in the Member States. The objectives of this chapter are:

(i) to summarise scientific work carried out recently and in the past on animal disease;

(ii) to provide a framework to show the complexity of defining impacts;

(iii) to present some potential synergies for integrating work done in various fields and at different levels;

(iv) to provide richer findings.

## 7.2. Literature survey on sanitary risks and crises in EU livestock

The coming pages review a recent publication entitled *The economics of livestock disease insurance* (Koontz et al.,. 2006). The content of the book is the result of two conferences: ‘The livestock insurance products international conference and forum: discovery of ideas and issues’, which was held in November 2002 in Colorado, and ‘The economics of animal health’, held in July 2003 during the Western Agricultural Economics Association meeting in Denver, Colorado. A huge number of experts in animal disease management, insurance and public policy contributed to this book.

A report made in 2003 by the Institute for Risk Management in Agriculture (IRMA) from Wageningen University in the Netherlands for the European Commission is also analysed (Asseldonk et al. 2003). Livestock epidemics can result in substantial losses for governments, farmers and all the other participants of the livestock production chain involved. The EU and national governments generally support the largest part of the direct losses, such as the value of destroyed animals and organisational costs. Consequential losses, such as losses resulting from empty buildings and movement standstills, are almost always completely borne by the farmers themselves if not insured privately.

Due to various developments (enlargement of the European Union with acceding countries, budgetary constraints, interest of farmers to have consequential losses covered by means of insurance), however, the current risk financing system for livestock epidemics is being reconsidered due to various developments. Let us list and analyse the existing risk financing systems in the Member States.

### *7.2.1. Direct losses*

As shown in Table 37, some Member States finance the non-EU-compensated part of the direct losses ([58]) entirely from the national budget. Other Member States have set up some form of statutory system to co-finance the direct losses. These public–private financing schemes have a compulsory fund structure in which all farmers pay a tax. In the case of co-financing to complement the public part, the amount that is financed by the sector is either proportional or non-proportional. Only a limited number of countries apply free public disaster assistance.

In some countries the government compensates above the value of the animals which are forcibly slaughtered, to cover part of the consequential losses. The current applied consequential loss cover can be based on the actual losses incurred or an estimation of the loss based on the period with business interruption ([59]) or a fixed amount ([60]).Not all the cases are eligible for compensation; there are some parameters to respond to.

([58]) Direct losses due to disease: direct financial loss due to mortality or morbidity of livestock or crop plants can vary from insignificant to catastrophic. In many cases the direct losses would be modest and would fall on a small number of farms. One of the major determinants of the magnitude of the direct losses will be the rapidity with which the disease is noticed and diagnosed.

([59]) I.e. fixed sum per day times the duration.

([60]) I.e. 10 % of the animal value.

**Table 36. Classification of animal diseases**

| Multiple species disease | Cattle diseases | Sheep and goat diseases | Swine diseases | Avian diseases |
|---|---|---|---|---|
| Anthrax | Bovine anaplasmosis | Caprine arthritis/encephalitis | African swine fever | Avian chlamydiosis |
| Aujeszky's disease | Bovine babesiosis | Contagious agalactia | Classical swine fever | Avian infectious bronchitis |
| Bluetongue | Bovine genital campylobacteriosis | Contagious caprine pleuropneumonia | Nipah virus encephalitis | Avian infectious laryngotracheitis |
| Brucellosis (*Brucella abortus*) | Bovine spongiform encephalopathy | Enzootic abortion of ewes (ovine chlamydiosis) | Porcine cysticercosis | Avian mycoplasmosis (*M. gallisepticum*) |
| Brucellosis (*Brucella melitensis)* | Bovine tuberculosis | Maedi-visna | Porcine reproductive and respiratory syndrome | Avian mycoplasmosis (*M. synoviae*) |
| Brucellosis (*Brucella suis)* | Bovine viral diarrhoea | Nairobi sheep disease | Swine vesicular disease | Duck virus hepatitis |
| Crimean Congo haemorrhagic fever | Contagious bovine pleuropneumonia | Ovine epididymitis (*Brucella ovis*) | Transmissible gastroenteritis | Fowl cholera |
| Echinococcosis/hydatidosis | Enzootic bovine leukosis | Peste des petits ruminants | | Fowl typhoid |
| Foot-and-mouth disease | Haemorrhagic septicaemia | Salmonellosis (*S. abortusovis*) | | Highly pathogenic avian influenza and low pathogenic avian influenza in poultry |
| Heartwater | Infectious bovine rhinotracheitis/infectious pustular vulvovaginitis | Scrapie | | Infectious bursal disease (Gumboro disease) |
| Japanese encephalitis | Lumpy skin disease | Sheep pox and goat pox | | Marek's disease |
| Leptospirosis | Malignant catarrhal fever | | | Newcastle disease |
| New world screwworm (*Cochliomyia hominivorax)* | Theileriosis | | | Pullorum disease |
| Old world screwworm (*Chrysomya bezziana*) | Trichomonosis | | | Turkey rhinotracheitis |
| Paratuberculosis | Trypanosomosis (tsetse-transmitted) | | | |
| Q fever | | | | |
| Rabies | | | | |
| Rift Valley fever | | | | |
| Rinderpest | | | | |
| Trichinellosis | | | | |
| Tularemia | | | | |
| Vesicular stomatitis | | | | |
| West Nile fever | | | | |

*Source:* OIE.

Member States are obliged to apply the control measures established in EU directives ([61]) if an outbreak arises of former ‘List A diseases’ (Office International des Epizooties, 1998). Table 36 shows the former list A diseases. They concern transmittable diseases which have a very serious and rapid spread potential, irrespective of national borders.

After obtaining EU approval, countries may take additional control measures. These livestock epidemics can have large economic consequences not only for farmers but also for other various parties of the production chain in terms of direct or consequential losses.

Direct losses comprise the value of animals destroyed under depopulation and welfare control measures and the costs of organisational aspects, such as the monitoring of farms in restriction zones.

The veterinary budget of the European Union refunds 50 % of the costs of compulsory and pre-emptive slaughter, 70 % of the costs of welfare slaughter and 50 % of the organisational costs ([62]) (Asseldonk et al. 2006).

As has already been said, certain Member States finance entirely the direct losses using the national funds. In contrast, others have set up a kind of statutory system to co-finance what is considered the non-EU subsidised part of direct losses (Belgium, Germany, the Netherlands and Austria). In this case all the farmers have to pay a compulsory tax. The levy system is based on pooling over time within the sector. Payments to the fund can be organised through up-front payments (deposits) or through payments after an outbreak, or both. Belgium, Germany and Austria have a proportional levy system to establish emergency funds.

([61]) The basis for these measures originates from EU Council Directives 85/511/EEC and 80/217/EEC respectively. Measures include: (i) stamping-out of infected herds; (ii) pre-emptive slaughter of contact herds; (iii) the immediate establishment of surveillance zones around such herds. In these zones, animal movements are restricted and to a large extent prohibited.

([62]) Council Decision 90/424/EEC of 26 June 1990 on expenditure in the veterinary field (OJ No. L 224, 18.08.90)

**Table 37. Contribution of the sector to schemes covering direct losses resulting from livestock epidemics**

| Contribution | No levy | (Partly) levy or compulsory insurance scheme |
|---|---|---|
| Austria | | x |
| Belgium | | x |
| Denmark | x | |
| Finland | x | |
| France | x | |
| Germany | | x |
| Greece | | x |
| Ireland | x | |
| Italy | x | |
| Luxembourg | x | |
| Netherlands | | x |
| Portugal | x | |
| Spain | x | |
| Sweden | x | |
| United Kingdom | x | |

*Source:* Asseldonk et al. (2006).

Let us examine Table 37.

Austria: There is a proportional levy system to establish an emergency fund.

Belgium: The government has set up a fund that is used to finance various animal health and quality improvement measures. The levy can vary depending on the level set by the government. The levy is differentiated according to species and farm size.

Denmark: The government pays only for the value of the animals which are compulsorily slaughtered. If a whole herd is slaughtered, a further 20 % is paid to cover the loss of income from the herd. No statutory or voluntary levies are operated to establish an emergency fund.

Germany: There is a national framework but each *Bundesland* is responsible for running the programme with own rules of application. The scheme is compulsory. The administrative council is made up of farmer and ministry representatives and decides the size of the levy. The compensation payments are made from the available funds and the Ministry of Agriculture pays for the costs if the fund runs out of money. To pay back the loan to the ministry the levy increases over the following years after an outbreak.

No compensation is paid to farmers in the surveillance zones.

Greece: The government operates a compulsory agricultural insurance scheme via the Greek Agricultural Insurance Organisation (ELGA). ELGA organises and implements programmes of proactive protection and insures the production. ELGA is funded by an 'income from special insurance contributions' (of which the fee is 0.5 % of the value of the sold livestock production) and this constitutes one of the major financial sources.

Spain: No government compensation is available other than for slaughtered animals. No statutory or voluntary levies exist.

Italy: No government compensation is available other than for slaughtered animals. No statutory or voluntary levies exist. As for Spain: cover is not as complete as for other countries such as the UK.

Luxembourg: The Luxembourg government pays compensation when animals are compulsorily slaughtered. No levy for farmers.

Netherlands: The producers and the Ministry of Agriculture have agreed on a system where a bank guarantee is supplied and producers will have to pay the levy mainly after the epidemic. The amount of the levy will depend on the actual cost of the epidemic.

Finland**:** No statutory or voluntary levies are operated to establish an emergency fund. The government reimburses farmers.

Sweden: If a 'production unit' is closed during an epidemic of a notifiable disease the government can compensate the farmer for the destruction of the animals, animal value, decontamination and for production losses. Compensation for certain notifiable diseases can cover up to 100 % for both animal value and decontamination costs. Veterinary costs caused by an outbreak are not compensated. There is no levy for farmers.

UK: For FMD in cattle, sheep and pigs and for CSF and swine vesicular disease (SVD) in pigs the government compensates destructed animals at 100 % of the market value. There is no levy for farmers. The UK government also pays some compensation for animals slaughtered due to bovine tuberculosis, brucellosis and BSE in cattle. As far as poultry diseases are concerned, such as avian influenza and Newcastle disease, the government only pays compensation for birds slaughtered which are non-diseased (at 100 % of their market value). For Aujeszky's disease in pigs the government will also pay 100 % of the animal's market value ([63]).

([63]) The only difference with Aujeszky's disease is that when the disease was in the country a levy was paid on all pigs at slaughter to cover the compensation costs. This levy is no longer collected but the legislation is in place to collect it again should the disease come in to the country again.

Thus, in conclusion, direct losses are (partly) compensated by the EU or national governments and there are mainly three types of financing schemes adopted by the Member States; let us visualise them in Table 38.

**Table 38. Financing schemes covering direct losses in livestock epidemics in the EU**

<table>
<tr><th rowspan="2">EU budget</th><th rowspan="2">National budget</th><th rowspan="2">EU budget</th><th rowspan="2">National budget</th><th rowspan="2">Levy</th><th rowspan="2">EU budget</th><th>Levy</th></tr>
<tr><th>National budget</th></tr>
<tr><td colspan="2">Country 1</td><td colspan="3">Country 2</td><td colspan="2">Country 3</td></tr>
</table>

*Source:* Asseldonk et al. (2006).

### 7.2.2. *Indirect or consequential losses*

In insurance contracts, consequential losses are indirect losses — a reduction in the value of property that is a result of a direct damage loss. They are usually associated with a time element or other remote or indemnification type losses. Consequential losses are different from ensuing losses since consequential losses are indirect losses, not direct damage losses, whereas following losses are further or additional direct damage losses that have been initiated by the original direct damage cause of loss.

**Consequential losses** that arise at farm level can be due to one or more categories:
— business interruption,
— losses related to establishing restriction zones,
— additional repopulation,
— losses from emergency vaccination,
— price effect.

Consequential losses are almost always completely supported by the farmers themselves. In some EU Member States, the absence of public assistance has led to the creation of private insurance schemes for some types of livestock production. In fact, we can say that in some Member States, the consequential loss risk is transferred by means of private insurance systems.

There is also sort of public–private partnership in which the government can play the role of the insurer or of the reinsurer for the subsidised consequential loss policy. In such a partnership, the government functions either as an insurer or as a reinsurer. Another option is that the government subsidises the insurance premium directly. In the case of a public–private partnership with governmental reinsurance, the private insurer both retails and services the insurance policy, while retaining a part of the loss risk (Meuwissen et al., 2003).

However, the policies are reinsured not solely through the reinsurance market but also or only by the government, either as a quota-share or stop-loss provision. Quota-share provisions specify which percentage of premiums and loss exposure the private company will retain. Stop-loss provisions specify the maximum amount of loss that the company will have to cover before the reinsurer covers the additional losses (Skees and Barnet, 1999).

Governments can also financially assist farmers for consequential losses. This kind of programme can be formalised by a public insurance scheme or by ad hoc relief payments. In the case of a public insurance scheme, risk covered is decided a priori; in the case of a relief programme, it generally functions after the outbreaks.

Many standard livestock insurance policies in Europe indemnify farmers for animal losses as a result of a number of perils, but some have been extended, sometimes as an option, to cover at least a part of consequential losses.

The indemnity of additional consequential loss cover is based on:

(i) a percentage of the insured sum (for example 10 % of the value of the livestock);

(ii) duration of business interruption;

(iii) actual losses.

In most cases the farmer chooses, within a certain range, the value of the livestock and the daily gross margin. All private insurance policies exclude direct losses that are met by the public sector. Additional constraints include a probationary period, a maximum cover period, a multi-year policy term, a maximum insured amount, a maximum indemnification amount and a deductible.

Few private insurance schemes exist on the European market to cover the risk of consequential losses from livestock epidemics.

The current EU financing schemes covering losses resulting from livestock diseases are reviewed in Table 39. The results are obtained from literature and from a survey among members of the Comité Européen des Assurances (CEA), the Agricultural Risks Insurance Committee (CEA 2005a, 2005d). The private and public–private financing systems refer to insurance and the public system to ad hoc aid.

**Table 39. EU financing schemes covering (part of) consequential livestock losses resulting from livestock epidemics**

| | Financing system | | |
|---|---|---|---|
| | Private | Public–private | Public |
| Belgium | - | - | - |
| Denmark | - | - | + |
| Germany | + | - | - |
| Ireland | - | - | - |
| Greece | - | + | - |
| Spain | - | + | - |
| France | - | - | + |
| Italy | +/- | - | - |
| Luxembourg | - | - | - |
| Netherlands | + | - | - |
| Austria | - | - | - |
| Portugal | - | - | - |
| Finland | - | - | + |
| Sweden | + | - | + |
| United Kingdom | + | - | - |

Legend:

| | | | |
|---|---|---|---|
| - | not available | +/ | it depends from the disease and from species bred |
| + | (partly) cover and 1 % maximum participation (head insured/head registered) | | |

*Source:* Asseldonk et al. (2006)

Let us analyse briefly the situation in these Member States regarding the consequential losses cover.

Denmark: The government supports a further 20 % to cover the loss of income from the compulsory slaughter of a herd.

Germany: The private Ertragsschadenversicherung indemnifies farmers against the full range of consequential losses as one of the cover options.

Spain: Farmers can insure against disease outbreaks, although only for cattle, sheep and goats (Agroseguro). The insurance covers the difference between the actual level of aid farmers receive when an animal is slaughtered and its real value (which is another approach to direct loss compensation). These policies are government subsidised.

France: There is no insurance to cover epidemic losses. When an outbreak occurs the losses are paid by public authorities following a certain priorities scheme.

Italy: The additional cover is only available for dairy cows and sheep. The level of participation is very limited (< 5 %).

Netherlands: The additional cover (only for cattle) can be a proportion of the insured sum of the culled animals (ranging from 10 % to 30 %) or be based on the duration of business interruption. In certain specific cases a mutual insurance scheme also covers the consequential losses.

Finland: The government is authorised to compensate consequential losses (via ad hoc payments) for farmers who suffer substantial income losses. There are no commercial insurance companies offering insurance programmes for consequential losses caused by epizootic diseases.

Sweden: The compensation that a farmer receives from the government is calculated as the difference between the actual profit and the expected profit if the farm was still engaged in production. Compensation for consequential losses can vary from 50 % up to 100 % in the case of certain defined diseases.

UK: There are insurance schemes which would pay consequential losses, but they are not set as typical business interruption covers and merely pay a selected percentage (usually 25 %) of the direct loss compensation. This means they only pay out when animals are slaughtered and do not cover losses in restricted zones or price effects.

Only a few private insurance systems exist in Europe to cover the consequential losses due to livestock epidemics (e.g. in Germany, Italy, Sweden, the Netherlands and the UK).

Most general livestock insurance schemes cover death and emergency slaughter because of the illness.

### *7.2.3. Main conclusions on the current financing schemes*

The main conclusions arising from the IRMA report (Asseldonk et al., 2003) with respect to the current applied risk financing schemes currently applied are those listed below.

— Direct losses: Only the value of the animals that are compulsorily slaughtered of the non-EU compensated part is compensated by means of a public or statutory private financing scheme. The amount that is payable by the farmer depends mainly on whether or not there have been major outbreaks in previous years. Risk is shared between the national government and the sector for proportional as well as non-proportional schemes.

— Consequential losses: Livestock producers in Europe can currently obtain only limited cover (private, public–private or public) for consequential losses as a result of an epidemic. A widely adopted EU insurance scheme covering all epidemic diseases for all types of livestock is absent. In some countries the government compensates above the value of the animals that are compulsorily slaughtered, to cover part of the consequential losses.

Other EU Member States partly compensate consequential losses on the basis of actual incurred losses (a form of ad hoc relief programme also exists). The currently applied consequential loss cover can be based on the losses incurred or an estimation of the loss based on the period with business interruption ([64]) or a fixed amount. In general, farms that are confronted with losses as a result of decreased market value of their products but are not infected with an epidemic disease or are not in a movement standstill zone are not eligible for compensation. In some other EU Member States the absence of public assistance has led to the creation of private insurance schemes for some types of livestock production.

— Producers do not commonly take up private policies that are specifically designed to cover sequential losses. Only the German Ertragsschadenversicherung has a relatively high level of participation.

**Perspective for financial schemes**

Given the characteristics of the risk under analysis, a mandatory system to finance direct losses will facilitate alertness and rapid action in the case of an outbreak of an epidemic. In contrast, a consequential loss compensation scheme might be voluntary (producers can cope with this business risk in alternative ways).

Compensation for direct losses can be based on either a pre-set animal value or actual market value at the moment of culling. Compensation for consequential losses can ideally be based on actual losses incurred. However, basing the indemnity on a fixed sum per day times the duration of business interruption is probably a more feasible solution (for example for those countries joining the EU in the near future and those with inaccurate farm records).

Farms that are confronted with losses as a result of decreased market value of their products but are not infected with an epidemic disease or are not in a movement standstill zone should not be eligible for compensation.

The largest involvement of farmers is likely to be achieved by a levy system that is organised (partly) by the farmers themselves and a mutual insurance scheme.

The (prospective) schemes should as far as possible:

(i) not disturbance of markets;

(ii) be compatible with WTO agreements;

(iii) be run by the private market, without official EU participation;

(iii) be applicable to the whole of the EU.

The IRMA study concludes by stating that the schemes should be applicable to the whole of the EU. A levy scheme and an insurance scheme can be implemented in all EU Member States.

([64]) Fixed sum per day times the duration.

## 7.3. The expert workshop on options for harmonised cost-sharing schemes for epidemic livestock diseases

This section of the chapter summarises the output of an expert workshop ([65]) on the outcomes of a study, requested by the European Commission and conducted by the Community Animal Health Policy (CAHP) and the Food Chain Evaluation Consortium (FCEC[66]). The content of the study focuses on a pre-feasibility investigation on cost-sharing schemes for epidemic livestock diseases. The aim of the Commission is to further increase the level of responsibility of stakeholders regarding the prevention, detection and control of major epidemic animal diseases. The Commission suggested that the potential of different options should be assessed to replace current ad hoc emergency measures, including support to private insurance schemes.

### *7.3.1. Criteria for harmonised cost-sharing schemes*

***I. Categorisation of animal diseases:*** Cost-sharing schemes have to take into account that the public interest in managing risks associated with a particular disease depends on the possible impacts on public health, animal health and/or the economic impacts of the disease.

***II. Incentive compatibility:*** Incentives provided by cost-sharing schemes, in particular by their monetary flows, have to encourage efficient risk-reducing behaviour of all parties involved, in particular through preventive measures. Incentives for preventive measures to reduce risks and avert crises, and to minimise their effects, must be provided.

***III. Balancing costs and responsibilities:*** The financing of cost-sharing schemes has to reflect the responsibilities of the parties involved.

The costs of disease control, eradication and prevention should be shared.

***IV. Prevention of distortion of competition:*** State intervention should not lead to a distortion of competition between Member States.

***V. Compatibility with EU financial instruments and ongoing initiatives****:* Cost-sharing schemes should operate within a framework for State support that takes into account EU financial instruments (including use of funds from modulation, if

([65]) The workshop was held the17th March 2006, Brussels and brought together experts from insurers, stakeholder organization, costs sharing schemes, the Commission, the European Parliament and the evaluation team.

[66] The FCEC consist of Civic Consulting, Bureau van Dijk, Arcadia International and Agra CEAS

appropriate), cross-compliance requirements and WTO requirements. Cost-sharing schemes have to be seen in the ongoing discussion on risk and crisis management in the agricultural sector and the ongoing CAHP evaluation.

***VI. Harmonisation and flexibility of implementation:*** Cost-sharing schemes should be harmonised to the extent necessary to fulfil the above criteria, while taking into account existing systems.

### *7.3.2. Main alternatives for cost-sharing schemes*

Four main alternatives are available to finance prevention, the detection and control of outbreaks of major epidemic animal diseases at the Community/Member State levels in the future.

**A. Continuation of the current system of expenditure in the veterinary field**

The current financing of control measures in case of a disease outbreak is focused on the compensation of direct losses ([67]) (mainly related to the slaughter of animals and their destruction). This provides adverse incentives under certain circumstances (and therefore could be not fully in line with criterion II). Also, the current level of financial responsibility of the parties involved (criterion III) is very different in Member States.

In some Member States the compensation of direct losses is fully paid by the government (in combination with EU co-financing) — no cost-sharing scheme exists. In other Member States stakeholders have to finance compulsory cost-sharing schemes that cover a part of or even the whole national contribution (up to a certain limit). This lack of harmonisation might lead to a distortion of competition between Member States (criterion IV) ([68]).

**B. Financing costs of disease control through ad hoc measures in the case of a disease outbreak**

Ad hoc compensation rules are usually developed after a disease outbreak, either at national or Community level or both. This involves, however, uncertainty for farmers regarding how much compensation is being paid to them, if any.

No incentives are provided to encourage efficient risk-reducing behaviour of all parties involved (criterion II); on the contrary, it could motivate risk-increasing behaviour in certain cases because compensation in the case of a disease outbreak is taken for granted. This also could imply adverse incentives to inflate aggregate losses.

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([67]) See the glossary for a definition of direct losses.

([68]) Cross reference: Chapter 4, paragraphs 4.1.1 and 4.1.2 of the report.

**C. Setting up a unified cost-sharing scheme at the European level**

A possibility for providing compensation in the case of a disease outbreak that fulfils most of the above listed criteria could be to set up a European cost-sharing scheme, following as a possible example an existing national model such as a public animal health fund (NL), to which every farmer would have to contribute. A unified cost-sharing scheme at the European level would per definition not allow flexibility of implementation by the Member States and would also not take into account existing systems (criterion VI). Thus setting up an EU-wide cost-sharing organisation could be out of line.

**D. Defining a harmonised Community framework for national or regional cost-sharing schemes**

The initial analysis of the evaluation team indicates that this is the preferred alternative that can be brought into line with the above criteria. The main element of this alternative is to resort to existing national schemes, and to require other Member States to set up similar systems. National cost-sharing schemes could have a different institutional set-up but would have to function according to common rules. This would allow for flexibility of implementation by the Member States and at the same time be likely to increase acceptance by stakeholders, as participation mechanisms are easier to implement at the national or regional level. Harmonisation at the EU level should cover:

— the obligation of Member States to introduce a cost-sharing scheme at the national or regional level;
— the objective of the different schemes, i.e. providing efficient transfer of animal health risk from farmers to a cost-sharing scheme; and
— the basic principles for efficient schemes, involving organisational principles like the responsibility for certain diseases only, and operating principles like conditions for incentive compatibility and covered risks.

This last proposal seems to be the favourite. Let us go further, studying the details of the document we are summarising.

### *7.3.3. Categorisation of animal diseases (criterion I)*

Epidemic livestock diseases may involve large externalities, i.e. costs resulting for third parties. An animal health standard is efficient if it not only accounts for the losses of the individual farmer but takes into account losses that may result for third parties such as farmers in the neighbourhood.

When an efficient standard is implemented, the total costs of disease over time are minimised. When efficient standards are lower than legal standards, this has no effect on prevailing animal health standards, because legal standards have to be met. When efficient standards are higher than legal standards, however, a cost-sharing scheme should require the implementation of these standards as a pre-requisite. For example, it might be efficient to have regular health checks of farm animals for all farmers (not required by law) instead of indemnifying the costs of large-scale disease outbreaks that could possibly have been prevented by such checks.

**Certain animal diseases require significant public involvement in a cost-sharing scheme and participation of farmers in a scheme needs to be compulsory**

Some diseases are a large potential hazard to the economy and/or to the health of the population and are therefore normally covered by legislation.

The diseases involving large externalities are mainly extremely contagious diseases like FMD or avian influenza, which are referred to hereafter as diseases with high externalities (DHE).

Efficient animal health standards to manage the risk of these diseases are relatively high and an efficient cost-sharing scheme has to consider an effective mechanism that ensures implementation of these standards. Extremely contagious diseases are very difficult to be covered on unregulated private insurance markets because of their loss accumulation potential.

There is a public interest to cover diseases of this type in a cost-sharing scheme. A cost-sharing scheme for diseases with high externalities (DHE scheme) should be compulsory (with a compulsory levy, as already exist in some Member States ([69])).

**Some diseases require only limited public involvement**

These diseases will hereafter be referred to as diseases with low externalities (DLE). They are mostly only moderately infectious (e.g. brucellosis, bovine tuberculosis). The main reason for public concern is that under specific conditions they may pose some hazard to the economy and/or to the health of the population and therefore are mostly covered by legislation.

Also, if a DLE is notifiable according to Community or OIE rules, an outbreak may lead to additional externalities through potentially affecting trade in animals and products of animal origin.

*Main points*

*(a) Also in the case of diseases with low externalities (DLE), participation in a cost-sharing scheme could be compulsory, as is the case for DHE.*

*(b) Participation in a cost-sharing scheme for DLE could be voluntary.*

*(c) DLE diseases could be left to private insurance markets (similar to DNE, see below).*

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([69]) Cross reference: Chapter 4: see Tables 25 and 26 of the report.

**Other diseases do not require public involvement and related risks should be left to private insurance markets**

These diseases will hereafter be referred to as diseases with no externalities (DNE). Similar to DLE, a spread to other farms is not usually to be expected, and a large-scale epidemic is almost impossible. They are mostly not covered by relevant legislation. Cost-sharing solutions for DNE can be left to private insurance markets, since there is no public interest to restrict freedom of farmers' production management decisions; governments should support the development of private insurance markets to cover these risks.

**Disease categorisation could take into account regional differences**

Whether a disease poses a potentially large hazard to an economy and/or population (i.e. whether it is a DHE) may depend on the infectiousness and other characteristics of the disease, but also on regional factors like climatic and other environmental conditions, prevailing farming practices, farming density and others.

Disease categorisation could therefore differ by region. On the other hand, having different categories of diseases may also affect the free circulation of goods and animals.

*Main points*

*(a) Disease categorisation should be carried out at the Community level.*

*(b) Disease categorisation should be carried out by each cost-sharing scheme according to harmonised criteria.*

*(c) Disease categorisation should be carried out by each cost-sharing scheme according to criteria defined by each scheme.*

### *7.3.4. Incentive compatibility (criterion II)*

**Contributions of farmers to a cost-sharing scheme have to reflect their individual risks**

Whenever a cost-sharing organisation observes risk-relevant production circumstances or decisions (location, degree of vertical integration of the production chain, the intensity of livestock contacts with other farms, etc.) the contributions to a cost-sharing scheme have to be differentiated according to the effect of these risk-relevant factors on expected losses. At minimum, the contributions to a cost-sharing scheme should reflect regional differences in risk, caused by e.g. differences in livestock density.

*Main points*

*(a) A cost-sharing organisation should be required to differentiate contributions of farmers according to the individual risk of the farmer.*

*(b) A cost-sharing organisation should be required to provide a bonus (reduction of contribution) for farmers that take specific measures to decrease their individual risk.*

*(c) A cost-sharing organisation should be required to differentiate contributions by taking into account regional differences in risk.*

**The compensation payment made by the cost-sharing scheme to a farmer for losses in the case of disease outbreak has to involve a deductible**

There are costly production management decisions which are not observable and verifiable for a cost-sharing organisation at reasonable cost. Many of these decisions influence the probability of losses caused by epidemic livestock diseases (e.g. hygienic and bio-security measures). In order to provide incentives for risk-reducing measures, loss risk should not be completely transferred to a cost-sharing organisation. Thus, a farmer has to bear some financial consequences of a disease outbreak up to a deductible, which could be defined as a share of the sum assured (e.g. 10 % of herd value). Losses exceeding the deductible will be indemnified.

**The compensation payment made by the cost-sharing scheme to a farmer for losses in the case of disease outbreak has to depend on the time of reporting the suspicion**

There are also costly production management decisions that affect loss size, which are mainly emergency reaction decisions after disease outbreak. In order to provide incentives for loss reduction, the compensation should not indemnify high losses completely (e.g. through a proportional coinsurance rate for high losses). The most important loss size-reducing measure is early reporting of (suspected) disease outbreaks so that control measures can be applied in good time. The number of diseased or dead animals can serve as a signal for the interval between the time when first symptoms could have been detected and the time of reporting ([70]).

*Main points*

*(a) A cost-sharing organisation should apply current best practices and compensate only 50 % of the value of diseased animals at the time of reporting, and not at all dead animals.*

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([70]) For example, the Dutch Animal Health Fund generally compensates only 50 % of the value of diseased animals. Dead animals at the time of reporting are not compensated at all. Animals that are diseased or die after the outbreak is reported to the authorities are compensated fully.

*(b) A cost-sharing organisation should further differentiate compensation rules for diseased and dead animals at the time of reporting depending on the characteristics of the disease, to take into account differences in morbidity and mortality.*

*(c) A cost-sharing organisation should apply other compensation rules that provide incentives for early reporting.*

**The cost-sharing scheme has to cover all production risks to avoid providing adverse incentives**

Existing cost-sharing schemes mainly indemnify direct losses such as the value of compulsory, pre-emptive and welfare slaughtered animals and organisational costs related to destruction, and monitoring. Consequential losses such as production losses directly related to regulatory measures (e.g. movement restrictions) are not covered. In some countries private insurance covers consequential losses, but in most countries the market is not well developed and demand is low.

The main disadvantage of compensating direct losses at a higher rate than consequential losses is that farmers may have the possibility to partly shift consequential into direct losses ([71]).

**Some losses may be indemnified fully without providing adverse incentives**

Losses that cannot be influenced by farmers at all should be fully indemnified in a cost-sharing scheme that aims at providing the highest possible risk transfer to farmers. This consideration is mainly relevant for losses which are directly related to regulatory measures (e.g. costs of emergency vaccination).

However, if a highest possible risk transfer to farmers is not intended, it is also possible to only partially indemnify this type of loss without affecting incentive compatibility.

*Main point:*

*A cost-sharing organisation could fully compensate losses which are directly related to regulatory measures and cannot be influenced by farmers (e.g. costs of emergency vaccination).*

**Price risks should not be covered by a cost-sharing scheme**

Farmers have to bear severe price risks, as market prices for animals can drop significantly following a serious livestock epidemic. However, price risks can be adequately managed on futures markets (make a note with the text already in the

([71]) For example a farmer facing production losses due to movement restrictions that are not compensated could theoretically shift these losses, through intentional infection of his livestock, into losses caused by compulsory slaughtered animals that are compensated.

report) or other similar instruments and would therefore not have to be covered by a compulsory cost-sharing scheme.

**Losses of animal value have to be indemnified not according to pre-crisis market prices, but according to replacement values**

This loss assessment rule applies to total losses of animal value due to compulsory, pre-emptive and welfare slaughtering. Also losses from a drop in value due to regulatory measures (e.g. resulting from emergency vaccination) have to be assessed according to replacement values. The currently used value assessment rule for compensation, the market value of the animal before the disease outbreak, could lead to similar adverse incentives such as higher compensation rates for direct losses than for consequential losses. Some production losses that are hard to quantify can be compensated with flat rates; business interruption and other costs related to movement restrictions may be hard to quantify, as they often manifest in work or opportunity costs. These can be indemnified through daily rates for the time period when restrictions are in place. These rates should be negotiated *ex ante* between farmer and cost-sharing organisation.

**Balancing costs and responsibilities, compatibility with Community requirements (criteria III to V)**

A harmonisation of cost-sharing schemes in the EU must avoid a distortion of competition.

Current compensation schemes for direct losses of certain diseases differ significantly between Member States with respect to farmers' contributions (with cover by farmers of 100 % of the national share up to a certain threshold to no farmer contribution at all). This may distort competition.

Therefore any public contribution (Community and Member State national/regional contribution) to a cost-sharing scheme should be designed to avoid a distortion of competition. Guidelines on State aids have to be taken into account.

The level of public financial support to cost-sharing schemes and the risk transfer between regions is a political decision.

The specific design of the proposed rules is not related to the degree to which public contributions are provided to cost-sharing schemes. An efficiency condition of a cost-sharing scheme is that it has to demand risk-adjusted contributions. This implies that the expected compensation payments of a cost-sharing scheme should be ideally covered fully by farmers' contributions (*ex ante* or *ex post*). On the other hand, public intervention may be required to safeguard that, in the case of disease outbreak, adequate action is taken immediately. Additionally, a cost-sharing scheme has to incur additional expenses for determining and implementing efficient safety standards (including prevention measures), which could be easier implemented with public support. Any approach taken has to balance these aspects.

### *7.3.5. Flexibility of implementation at the national/regional level (criterion VI)*

**Public involvement does not determine institutional arrangements of a cost-sharing scheme**

Any cost-sharing scheme has to fulfil three tasks.

1. Efficient animal health standards have to be developed.
2. These standards have to be implemented.
3. A cost-sharing scheme has to compensate losses.

These tasks can be fulfilled through one or more institutions. They can be realised in a variety of institutional arrangements, each of which involves assets and disadvantage.

Likely options that mainly build upon institutional models already existing in some Member States include funds and public or private insurance.

**Option A1 — Public fund**

A fund administered through a public authority could perform all tasks of an efficient cost-sharing scheme. A public fund could be expected to be accepted among farmers. It would, however, require additional effort for the authority to perform all the tasks associated with an efficient cost-sharing scheme, in particular related to risk-adjustment of farmers' contributions. A public fund can be financed through *ex ante* levies, *ex post* levies or a combination of both.

**Option A2 — Mutual fund**

A mutual fund is owned by the participating farmers, it works like a private risk pool of the farming industry. This may lead to a high acceptance among farmers.

Due to its ownership structure, a mutual fund is expected by the members to act in the interest of the farmers. A mutual fund would have similar problems like a public fund regarding risk adjustment of contributions.

**Option B — Public insurer**

A public insurer is an independent organisation that implements safety standards and undertakes insurance functions. Its status as an independent organisation makes a public insurer to some extent autonomous of elected governments.

A public insurer could possibly provide better incentives for risk-adjusted farm management than a fund solution.

**Option C1 — Competitive insurance market**
Farmers have to obtain a contract with one of a number of competing insurers. As DHE risks pose a severe loss accumulation potential, private insurers would demand high safety loadings. In order to establish an insurance market with reasonable prices, State-run reinsurance is necessary. Also, this option requires thorough control of the efficiency of the animal health standards, determined in the insurance contracts with farmers, through the public authorities.

**Option C2 — Private insurers' pool**
A private insurers' pool is cooperation among private insurers who jointly establish and own the pool company that operates the cost-sharing scheme. Through establishing a private insurers' pool, existing underwriting awareness of insurance companies can be used directly. The pool would demand risk-adjusted premiums, thus providing incentives for considering risk in farm management decisions. As with the previous scheme, a State-run reinsurance and/or other forms of public support (e.g. financial contribution towards the premiums paid by farmers) may be required.

**Observations**
This collection of information gives us some tool to observe that for DHE (diseases with high externalities) it is not worth and even not possible to design a cost-sharing scheme at a private level. These epidemic livestock diseases can be a large potential hazard to the economy and, in the worse case, to the health of the population. Therefore, DHE are covered by legislation. Assuming that public interest in managing risks associated with these particular DHE is very strong; it seems impractical to discuss whether a private insurance scheme can be implemented. Besides, the possibility of forecasting these high-risk events is very difficult; at least would be possible to predict, or better say prevent, if an efficient risk-reducing behaviour, in particular through preventive measures, took place systematically.
On the other hand, from the outcome of the Health and Consumer Protection DG workshop (17 March 2006, Brussels) it seems clear that it can be possible to build a cost-sharing scheme for DLE (diseases with low externalities) or DNE (diseases with no externalities).
The intent of this section is to follow up a more detailed analysis of livestock sanitary risks, exploring the determining factors of those epidemic risks.

**Point of view: role of the public policy in controlling animal diseases**
'The role of public policy in controlling animal disease' is explained in a paper of that name by Sumner et al. (in Koontz et al. 2006). The authors support the theory that the general economic concepts that apply to public policy in other areas also apply to animal diseases.
The most important of these concepts is the idea that for some goods or services, private firms will provide socially insufficient quantities due to insufficient private

economic incentives. The lack of sufficient private incentives may be attributed to 'public good' characteristics or to the occurrence of external costs or benefits (Sumner et al. 2006).

What they stress most is this concept of considering the management of infectious diseases as a public good and the closely related idea of externalities related to the costs and benefits of private efforts to control infectious diseases.

In fact, they analyse if many producers may find that there is sufficient private incentive to vaccinate their animals against a serious contagious disease. Together, they may largely solve the public good problem by vaccinating against a disease.

However, if there are still a few individuals for whom the private incentive is insufficient, they may not vaccinate and thus a reservoir of infection may remain and be capable of infecting other animals.

That reservoir will require vaccine producers to continue to vaccinate, at significant cost, rather than to be able to cease vaccinating, as would occur if the disease could be eradicated in the region. There is a reason for government animal disease control, either by requiring vaccinations or by directly carrying out the vaccinations required to eliminate the reservoir.

Private agents have adequate incentives to carry out most of the expenditures that are made for the management of animal diseases. In fact, animal disease management frequently has some externalities and/or public good characteristics, and government frequently has a role in disease management.

It has been observed that the nature of externalities and public good characteristics, particularly whether they are large and thus warrant concern, is determined by geography and biology. Both of these affect the natural habitat for specific diseases and so the probability that a disease will spread from one region to another.

The probability of spread is a crucial consideration in government intervention, whether regarding efforts to exclude, to control or to eradicate the disease from a region. A further aspect to be considered is the distributional effects of disease outbreaks and how forward pricing, or the use of futures markets, may mitigate risks (Sumner et al. 2006). Compensation for animals destroyed during eradication or control efforts may also reduce direct losses.

**Animal diseases economic impacts: a survey of literature and typology of research approaches**

A survey of literature and typology of research approaches was carried out in 2005 by the International Food and Agribusiness Management Association (IAMA) (Pritchett et al., 2005).

Animal diseases can create strong economic impacts on:

— production,
— market and price,
— trade,
— impacts on food security and nutrition,

— human health,
— environment,
— financial costs.

Disease impacts are generally easy to identify but may be difficult to quantify (UN-FAO, 2001).

An accurate assessment of losses due to animal disease is useful for policymakers who may consider these potential losses against the costs of disease prevention and mitigation; and models that provide the most comprehensive assessment of potential losses are most useful to decision-makers (Pritchett et al. 2005).

Table 40 summarises the economic approaches to quantify economic loss ranging from individual agent impacts (producers, consumers, businesses) to broader, inter-sector impacts (sector, regional and national/international studies) to provide the reader a baseline of information on what is already discovered. Several directions exist for animal disease studies at each of the various market levels, which can subsequently feed better baseline data to broader sector, regional and national analyses.

Potential economic losses include higher prices or diminished satisfaction for consumers and producers. But, some individuals actually charge better after an animal disease outbreak, such as producers who are not quarantined, or consumers who are uninfluenced by animal disease outbreaks (and who are able to buy at lower prices), an issue for future researchers to consider.

Too often data limitations prevent analysis of spatial economics when evaluating outbreak scenarios. Finally, market structure plays an important part in determining the distribution of losses associated with an animal disease outbreak.

**Table 40. Economics of animal disease typology matrix**

| Scope of analysis | Research objectives | Policy instruments | Research opportunity |
|---|---|---|---|
| **Producer impacts** | Business loss<br>Incentives for control | Compensation<br>Testing | Epidemiological and economic models<br>Catastrophic insurance |
| **Agribusiness Suppliers and supporting activities** | Business loss<br>Shareholders' welfare loss | Production practices<br>Certification<br>Traceability | Economic geography<br>Market structure |
| **Consumer** | Welfare loss<br>Risk assessment | Education<br>Certification<br>Information | Substitution |
| **Sector** | Industry losses | Traceability<br>Certification | Epidemiological links<br>Market structure<br>Distribution |
| **Regional** | Welfare impact<br>Industry loss | Travel restrictions<br>Compensation<br>Prescribed cull | Economic geography<br>Mitigation and prevention costs |
| **National International** | Welfare impact<br>Distribution of loss | Regionalisation<br>Tariffs/non-tariff Barriers<br>Restrictions | Economic geography<br>Distribution of impacts |

*Source:* Pritchett et al. (2005).

## 7.4. GIS in veterinary activities

### *7.4.1. First OIE international conference on the use of GIS in veterinary activities*

The first OIE (World Organisation for Animal Health) international conference on the use of GIS (geographic information system) was organised in Abruzzo (Italy) in October 2006.

The exponential growth of GIS in recent years has tremendously expanded the capacities of analysis in epidemiological studies and led to the development of new powerful tools in the surveillance of animal diseases. GIS, spatial analysis and remote sensing allow precious epidemiological investigations and data collection, correlating diseases' trends with climatic and environmental information, thus increasing understanding of the links between disease processes and explanatory spatial variables.

Until recently, the use of these tools in veterinary public health were underexploited, due to the prohibitive cost of hardware and the great complexity of GIS software that required very specialised personnel.

In the past decade, thanks to the revolutionary change in the area of computerised technology, the reduction of prices and the availability of new simple web-based software, GIS tools have become more widely accessible by veterinary services at all levels. At the same time, the increased awareness of the possibilities offered by these tools has created new opportunities for decision-makers to enhance their planning, analysis and monitoring capabilities. The new technologies, furthermore, offer a new way of sharing and accessing spatial and non-spatial data across groups and institutions. It seems necessary, at this point, to take a picture of the state of the art in the use of GIS in veterinary activities, in order to identify priority needs in the development of new GIS tools at international level for the surveillance of animal diseases and zoonoses and in the definition of proposals for their implementation.

### *7.4.2. Forage pastures insurance in Spain*

Another kind of risk for livestock production is the productivity reduction for pastures and fodders (see Section 3.3.4).

Recently, a new livestock insurance product was introduced in Spain with the aim of preventing the effects of the possible decrease of pasture forage availability in the case of adverse climate conditions. With this type of insurance farmers get a reimbursement when, due to bad climatic conditions (e.g. drought), the forage present on the pasture is reduced compared with the normal production average in the correspondent area.

The aim of this kind of guarantee is to indemnify the farmer for the increase of his/her production price, due to the necessity of feeding the animals with different modalities.

This insurance system has a specific evaluation of damage; in fact it is done by means of satellite images which are able to measure the level of forage that a determined area should produce in favourable conditions.

# 8. Feasibility of an EU-wide system of agricultural insurance

## 8.1. Chapter synthesis

The wide range of risk management tools available in the Member States could be developed further to help improve competitiveness and the economic sustainability of farm enterprises. However, these tools cannot and are not intended to offer the kind of guarantees provided by the former CAP, but would rather help the farm business withstand temporary shocks and improve its access to finance for the development of its activities. It is in this perspective that the development and availability of risk management instruments might usefully be encouraged.

The Commission [72] has looked at a number of options for encouraging the development of risk management tools and providing an improved response in the event of crisis (see Section 4.8).

## 8.2. An EU-wide system of agricultural insurances or an alternative solution?

Given the many differences observed in EU countries, not only in their agricultural risks but also in their legal, social and economic backgrounds, an EU-wide system of agricultural insurances can be discussed. A series of alternatives to a common system can be proposed and analysed. In any case, any of these alternatives should be simple to manage by the EU administration and easy to control.

Some alternatives to a proper EU-wide scheme can be a set of actions to foster national systems by:

— facilitating/subsidising the composition of databases, preferably at the farm level;
— reinsuring;
— clarifying the framework; and
— partially subsidising national systems which are within the framework.

[72] Communication from the Commission from the Commission to the Council on risk and crisis management in agriculture, COM(2005) 74 final of 9 March 2005, Brussels (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0074:FIN:EN:PDF).

### 8.2.1. *Facilitating/subsidising the composition of databases, at a detailed level*

A balanced agricultural insurance system needs reliable and detailed databases in order to limit, to the minimum possible level, malfunction due to asymmetric information that leads to adverse selection and, to some extent, moral hazard: if premium rates are determined with a coarse geographic detail, only farmers with a high risk level will buy the insurance. This will push the insurer to raise the premium and the insurance will become uninteresting for most farmers. This danger can be reduced with a bonus/malus system, but it takes a long time to tune the system, and in the meantime the existence of the insurance product itself is jeopardised.

The public sector has developed several databases (IACS, FADN, LPIS, LUCAS, agricultural census, FSS, soil maps, interpolated meteorological data) for the management of the CAP that could provide a basis for fine-tuning premium rates. The use of some of these databases poses serious problems of principle. In other cases the approach could be debated more easily.

— FADN provides the type of data that could theoretically be more useful, although the geographic location accuracy is missing. However, its content (detailed accountancy by farm) is extremely sensitive and the confidentiality is essential. A hypothesis of using FADN for fine-tuning of premium rates might endanger the reliability of the data.

— Individual data in the agricultural census and FSS (farm structure survey) are also under statistical secret, but they are less sensitive than FADN data. Their use by an official body to derive geographically fine-tuned variability indicators useful for insurances might not be impossible.

— IACS (integrated agricultural control system), LPIS (land parcel identification system) and LUCAS (land use/cover area-frame survey) contain very detailed geographic information, but no data on yield. They could be considered as a basis for building a database for insurance purposes, but they are not directly usable.

— Soil maps and raw meteorological observations have copyright restrictions, but interpolated products elaborated in the framework of agrometeorological models are often free and potentially usable for insurances. Their use for yield forecasting at national level is now fully operational, but their local accuracy to estimate yield variability would still need a large volume of validation and calibration work based on field observations.

The US Risk Management Agency (RMA) determines the premium rates to be applied by companies in each county. Their approach is based on a very consistent network of field experts in the territory and is difficult to apply in Europe. A role of European institutions similar to the role of RMA in the USA is difficult to conceive, also because some national bodies (in Spain, Italy and Greece) already fulfil similar tasks. However, some support role of the European institutions to encourage other national public–private partnerships could be the object of a reflection process.

### 8.2.2. Reinsuring

Many agricultural risks are considered non-insurable in most countries because they are too systemic, i.e. a potential damage hits a high proportion of farmers simultaneously. Insurers and reinsurers are not willing to take this type of risk. The situation changes if there is a strong public participation in the reinsurance scheme (Spain and USA). If we consider the issue from the EU perspective, a major question is can EU institutions act as reinsurer?

Let us imagine that the EU acts as reinsurer and suppose that an extreme catastrophic event hits the whole EU, reducing by 40 % the crop output of the EU. We would have a loss of around EUR 68 billion; if we assume a deductible of 30 % of the production value this would correspond to EUR 17 billion compensation. Assuming that the premiums paid by farmers were 6 % of the insured capital (so, approximately EUR 10 billion) and that the EU provides stop-loss cover above the 100 % of the premiums, the liability of the EU as reinsurer might be approximately EUR 7 billion. This extreme example is highly unlikely to happen, but it illustrates the budgetary uncertainty that this type of role would introduce under major events. This uncertainty is difficult to conciliate with a policy of budget stabilisation and the likely need of some tool to limit the expenditure.

Alternative solutions might be creating a fund regularly fed, or enlarging the role of existing institutions, such as the European Investment Bank, in charge of this reinsurance role.

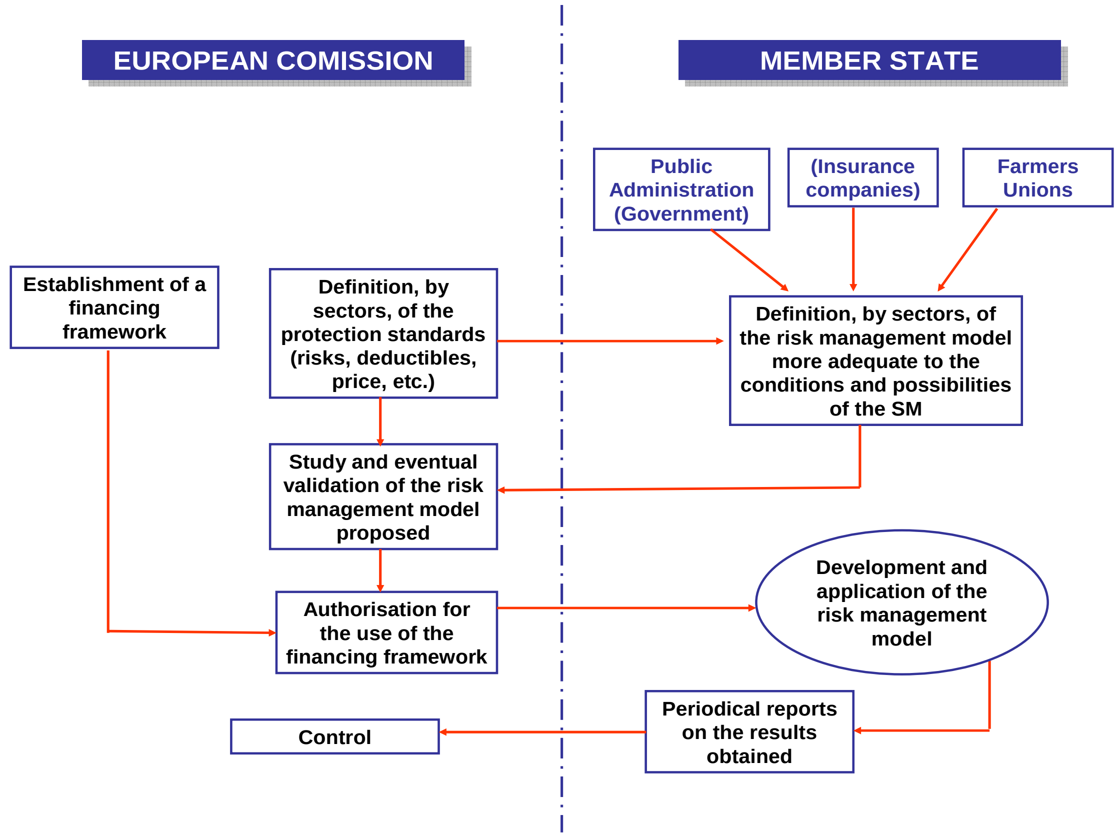
### 8.2.3. Clarifying the legal framework

The European Union is already defining a common framework for national support given to agricultural insurance, currently through the agricultural guidelines, and for the future, through the guidelines and the regulation currently being discussed (see Section 4.5). This regulation is made in compliance with WTO agreements, and with European Treaty principles.

If this framework was to be made more constraining, in order to achieve a greater homogeneity of the national systems, it could include some reference to the compatibility of ad hoc aid with subsidies to insurance. This could be either to forbid ad hoc aid on insurable risks (they do not seem to be justified if the private market can cover the risk), either to require the exigency of having bought some kind of insurance for being eligible for ad hoc aid (financial cooperation of the farmers in their own risk management) or both. Currently, these measures exist in some countries, but as we saw in Section 6.3, there is great divergence between countries.

### *8.2.4. Partially subsidising national systems which are within the framework*

An alternative to establishing a common insurance system could be to support national risk management systems. These could be either insurance models, funds or other risk management tools. In any case, they should be within a common legal framework, establishing some criteria as discussed in the previous section, and a common financing framework. The advantages of this option are that the different models could be adapted to the criteria, uses and needs of every country, permitting some flexibility.




*Source:* Authors' elaboration.

**Figure 62. Support to national risk management systems under a common framework — possible organisational scheme**

In Section 8.5.2 we discuss the possible financing sources for this support, and their compatibility with the CAP. Figure 62 gives a general overview of which could be the role of the European Commission and of the Member States. The Commission, besides establishing a general framework, should settle the protection standards for the different agricultural subsectors. This would consist of technical criteria: eligible risks, minimum deductibles, reference prices allowed, etc. The Member States would have to adapt their tools to this framework and develop their own model. The Commission would also have a control role.

## 8.3. The role of the public sector

There are examples of totally private insurance in agriculture, covering in particular hail damage. Most other insurance schemes are provided under subsidised governmental schemes because the risks being covered are, in fact, not insurable in the sense that a market determined premium would be too high (Moreddu (), OECD, 2001).

EU Member States providing insurance systems on the private sector with strong public support have integrated their systems as an essential agricultural policy instrument for the stabilisation of agricultural income. In these countries such as Spain, Italy and Austria with a high level of public support, insurance systems are well developed and most risks affecting agricultural yield are covered. Risks mentioned as not insurable in the private sector become insurable through the involvement of the public sector. On the other hand, public ad hoc payments are lower in these countries.

From an economical point of view it seems that it is easier to plan financial support to insurance premiums on a balanced annual altitude, than make public *ex post* payments for the compensation after unforeseen natural disasters.

Also we have to point out that a private–public partnership increases the farmer’s participation on the risk management tools and farmers take a higher level of responsibility to manage the risks affecting agricultural production.

## 8.4. Possible options of an EU-wide system of agricultural insurances

— **Single-risk or combined insurances** (hail, drought, frost kill, excessive rain)

— **Yield insurance** (climatic cause of losses has to be identified, evaluation of the losses), similar to combined insurance

— **Yield insurance** (no identification of climatic cause of losses, losses calculated as a difference in yields)

— **Whole-farm yield insurance**

— **Income/revenue insurance**

— **Area index insurance**

— **Indirect index insurance** (meteorological indexes, satellite images)

— **Public reinsurance**

— **Flexible system** (supporting Member States’ systems)

These options will be analysed first in a general assessment (Section 8.5) and then on a one-by-one basis (Section 8.6).

## 8.5. General assessment of the different options

### *8.5.1. Criteria to assess the feasibility*

A feasible EU-wide insurance scheme should ideally meet several conditions. Some of these conditions, which we can call political criteria, relate to decisions of the policymakers. Other conditions (socioeconomic) relate to decisions of the private sector (insurers, reinsurers and farmers). A third category of conditions have a more technical nature.

- Political criteria:
  - Long-term financial perspective (linked with cost)
  - Compatibility with the WTO
  - Compatibility with European legislation and the CAP
  - Compatibility with EU financial regulations (reinsurance)
- Behaviour of the private sector
  - Percentage of farmers who would buy the insurance
  - Acceptation by insurers/reinsurers
- Technical criteria
  - Meeting the needs of farmers
    - Is there a need? How unstable is the income of farmers?
    - Will there be a need with changing circumstances?
  - Cost/affordability
  - How feasible/simple is the control to avoid fraud/malfunctioning?
  - Technical feasibility and base information availability (need of databases for insurance types with little or no tradition)
  - Asymmetric information: potential adverse selection, moral hazard or other problems
  - Advantages compared with alternative tools

### *8.5.2. General assessment*

The assessment related to some of these criteria is more or less common for any of the possible types of insurance (general assessment). For other criteria the assessment depends strongly on the type of option chosen.

**Political criteria**

— **Compatibility with the WTO and European legislation**
In general, compatibility with the WTO and with European legislation could be guaranteed for most risk management tools if they meet the criteria of the 30 % threshold and deductibles and if there was a declaration of calamity by the government for the single- or multi-peril or yield-oriented products. The 30 % thresholds and deductibles would not be a big problem for income products and for peril/yield-based products with high risks. It would be enough to leave to the private market the cover of field crops and others with low risks, and support those products with higher risks when losses are above 30 %. However, for the support of crop insurance products, the need of an official declaration would be a hindering constraint, so, while the green box definitions remain as they are, crop insurance would not be compatible with the green box.

— **Compatibility with the CAP and long-term financial perspective**
The Fischler reform, as already mentioned in Section 4.2.1, changes the framework of the 'old CAP', shaking it and preparing a good basis for its evolution towards a modern agricultural policy. The pillars on which the CAP is standing now are two: the decoupled payment and the rural development funds reinforced by the modulation.

— The direct payment (single farm payment) represents a farmer's income stabilisation tool.

— The modulation is intended to give a certain priority to rural development programmes.

Designed as a mechanism to strengthen pillar 2 of the CAP, modulation reduces direct payments and shifts the funds saved into rural development. Using the modulation of the direct payment (pillar 1) to collect funds and using them for the setting up of rural development plans (RDP) (pillar 2) could also be carried out for the creation of 'risk management programmes' subordinated to rural development programmes.

Let us assume that the objective is to introduce a risk management system within the current CAP framework, and not having to wait for a future CAP reform. One possibility that has been already considered by the European Commission (EC, 2005a) could be to include risk management among the measures of rural development in the second pillar. Discussion could take place on how additional risk and crisis management measures could be co-financed by one percentage point of modulation.

The single farm payment (SFP) falls within the green box. Modulation is an instrument which provides a means of ensuring the transfer of CAP funds from direct aids to farmers — more specifically from SFPs — to rural development measures; also in the green box. Community law states that all the funds released by modulation can only be used in the context of rural development programmes — including the amount that could possibly be used for risk and crisis management measures ([73]). It means that those funds could be used for risk management programmes under the name of RDP (pillar 2) whenever they do not run into WTO agreements.

New risk management measures co-financed from the one percentage point of modulation would aim to improve the competitiveness of the agricultural sector by strengthening the economic sustainability of agricultural holdings. It is in this context that Member States would have the choice of introducing new risk and crisis management measures into their rural development programmes.

Under the new financial regulation, and in particular the ‘Principle of annuality’, the new regime of compulsory modulation no longer allows Member States to retain funds in view of their redistribution in later years.

Using modulation to finance new risk and crisis management instruments would not require additional Community expenditure; it would simply make it possible for Member States to use a maximum amount of rural development funds for these purposes.

In this context, in all cases, the amounts used for risk and crisis management shall be limited to one percentage point of modulation in the Member States where modulation is applied. For the Member States where modulation does not yet apply, an equivalent method could be applied to set the maximum level of rural development funds that could be allocated to these measures (EC, 2005a).

Another instrument also introduced in the new CAP was cross-compliance. It sets certain conditions for farmers to get the direct payment (in its totality). Farmers must safeguard the environment and accomplish other requirements set up at EU and national levels. Given that cross-compliance was created as a condition to get the payment, a risk assessment plan for farms, made by public or private insurance companies, could be required as a condition to use the modulation funds, or even to get the direct payment.

An additional advantage of this approach is that it would favour a risk information process which appears to be needed. After a number of years, it would be possible to have enough information (regarding climatic/sanitary risks in specific regions/areas) to set up a more developed ‘risk management programme/insurance scheme’.

([73]) Commission Regulation (EC) No 1954/2005 of 29 November 2005 amending Regulation (EC) No 796/2004 laying down detailed rules for the implementation of cross-compliance, modulation and the integrated administration and control system provided for in Council Regulation (EC) No 1782/2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers and derogating from Regulation (EC) No 1782/2003 as regards payment of the aid.

— **Compatibility with EU financial regulations (reinsurance)**
See Section 8.2.2 'Reinsuring'.

**Behaviour of the private sector**

— **Percentage of farmers that would buy the insurance**
Any a priori feasibility assessment of a hypothetical EU-wide scheme of agricultural insurance has a large uncertainty. The most important source of uncertainty is probably the farmers' behaviour. Some studies report that farmers' behaviour does not always conform to theory and that there is a need to better understand farmers' attitudes toward risk and the way they adjust their farm operations (Moreddu ([13]), OECD, 2001; Meuwissen et al. 1999b; McCarthy, 1998).
The evolution of farmers' acceptance of insurance possibilities is slow. In the USA the system started in 1938 and only in recent years it has reached a high level of penetration. In Spain (law approved in 1978), the system offers a wide range of subsidised options, but the market penetration is still less than 30 %.

— **Acceptation by insurers/reinsurers**
Support to the insurance systems should be always welcome by the insurance sector. But there are two important points to take into account. Some insurance products that could be developed (index insurance, yield insurance, revenue insurance) have not already been developed by the private sector because of the systemic character of the risks involved. In these cases, there is a need for public support for reinsurance. Second, if a common system was to be developed, there would be a cost for the companies to adapt to it, and in some cases it might not be worthwhile for them. For these reasons, the private insurance sector seems to back up the idea of the coexistence of national systems rather than the implementation of a single EU system (see Section 4.8.2 on the position of the insurance sector)

**Technical criteria**

— **Meeting the needs of farmers**
- Section 3.6 gives an analysis of the types of farms and regions for which the income has a higher or lower level of instability. The quantitative analysis in this chapter generally underestimates the variability at farm level because of the smoothing effect of considering regional averages. However, the reported maps give a geographic picture of the existing needs in income stabilisation that are not concentrated in restricted geographical areas.
- Changing circumstances suggest that the needs of income stabilisation tools for farmers will be growing in the coming years. Market liberalisation, climate

change and the increasing concentration of retailers are growing factors of the instability of farmers' income.

— **Cost/affordability**

A most important criterion is the eventual cost of the programme. In general terms, the implementation of a risk management programme should never imply exceeding the current agricultural budget. So, as was discussed above, any cost would have to be taken from other agricultural expenses.

Some coarse assessments of the cost of different insurance programmes have been made. Their results are shown in Section 8.7. These examples are an income-based insurance on averages per type of farming, arable crops yield insurance, an area index (regional) yield insurance for cereals and an EU-wide insurance for fruits and vegetables. However, the cost of these programmes would depend on the percentage of the premiums that is to be subsidised. The cost would always be reduced by reducing the subsidy rate, but the subsidy should be large enough to make the product interesting for the farmers. This will be discussed in Section 8.7.

— **How feasible/simple is the control to avoid fraud/malfunctioning?**

We can differentiate two types of control:

1. the general control/management of the system;
2. the audits/last controls that could be done in the field.

1. In this case, we should differentiate whether the system is an insurance system by private companies or whether it is a public scheme. In the case of a private insurance system, it seems clearly in the interests of the private insurance companies to follow and control the farmers' declarations of losses. So, in the case where subsidies are given directly to the companies, the control should be performed on the companies. These are usually quite transparent, as they yield annual reports to public organisms in each country. They are usually under the survey of the government in those countries where agricultural insurance is subsidised, meaning that it is a realistic assumption. So, the last step to be undertaken is how the governments are controlled by the EU. In a case where the system is not private but a public scheme, control would have to be carried out entirely on the governments.

   In both cases, the control on the government can be made within the framework of the CAP, and with the tools introduced by the Fischler reform. As the main administrators of the CAP, Member States currently play the leading role in applying the CAP's management tools. Taking cross-compliance as an example, the Member States' responsibilities include establishing the definition of good agricultural and environmental conditions for their agricultural circumstances (at national or regional level) and taking into account the specific characteristics of the areas concerned, including soil and climatic conditions, existing farming systems, land use, crop rotation, farming practices and farm structures. Member States must inform farmers of the definition, provide them with the list of statutory management requirements and set up management controls and sanction systems for all cross-compliance. Due to the introduction of this condition a 'farm advisory system' had to be set up as an obligatory instrument and further on, a formal audit programme as well. Transferring this example to the hypothetical introduction of risk management programmes, it can be supposed that risk management programmes can be run and controlled by the public or private insurance companies.

Summarising, if a risk management programme were introduced (parallelism with the cross-compliance), Member States would probably be responsible for creating the right risk information programmes and supporting a private or public insurance company in the development of tools and offers for the market. The insurance companies then would be responsible for the management of the sector, avoiding frauds or the malfunctioning of it.

2. Regarding the audits or controls that could be carried out in the field, it appears rather difficult to take direct control of insurance systems like single, combined or yield insurance at a European level because the loss assessment is generally carried out at farm or field level. However, this control does not seem particularly necessary if the insurance is in the hands of private companies, because they would not permit abuse by farmers. So, it could possibly only be made in a proper way on the insurance companies. Regarding other types of products, like index- and area-based insurance schemes, even if they are not yet developed in Europe, it could be possible to control them at an EU level through the use of agrometeorological indicators and satellite images.

— **Technical feasibility and database information availability**

The technical feasibility of insurance products is not always possible. In theory, all that exists in one country could always be applied in others. However, there are some characteristics of some insurance products that could make them unfeasible in some countries.

One of the most important things for insurance feasibility is the availability of databases. The lack of historical yields data at the farm level can hinder the apparition of yield insurance as it is in the USA. For revenue insurance, there is the need for one or several markets which can provide a transparent price accepted by insurers and farmers and that cannot be manipulated. In the USA, revenue insurance products are based on futures markets prices. This would not be easy in many regions in Europe, because of the lack of futures markets and because the prices of those that exist are not particularly representative of farmers' prices in many regions. Income products in Canada are based on farmers' fiscal declarations. In European countries, agricultural fiscal systems may not be adequate to base an insurance product on their reports.

— **Asymmetric information: potential adverse selection, moral hazard or other problems**
Adverse selection is a problem which appears due to the asymmetry of information between insurers and insured. In order to fix the premiums of insurance types with little or no tradition, and mainly for such insurance types as yield insurance or income insurance, it is necessary to have adequate databases with records at the farm level. Is it feasible that public databases (LPIS, soil maps etc.) are used to adjust premium rates which will be applied by private companies? In the USA, rates are fixed by the government (RMA) and applied by insurance companies. In Spain, sometimes it is ENESA that calculates the premiums which will then be agreed by Agroseguro.
Launching new insurance systems often requires a test period in pilot areas. This can also apply to the application of systems that have been tested in areas with very different agricultural characteristics. Many insurance systems are difficult to apply because asymmetry in information leads to an adverse selection behaviour that undermines the system. Each individual farmer knows better the own risk level than the insurance company, and it can happen that only farmers with a high level of risk buy the insurance. Consequently the risk in the insured population is higher than the average.

— **Advantages compared with alternative tools**
There are several advantages of insurance over other risk management tools. One of them is that in the case of insurance the farmers have a legal title to get compensation compared to ad hoc payments from the public sector. Insurance provides a quicker payment of compensation, that is, when the farmers need it more. The average time of payment could be around two months in the private option and one to two years in the public one. Another advantage for farmers is that private insurance gives indemnities more adjusted to the farmers' real losses on an individual basis. An advantage for the government is that the premiums subsidies constitute a regular and foreseeable expense, so they are easier to programme than ad hoc compensation, which can be very irregular from one year to another. Some also attribute insurance an advantage on general economic rationality terms: via the amount of the premiums, it delivers to farmers information on the risks inherent to their production choices, so it can lead to a rationalisation of the latter.
However, critical views support the theory that the global cost is higher because of the higher cost of loss adjustment, and that subsidising agricultural insurances means subsidising insurance companies. But subsidising agricultural insurance

means supporting a system in which what the farmer participates on the premium minimises the budgetary impact on the public sector. Both, the farmer and the government are able to calculate their budget. Also we can point out that in developed schemes, such as those in Spain and Austria, behind the public involvement there is also a high level on the involvement of the farmers' union to represent their interests. However, another point of view holds that with a public system (ad hoc aid), the administration (government) is in charge of damage assessment etc. Supporting an insurance system transfers this responsibility to the companies that have a profit in compensation of this service. For example, in the USA, the profit of companies ranges from USD – 30 million to USD 400 million/year with an average of around USD 200 million/year in a programme with a total cost of approximately USD 4 000 million/year. The question is whether this compensation is fair. Lastly, there is also a cost in political image.

The development of agricultural insurance systems reduces the public expenditure in ad hoc aid. This reduction is difficult to estimate but should be considered when total cost is computed.

## 8.6. Specific assessment of each option

— **Single-risk or combined insurances**

- Single-risk (hail) and combined risk insurance schemes already exist in all Member States, sometimes subsidised at national level
- The availability of a long history of data makes it easier to calculate.
- Control: high level of experience in loss assessment and very similar in the countries, but high loss expenses
- Moderate risk of moral hazard
- Higher adverse selection in single-risk insurance
- Support at EU level is doubtful

— **Yield insurance** (climatic cause of losses has to be identified)

- Similar to combined insurance but more comprehensive
- Meets farmers' needs better
- Probably more expensive
- Need of higher deductibles for systemic risk (drought)
- Lower adverse selection because more attractive in different regions
- Loss assessment more difficult
- Need of public support for development in private sector
- Support at EU level useful

— **Yield insurance** (no identification of climatic cause of losses)
- High risk of moral hazard
- Lower acceptance by insurance and reinsurance
- Lower costs for loss assessment

— **Whole-farm yield insurance**
- Addresses a bit better the target (income stabilisation)
  - — Heavier to control

— **Income/revenue insurance**
- Addresses much better the target (income stabilisation)
  - — Difficult to control, unless on area index basis
  - — Very systemic risks (prices): difficult to accept by insurers unless strong public support
  - — Difficult to give a reference price
  - — High risk of moral hazard to undermine the system

— **Area index insurance**
- Little risk of moral hazard and adverse selection
- Relatively easy to control
- Does not take into account the differences of damage inside each ‘presumed homogeneous’ area
- Who is competent to give the official reference yield?

— **Indirect index insurance** (meteorological indexes, satellite images)
- Objective criteria, but some are difficult for farmers to understand (NDVI)
- Only useful for cover with high deductibles
- Risk of overcompensation or contrary effect

— **Public reinsurance:**
- Difficult to guarantee that the expenditure will be kept within a certain level (compatible with EU financial regulations?)
- Partial public support to reinsurance as an option
- Could make insurable risks that have been mentioned as not insurable

— **Flexible system: supporting Member States’ systems**
- Meets better different demands at national level
- Breaking the difficulties in case of different systems in Member States
- Could be a first step to harmonise the systems, depending on the regulations (see Section 8.2.4).

The previous chapters have highlighted how heterogeneous the situation of agricultural insurance schemes in the EU is, ranging from countries or agricultural sectors with a very strong presence of insurance schemes to countries/sectors in which their presence is marginal or non-existent.

Pressure in the framework of the WTO negotiations raises the question of whether the CAP has a role to play in risk management and in particular on agricultural insurance. Several questions can be considered.

— What can be the budgetary impact of a hypothetical CAP subsidy to agricultural insurances?
— What can be the benefits of such support?
— Which would be the geographical distribution of the benefits?
— How would the distribution of the benefits for different sectors or farm sizes be carried out?
— Which type of insurance can be supported: single-risk, combined, yield or income insurance?
— To what extent can risk management policies replace income support policies?
— Are the existing tools for risk reduction sufficient for income stabilisation?
— Would Community action provide value added, compared with national or regional initiatives/action?

## 8.7. Possible cost of some of the options

Let us make an attempt to tackle the question of the budgetary impact or cost of a hypothetical CAP support to agricultural insurance. For this purpose we can start defining a set of scenarios for specific sectors and insurance types.

The definition of a scenario involves a number of choices. It is not always possible to support such choices on the basis of objective considerations. Ideally, each scenario should be defined by some assumptions on:

— the items covered (crops, livestock, assets, income);
— the risks covered;
— the proportion of farms/production insured;
— the technical characteristics of the insurance, in particular the franchise;
— the average rates that can be applied;
— the possible subsidy rate to the premiums.

**Table 41. Premiums per crop for single-risk insurance**

| Crop | Perils | Country | Premium (%) | Deductible (%) | Subsidy (%) |
|---|---|---|---|---|---|
| Arable crops | Hail | Austria | 2.8 | 8 | 50 |
| Field crops | Hail or frost or other | Italy | 2.6 | 10–30 | 65 |
| Cereals, protein and oil crops | Hail or fire or lightning or explosion | Portugal ([1]) | 2.2 | 20 (relative) | 68 (average) |
| Fruits | Hail or quality | Austria | 14 | 10–30 | 50 |
| | Hail or frost | Italy | 13.8 | 10–30 | 54 (average) |
| | Hail or fire or lightning or explosion | Portugal ([1]) | 18 | 20 (relative) | 68 (average) |
| Olives for oil | Hail or frost or other | Italy | 4 | 10–30 | 63 |
| Vegetables and flowers | Hail or frost or other | Italy | 5.6 | 10–30 | 54 (average) |
| Potatoes | Hail or fire or lightning or explosion | Portugal ([1]) | 4 | 20 (relative) | 68 (average) |
| Wine grapes | Hail or frost or other | Italy | 6.2 | 10–30 | 63 |
| | Hail or fire or lightning or explosion | Portugal ([1]) | 8 | 20 (relative) | 68 (average) |

([1]) The premium can also include a complementary cover (frost, snow, tornado and waterspout) that would make it combined insurance.

*Source:* Authors' elaboration.

**Table 42. Premiums per crop for combined insurance**

| Crop | Perils | Country | Premium (%) | Deductible (%) | Subsidy (%) |
|---|---|---|---|---|---|
| Arable crops | Hail, wind, frost, flood, excess of water | France | 7 | 15 (average) | 0 |
| | Two or three perils combined | Italy | 2.6 | 10–30 | 75 |
| Citrus | Hail, fire, flood, rain, frost, wind and others | Spain | 8.5 | 10–30 | 43 |
| Fruits | Hail, frost, wind | France | 8.6 | 15 | 0 |
| | Hail, fire, flood, rain, frost, wind and others | Spain | 11 | 10–30 | 43 |
| Olives for oil | Two or three perils combined | Italy | 4.4 | 10 | 69 |
| Vegetables and flowers | Hail, fire, flood, rain, frost, wind and others | Spain | 4.8 | 10–30 | 37 |
| Wine grapes | Hail, frost, additional expenditures after hail | Austria | 6.5 | Hail: 8<br>Frost: 35 | 50 |
| | Hail, frost, wind | France | 2.15 | 15 | 0 |
| | Two or three perils combined | Italy | 4.8 | 10–30 | 71 |
| | Hail, fire, flood, rain, frost, wind and others | Spain | 10 | 10–30 | 41 |
| Grassland | Hail, flood | Austria | 1.5 | Hail: 8<br>Flood: max. EUR 440/cut/ha | Hail: 50<br>Flood: 0 |
| | Drought etc. affecting pastures (index insurance) | Spain | 6 | 0 | 35 |

*Source:* Authors' elaboration.

**Table 43. Premiums per crop for yield insurance**

| Crop | Perils | Country | Premium (%) | Deductible (%) | Subsidy (%) |
|---|---|---|---|---|---|
| Arable crops | Hail, storm, frost, flood, rain, drought, others | Austria | 3.6 | Hail: 4<br>Other risks: max. indemnity/ha | Hail and frost: 50<br>Other risks: 0 |
| | Hail, wind, frost, flood, excess rain, drought, plant diseases | Italy | 2.6 | 10–30 | 77 |
| Wine grapes | Hail, wind, frost, flood, excess rain, drought, plant diseases | Italy | 6.5 | 10–30 | 78 |

*Source:* Authors' elaboration.

**Table 44. Premiums for livestock insurance**

| Animal | Perils | Country | Premium (%) | Deductible (%) | Subsidy (%) |
|---|---|---|---|---|---|
| Cattle | Stillbirth and death (epidemic disease excluded) | Austria | 1.5 | EUR 0–15/head | 0 |
| | All-risk mortality | Greece | 8.3 | 1–2 | 0 |
| | Accidents and epizooties | Spain | 4.7 | 10 | 44 |
| Sheep and goats | Accidents | Spain | 0.6 | 10 | 39 |
| Poultry | All-risk mortality | Greece | 1 | 1–2 | 0 |

*Source:* Authors' elaboration.

For a first and rough analysis of the approximate cost of the difference scenarios, data from existing insurance systems can be used and extrapolated to other European countries or to the EU as a whole. Table 41 to Table 44 show some of the data on premiums for different types of crops and insurance types which could be used to estimate average values of premium rates. The risks covered and the deductibles in each case are also shown, in order to account for the differences in premium rates. The subsidy rates are shown just as reference information.

Once the cost of the insurance (the value of the premiums) is known, it comes to analysing how much would be the cost for the public sector. This cost would depend on the percentage of the premiums that is to be subsidised. This should be a political decision, but some discussion must take place on that subject.

The cost would always be reduced by reducing the subsidy rate, but the subsidy should be large enough to make the product interesting for the farmers. This equilibrium should be found. Looking at the current subsidy rates in Europe and the USA, we can find subsidy rates ranging from 0 % in some European countries to 72 % in the USA. The European guidelines allow subsidies of up to 80 % only for catastrophic risks, and up to 50 % when also other risks are covered. We could think that 50 % would be the maximum reasonable subsidy and not negligible for the farmers; 40 % being a more moderate one.

Currently, many countries already subsidise crop and livestock insurance. A possible strategy could be a co-financing of the subsidies by the EU and the Member States. Examples of this are Austria and Canada, where insurance premiums are 50 % co-financed by national and provincial governments. In Austria, the national subsidy is conditioned to the existence of the regional subsidy. In Spain, in contrast, regional governments freely subsidise insurance at the percentage they choose, independently from the national subsidy.

An issue to take into consideration is the amount of the subsidies that falls on the farmers and not on the insurance companies' expenses. Let us make the hypothesis of a 50 % subsidisation of insurance, and an average loss ratio for the insurance companies of 70 %. This would mean that for a EUR 100 premium, the farmer pays EUR 50, EUR 50 are subsidised, and he gets back EUR 70 in average indemnities. So, the net subsidy received by the farmer would be EUR 20/EUR 70, that is, 28.6 % of his losses.

Next, we present a first, global and rough approach to a definition and analysis of several different scenarios.

### *8.7.1. A possible option on income insurance*

Let us consider a hypothetical income stabilisation tool of this type.

— If the average income/AWU of a given type of farm in a given region is less than the long-term trend by a percentage above a given threshold (deductible), all the farms that have bought the insurance are compensated in a quantity equal to the loss minus the deductible.

If we think about the FADN typology of farms in eight farm types and the FADN regions, with a straight deductible of 10 %, we have estimated the risk (expected average payment by the insurer, that is, the risk premium or actuarially fair premium) to be around EUR 3.5 billion for the FADN observation field, i.e. excluding small producers (see Section 7.3 for more details on the approach). The economic weight of farms outside the FADN observation field is small, but we can assume that the risk premium would grow to around EUR 4 billion/year when they are included.

The average loss ratio (for companies) of insurances that involve individual loss adjustment is generally around 60 to 70 %, with administrative costs (mainly adjustment costs) at around 20 to 25 % of the premiums. This type of insurance would have low adjustment costs; therefore a loss ratio of 80 % would be reasonable. The total amount of premiums of less than 100 % cover would be around EUR 5 billion; but we know that it takes a long time for farmers to accept insurance schemes, and it is difficult to think of more than 40 % to 60 % of market penetration. This makes a total premium amount of EUR 2 billion to EUR 3 billion. If we assume a subsidy of 50 %, we would be talking of a budgetary impact of EUR 1 billion to EUR 1.5 billion.

This type of income insurance can be seen as an income support tool decoupled from production and, therefore, might match with the WTO green box. If this was included in pillar 1 from the current CAP scheme, a part of direct payments being shifted to provide subsidisation to this insurance, it would result in a regular income loss for farmers in normal years and an additional income support in crisis situations.

Notice that this type of option does not necessarily involve the participation of insurance companies and can be managed by mutual funds or stabilisation accounts.

### *8.7.2. Yield insurance on cereals: simplified quantification on arable crops*

For the analysis of production cover for winter–spring cereals, we could assume that the yield of wheat is a good indicator of the variability of yield of cereals in general. We consider a general insurance on yield with all climatic risks covered.

The percentage of production insured is likely to depend on the variability of the potential yield: a well developed scenario can assume that 90 % of the production is insured in areas with very high variability of the potential yield, while only 30 % of the production is insured in areas in which the variability is low.

The franchise could be 30 % of the ‘normal’ yield. The compensation to the farmer will be the percentage of loss compared with the ‘normal’ yield — 30 % (straight deductible).

The premium rates applied depend on the yield variability as well, but also on the penetration level of the insurance products: if it is low, it is likely that the insured farmers are those with the highest yield variability and therefore the insurance rates will be higher. The premiums could be subsidised by 50 % in less-favoured areas and 30 % in other areas. The public support to the reinsurance is similar to the support currently provided in Spain, where the public–private partnership on agricultural insurances is particularly developed.

The yield variability is a key parameter for the assessment of this type of scenario: the higher the yield variability the higher should be the demand for insurance and the higher the rates applied by the insurance companies.

Currently, the data we have are not detailed enough for a proper analysis of this scenario, but we can make a quantification of a more simplified scenario on arable crops. The premium rates for yield insurance on arable crops ranges from 2.8 % to 7 % depending on the region, the risks included in the cover and mostly on the used deductible. If we consider an EU-wide system on yield insurance for arable crops, covering most risks like hail, storm, frost, drought, flood and excessive rain and a deductible of 30 % at farm level for specific crops and that in an EU-wide system the risks are widespread, an average premium rate of 3.5 to 5 % for arable crops seems suitable.

The production value on arable crops in the EU-25 is about EUR 67 300 million. If we assume for insurance a market penetration of about 40 %, we are talking about an insured value of EUR 20 million. A higher penetration level seems improbable in a first period of an EU-wide system that is not compulsory. This assumption results in a total premium amount of about EUR 940 million to EUR 1 350 million. If we assume a premium support of 50 %, we would be talking of a budgetary impact of EUR 470 million to EUR 675 million.

### *8.7.3. Area index yield insurance for cereals*

Let us consider an insurance policy using the regional average yield of a given cereal as a trigger for all the farmers having bought insurance in that region. An indication of the total premium volume involved can be computed from Eurostat data, as analysed in Section 7.3. The geographical scale of available Eurostat data is generally coarse, especially in some countries. This aggregation effect produces a smoothing in the variability of the yield time series. To make reasonable assumptions with this geographic level, we have made quantifications under two scenarios: with straight deductibles of 10 % and 20 %. The average risk level (expected payment due to the farmers) is 2.6 % (with a 10 % deductible) and 1.45 % (with a 20 % deductible) using the historical average production of each region as weight. It may happen that the acceptance of the insurance is higher in the areas with the higher risk level. This would modify the weights for the average risk level, which would become higher, maybe around 2 % and 3 % for both scenarios. The average premium rates might range between 3 % and 5 %.

The yearly production value of cereals in the EU is slightly above EUR 35 billion. The acceptance level at medium term is difficult to estimate on an objective basis, but the experience in countries such as Austria, Italy, Spain and the USA suggest that it would reach, at most, 40 %. In this case the insured production would be around EUR 15 billion and the amount of premiums between EUR 450 million and EUR 750 million.

### *8.7.4. Fruits and vegetables*

In the case study on fruits and vegetables reported in Section 8.3, we estimate, under certain assumptions, that the volume of premiums for an EU-wide insurance system might range between EUR 500 million and EUR 900 million for fruits and another EUR 500 million to EUR 800 million for vegetables. The most important source of uncertainty in these estimates is the acceptance rate by farmers, which we have assumed to be 50 % for fruits and 15 % for vegetables, a sector in which the acceptance is low, even in Spain, a country with a well developed (and subsidised) set of insurance products available.

Table 45 summarises the estimations of the four analysed scenarios.

**Table 45. Coarse estimation of quantitative costs for some options**

| Option | Premium rate (%) | Penetration level (%) | Premium (billion EUR) | Subsidies if 50 % of premiums (billion EUR) |
|---|---|---|---|---|
| 1. Income insurance | – | 40–60 | 2–3 | 1–1.5 |
| 2. Yield insurance on arable crops | 3.5–5 | 40 | 0.95–1.35 | 0.47–0.67 |
| 3. Area index insurance for cereals | 3–5 | 40 | 0.45–0.75 | 0.23–0.37 |
| 4. Yield insurance on fruits and vegetables | 9–15 | Fruits: 50<br>Vegetables: 15 | Fruits: 0.5–0.9<br>Vegetables: 0.5–0.8 | Fruits: 0.25–0.45<br>Vegetables: 0.25–0.4 |

*Source:* Authors calculation

## 8.8. A case study: insurance schemes for fruits and vegetables

We consider here data on the current situation of insurance schemes for four countries: Spain, France, Italy and Austria. The main types of insurance for fruits and vegetables we have identified are:

— single-risk, for example: hail, frost, flood, damage by strong rain or wind;

— combined: covering two or more risks;

— yield insurance for one product: covering any climatic risk;

— whole farm insurance.

In the case of Austria, frost on fruits is considered non-insurable, and this is probably also the case in many countries of central Europe, probably because the rates would be too high and reinsurers are reluctant to take such a systemic risk. This might change if there is a support from the public sector, in particular for the reinsurance, but this needs to be discussed with the private sector.

### *8.8.1. Data on production and value of fruits and vegetables*

Production and value data used below have been obtained from datasets downloaded from the Eurostat intracomm site (http://europa.eu.int/estatref/download/everybody/). The data may need some corrections, partly because of the possible inconsistencies on nomenclature concepts, but such corrections should not be a major source of inaccuracy compared with other sources of uncertainty.

The production data we consider are obtained from the Eurostat table 'Pvfrulea' as an average of the available data between 2000 and 2004 (the averaged years can vary from country to country). The production value data come from the Eurostat table 'A2acct97' (Agricultural accounts with the 1997 nomenclature) as an average of the available data between 2000 and 2003.

The relative weight of each of the four considered countries in each of the sectors (vegetables, citrus and other fruits) is similar in both tables, except for France. This suggests a more in-depth consistency analysis of the data for France.

**Table 46. Production of fruits and vegetables**

| | | Vegetables | Fruits (excl. citrus) | Citrus fruits |
|---|---|---|---|---|
| EU-27 | 1 000 tonnes | 64 105 | 24 513 | 10 429 |
| ES | 1 000 tonnes | 12 751 | 4 097 | 5872 |
| | % | 19.9 | 16.7 | 56.3 |
| FR | 1 000 tonnes | 6 226 | 3 571 | 27 |
| | % | 9.7 | 14.6 | 0.3 |
| IT | 1 000 tonnes | 14 125 | 5 724 | 2 980 |
| | % | 22.0 | 23.4 | 28.6 |
| AT | 1 000 tonnes | 528 | 719 | |
| | % | 0.8 | 2.9 | |

*Source:* Authors' elaboration.

**Table 47. Value of the production of fruits and vegetables**

| | | Vegetables | Fruits (excl. citrus) | Citrus fruits |
|---|---|---|---|---|
| EU-25 | Million EUR | 23 354 | 11 293 | 3 329 |
| ES | Million EUR | 4 852 | 2 319 | 1 913 |
| | % | 20.8 | 20.5 | 57.5 |
| FR | Million EUR | 3 212 | 2 743 | |
| | % | 13.8 | 24.3 | 0.0 |
| IT | Million EUR | 5 082 | 2 273 | 1 011 |
| | % | 21.8 | 20.1 | 30.4 |
| AT | Million EUR | 163 | 258 | |
| | % | 0.7 | 2.3 | |

*Source:* Authors' elaboration.

### *8.8.2. The possible order of magnitude of an EU-wide system*

The order of magnitude of a possible EU-wide insurance system for fruits and vegetables can be measured by the amount of production insured, the total amount of premiums or the cost for the public sector if the system is subsidised. The assumptions to make an estimate on such order of magnitude have to be based on the data available for European countries in which the system is developed. However the systems existing in different countries are generally not comparable and the climatic conditions and risk level are also strongly heterogeneous. The mentality of farmers and their possible reaction to a system that has never been applied in the country is another unknown factor that cannot be forecast on an objective basis. Therefore we need to accept a large amount of assumptions. Consequently any forecast that can be made has a very large degree of uncertainty.

We can give some indications of the order of magnitude of an EU-wide system. Let us assume that we consider a European system similar to the ‘whole farm insurance’ used in Spain for fruits (excluding citrus). The average cost in Spain has been EUR 6.17/100 kg. The total production in the EU-25 + 2 is around 25 million tonnes. A multiplication gives approximately EUR 1 500 million. Assuming that a political priority to this type of insurance leads to a 50 % cover with this type of insurance (or similarly, to a penetration level of 50 % of this type of insurance), we would get a figure of EUR 750 million for the total of the premiums. This involves some additional assumptions that are not easy to accept, in particular that the level of risk in Spain is approximately the average level of risk in the EU. Additional considerations need to be integrated in this coarse computation, such as the insurability of frost in many countries. An extrapolation of the Spanish data assuming a combined option with frost (indicatively an average of EUR 6 to EUR 7/100 kg) would result in a total of EUR 730 million to EUR 860 million, while an option without (roughly about EUR 4/100 kg) would give a figure of about EUR 500 million, always with the assumption of 50 % cover.

Data for Italy are available in terms of average price of the premium compared with the insured value at a certain reference price. The average price has ranged in recent years between 13 % and 15 %; we consider 14 % as indicator. This rate applied to the EU-25 figure for the production value (~ EUR 11 300 million) gives EUR 1 580 million, i.e. EUR 790 million for the total of premiums, assuming always a penetration level of 50 %. However, we have to take into account that more than 70 % of insurance for fruits in Italy is single risk (hail or frost). Therefore the apparent coherence of this figure with the extrapolation of the data from Spain comes with a question mark.

In the case of vegetables, the penetration rate is generally lower and the fares are also lower than for fruits, but the global value of the production is significantly higher than for fruits. The market penetration figure provided by ENESA is 30 %, although the insured production (EUR 973 million) corresponds to 20 % of the Eurostat production figure. The difference is probably due to the denominator used: insurable production or total production. In Italy the market penetration is around 8 % to 9 % of the production (Eurostat figures). A hypothesis of a 15 % penetration level for a hypothetical EU-wide system seems reasonable. This would mean an insured production value of the order of EUR 10 000 million. Since the average premium rate ranges between 5 % and 8 %, the amount of premiums would be around EUR 500 million to EUR 800 million. Figures are lower for citrus, although we do not have at the moment sufficient data on premium rates.

### 8.8.3. Cost for the public sector

A major question on this issue is the possible cost of subsidising insurance schemes for fruits and vegetables at EU level. The answer obviously depends on several factors, including the type of insurance, proportion of production insured and the percentage subsidised.
A simplified computation of the cost for the public sector would be:

$$C = ProdVal \times Degpen \times Mrate \times SubsP + PReins$$

Where
*ProdVal* = total value of the (insurable) production,
*Degpen* = degree of market penetration of the insurance, i.e. part of the (insurable) production that is actually insured,
*Mrate* = mean premium rate applied by the insurers,
*SubsP* = subsidy proportion for the premium,
*PReins* = public participation on the reinsurance.

The concept of insurable production is not necessarily harmonised across Member States. Therefore it may be preferable to refer *ProdVal* and *Degpen* to the total production.

A similar alternative formula would be:

$$C = ProdW \times DegpenW \times MrateW \times SubsP + PReins$$

Where:
*ProdW* = the production in weight,
*DegpenW* = the degree of penetration in weight (it can be identified with *Degpen*),
*MrateW* = the premium rate in EUR/tonne.

The strongest source of indetermination is probably the degree of penetration *Degpen*. It is likely to depend on two main factors: the risk level (that can be represented by the variability of yield) and the existence of subsidies on the premiums. In a first approach we consider the effect of the subsidies, assuming that an EU support system would lead to an average degree of penetration comparable to the current one in countries with a national support system. Since the information we have on it is not precise because it is based on the conjecture that certain national values can be extrapolated, we will not make a difference between *Degpen* and *DegpenW*.
The mean premium rate *Mrate* should depend on the type(s) of insurance and the risk of yield reduction above the franchise.

The interest of using one or the other formula depends on the available data. We should use statistical data for the production (weight or monetary value). At the moment we have data for production (weight), but not for value.

### 8.8.4. Available data in selected countries

Currently we only have data for a few countries in the specific field of insurance for fruits and vegetables. The type of data available for each country is quite heterogeneous and the extrapolation to the possible behaviour in the EU-25 from these data becomes difficult.

#### Spain

For fruits in Spain there are three possible insurance modes:

— combined per species, covering hail, frost and other risks like flood, damage by strong rain or wind;

— combined, excluding frost;

— whole farm insurance: combined for all types of fruits in the farm. This includes hail, frost and other weather risks and the missed conversion of flowers into fruits for climatic reasons. For hail the indemnities are paid by parcel, but the rest of the damages are calculated for the whole farm.

Deductibles: depend on the product and type of insurance, but are generally from 10 % to 15 % for hail and from 15 % to 30 % for the options including frost.

**Table 48. Average cost of insurance in 2005 for fruits**

| | Fruit options | |
|---|---|---|
| | **With frost (EUR/100 kg)** | **Without frost (EUR/100 kg)** |
| Peaches | 7.63 | 4.38 |
| Apricot | 7.81 | 3.69 |
| Plums | 6.56 | 4.68 |
| Cherry | 26.71 | 18.83 |
| Table apples (excl. cider) | 4.81 | 3.41 |
| Pear | 5.36 | 3.12 |
| Whole farm | 6.17 | |

*Source:* Authors' elaboration from ENESA data (2005).

**Table 49. Average cost of insurance in 2005 for vegetables**

| | Cost (EUR/100 kg) |
|---|---|
| Onion | 0.70 |
| Melon | 1.34 |
| Pepperoni | 2.59 |
| Winter tomato | 1.40 |
| Summer tomato | 0.49 |
| Tomato Canary Islands | 4.11 |

*Source:* Authors' elaboration from ENESA data (2005).

**Table 50. Insurance for fruits and vegetables in Spain**

| | Fruits (excluding citrus) | Citrus | Vegetables and flowers |
|---|---|---|---|
| **Degree of penetration** | | | |
| Combined cover | 65 | 37 | 30 |
| Yield insurance | 6 | | |
| Insurance through producers' organisations | 4 | | |
| **Insured production (multi-risk)** | | | |
| Area (1 000 ha) | 128 | 207 | 112 |
| Value (million EUR) | 1 197 | 645 | 973 |
| **Insured production (yield)** | | | |
| Area (1 000 ha) | 35 | 0 | 0 |
| Value (million EUR) | 21 | 0 | 0 |
| **Insured production (producers' organisations)** | | | |
| Area (1 000 ha) | 3.4 | 0 | 0 |
| Value (million EUR) | 3.9 | 0 | 0 |

*Source:* Authors' elaboration from ENESA data (2005).

## Italy

The Italian data presented in this section are obtained from a provisional report on the insurance campaign 2005 and from the risk management data base 'Sicuragro' elaborated by the Institute of Services for the Agricultural and Food Market (ISMEA). In the agricultural insurance system, ISMEA's role is to manage the public reinsurance fund and to run and keep updated the database on agricultural risks. ISMEA conducts research and experimentation for new agricultural risk management tools. It supports the Ministry for Agricultural Policies (MAP) in preparing the annual report.

In the 2005 campaign 74.98 % of the insured value relates to three sectors: cereals (EUR 958.8 million of the insured value), vineyards (EUR 876.6 million) and fruits (EUR 725.8 million). The higher costs borne to insure the fruit sector (13.83 % medium fare in 2005) show a rise equal to 6.17 % compared with those of 2004.

Table 51 provides the possibility to compare and observe the trends and the evolution of the insurance market during the past few years. We can observe that the insured volume in the 2004 campaign was especially high (EUR 915 million of insured value). The fruit sector in 2005 suffered a significant reduction compared with 2004, but the data are similar to those of the previous years.

**Table 51. Fruits — evolution of the insurance market (2001–05)**

| Fruits | Unit | 2001 | 2002 | 2003 | 2004 | 2005 | Variation 2005/04 (%) |
|---|---|---|---|---|---|---|---|
| Contracts | Number | 58 903 | 64 365 | 59 728 | 60 375 | 51 107 | – 15.35 |
| Insured value | 1 000 EUR | 717 357 | 783.48 | 779 055 | 918 847 | 725 847 | **– 21** |
| Insured surface | ha | 147 236 | 100 596 | 121 028 | 114.88 | 110 675 | **– 3.66** |
| Insured quantity | 1 000 tonnes | 2 086 | 2 141 | 1 961 | 2 073 | 1 507 | **– 27.28** |
| Insured quantity | 1 000 | 6 137 | 5 186 | 4 717 | 5 957 | 7 422 | – 24.59 |
| Total premium | 1 000 EUR | 94 134 | 115 214 | 108 499 | 119 681 | 100 375 | – 16.13 |
| Fare | % | 13.12 | 14.71 | 13.93 | 13.03 | 13.83 | 6.17 |

*Source:* Authors' elaboration with data from the Sicuragro database.

Almost all the insurance contracts for the products of this specific sector are characterised by a 20 % to 30 % threshold (franchise).

Table 52 gives the insured value per product.

**Table 52. Product with the higher insured volumes and medium fares (2005)**

| Products with the higher insured value | Million EUR | Medium fare |
|---|---|---|
| Apple | 208.8 | 18.66 |
| Pear | 166.5 | 16.38 |
| Nectarine | 81.2 | 14.29 |
| Kiwi | 60.1 | |
| Peach | 46.9 | |
| Table grapes | 39.3 | |
| Early nectarine | 29.4 | 11.34 |
| Plum | 25.4 | 12.04 |
| Breadfruit plants | 22.9 | |

*Source:* Authors' elaboration with data from the Sicuragro database.

The insurance schemes can be:

1. single-risk (hail and frost), which absorbs 71.74 % of the total insured value;
2. combined on yield, to which is attributed 3.64 % of the total value;
3. pluri-risk, to which belongs 24 % of the total insured value for this sector, and those guaranties are on:
   (i) hail and wind,
   (ii) hail and frost,
   (iii) hail, wind and frost,
   (iv) hail, wind, frost and drought.

At a regional level we can observe that the insured volumes are concentrated in the Emilia Romagna region which absorbs 40.33 % of the whole insured value for the fruits sector (79.63 % of the pear insured value belongs to this region). Another region which presents high volumes is the Province of Bolzano and the Province of Trento, formerly the Trentino Alto Adige region (19.78 % of the fruits sector and 67.60 % only for apples).

In 2005 (see Table 53) the insured volumes for the vegetables and potatoes sector were decreased in comparison with the previous insurance campaign; in terms of value (– 10 %), surface (– 16.45 %) and quantity (– 9.73 tonnes). This kind of market evolution shows a decrease of the insurance demand.

Almost all the subscribed policies of 2005, 98.87 % in terms of insured value, are characterised by the threshold fixed at 20 % to 30 %. Only a few crops were covered by insurance contracts without a threshold. The vegetables and fruits sectors adopt the same type of insurance schemes as those listed above.

**Table 53. Vegetables and potatoes — evolution of the insurance market (2001–05)**

| Vegetables and potatoes | Unit | 2001 | 2002 | 2003 | 2004 | 2005 | Variation 2005/2004 (%) |
|---|---|---|---|---|---|---|---|
| **Contracts** | number | 11 185 | 11 344 | 12 505 | 12 179 | 11 344 | – 6.86 |
| **Insured value** | 1 000 EUR | 390.48 | 378 244 | 419 511 | 496 686 | 446 949 | – 10 |
| **Insured surface** | ha | 66 025 | 61 688 | 68 809 | 78 499 | 65 588 | – 16.45 |
| **Insured quantity** | 1 000 tonnes | 3 196 | 3 421 | 4 313 | 4 578 | 4 132 | – 9.73 |
| **Insured quantity** | 1 000 EUR | 71 977 | 84 198 | 111 898 | 102 456 | | |
| **Total premium** | 1 000 | 28 921 | 29 437 | 32 875 | 32 864 | 24 971 | – 24.02 |
| **Fare** | % | 7.41 | 7.78 | 7.84 | 6.62 | 5.59 | – 15.56 |

*Source:* Authors' elaboration with data from the Sicuragro database.

## France

Most of the data we have at the moment are aggregated for fruits and vegetables together. The types of insurance that exist are listed below.

— Mono-peril for all crops: this offers cover against fire, lightning, theft and hail. The risk of strong wind or small storm (*tempête*) seems not to be included for fruits and vegetables.

— Hail and frost: this cover has been available for vineyards and fruit trees since 2002. The insured surface for fruits and vegetables is 2 % to 3 %.

— Multi-peril (hail, storm, frost, drought, flood or excess of humidity, snow and ice weight, ravine/gully erosion): This resulted in a very low demand in the first year (2005) for fruits and vegetables. From 2007 on, demand can be expected to increase as the subsidy for fruits and vegetables will be higher than for other crops because premiums for fruits and vegetables are far more expensive.

**Premiums:** it depends on the extent of the guarantee, on the culture insured and on the location.

**Table 54. Premiums and production insured for fruits and vegetables**

| | Premiums (million EUR) | Production insured (million EUR) |
|---|---|---|
| 1999 | 44.5 | 747.0 |
| 2000 | 33.0 | 520.0 |
| 2001 | 43.9 | 801.0 |
| 2002 | 39.0 | 730.0 |
| 2003 | 35.0 | 709.0 |
| 2004 | 37.0 | 705.0 |

*Source:* Authors calculations.

**Deductibles:** The deductibles are usually 10 % of the damages for hail/storm insurance. It is variable for the other contracts. The deductibles for multi-peril for all crops depend on the type of contract: the whole-farm contract has a deductible of 20 % and the specific crop contract 25 %. (These are the minimum deductibles in order to be eligible for subsidies. Lower deductibles assume a higher premium, and the premium difference is not subsidised.)

**Level of subsidies (2005):**

Mono-peril: hail and storm for fruit trees and groceries: 7.5 %
Hail and frost for fruit trees: 25 % (for vineyards: 10 %)
Multi-peril 'hard blow': 35 %.

## Austria

Insurance for fruits and vegetables in Austria covers hail. Table 55 and Table 56 show the main data concerning hail insurance in Austria, for fruits and vegetables respectively. Two geographical areas are differentiated, depending on the likelihood of hail events: highly and middle endangered.

**Table 55. Main data for fruits insurance in Austria**

| | Average | |
|---|---|---|
| Number of contracts | | 3 075 |
| Average premium rate (hail) middle endangered area (33 %) | 15 % | 9 % |
| Average premium rate (hail) highly endangered area (67 %) | | 18 % |
| Insured area (ha) | | 7 021 |
| Insured value (million EUR) | | 59.1 |
| Amount of premium (million EUR) | | 7.54 |
| Annual average loss (million EUR) | | 6.5 |
| Subsidies (percentage and million EUR) | 50 % | 3.77 |

*Source:* Authors' elaboration

**Table 56. Premium rates for vegetables hail insurance in Austria**

| Vegetable category | Middle endangered | Highly endangered |
|---|---|---|
| Asparagus, carrots, parsley root, radishes, (beer-)radish, beetroots, wild horseradish | 2.1 | 3.4 |
| Broccoli, Chinese cabbage, fennel, green beans, peas, beetle beans, cauliflower, garlic, brassica, cabbage turnip, Brussels sprouts, white cabbage, industrial cabbage, red cabbage, parsley green, celery, spinach, sweet corn | 5.1 | 9 |
| Gherkins, field cucumber, aubergines, melons, hot peppers, leeks, rhubarb, courgettes | 6.8 | 12 |
| Peppers, tomatoes, lettuce, marrow, onions | 8.5 | 18 |

*Source:* Authors' elaboration

# 9. Conclusions

Farm income has always experienced a strong variability due to several factors. Some of them correspond to traditional concerns and others have started more recently to become an issue.

— Short-term climatic variability: drought, hailstorms, frost, excessive rain (this is the main factor covered by existing insurance schemes and this report is mainly focused on this source of risk);
— policy reforms: trade agreements and market liberalisation (reduction of prices);
— an unbalanced relationship with retailers, who are better organised to put pressure on prices;
— the risk of animal diseases;
— long-term climate change: there is a general perception that the frequency and intensity of extreme meteorological events is growing. The IPCC report (2007) confirms some of these fears.

The communication from the Commission to the Council (EC, 2005a) sets a basis for the debate on the inclusion of agricultural risk management in the CAP. An example of the presence of this concern in the political debate is the declaration of the French President, Nicolas Sarkozy, on 11 September 2007 (http://www.ambafrance-uk.org/President-Sarkozy-s-speech-at.html): 'Our environment is changing. We need to give the company heads that you are the means to protect yourselves against the disastrous consequences of climate and health risks. To do this, I am asking the European Commission to immediately set up a proficient risk and hazard management system. At the same time, I have asked Michel Barnier to work with Christine Lagarde to define, by the end of the year, the conditions for making the risk management mechanisms available to all our farms on the basis of the crop insurance experiment.'

This study constitutes a basis to analyse strategies to integrate risk management tools within the CAP. It provides a collection of mostly unpublished information on risk management tools and experiences at Member State level that should be useful for the future political debate.

## 9.1. Risk maps

Several sources of data have been used to give a geographical picture of the level of risk in the EU agriculture: yield data from the Eurostat REGIO database, the farm accountancy data network (FADN), agrometeorological models and satellite images. Data from the Eurostat REGIO database have been used to map the risk of regional average **yield reduction** beyond a certain level (deductible) for main field crops (wheat, barley, field beans, grain maize, rapeseed, sunflower, potatoes, sugar beet). These maps show a strong heterogeneity with most regions in the centre of the EU essentially stable and peripheral regions (Mediterranean, Romania and some Scandinavian areas) with a high risk of yield reduction.

We have used the CGMS system that uses crop physiology models, a soil map and a climatic database, obtained by interpolation of daily observations in more than 2 000 meteorological observatories since 1975. The risk maps produced with this database do not overturn general knowledge, but give a better tuning of geographic distribution of risk. The risk of drought is obviously higher in southern regions, but not in a homogeneous way; on the other hand a large region with a non-negligible drought risk can be mapped around the Baltic Sea and to a lesser extent in some regions along the Danube. Excess of rain at harvest time is problematic mainly in the eastern part of the EU. Frost risk affecting all types of crops is generally assessed by temperatures at ‘crown level’ (about 3 cm below the surface). It increases on approaching the north-east, with local risk spots.

Coarse resolution satellite images give a good tool to map the biomass reduction risk of pastures. Risk levels have been mapped on the basis of images from the sensor vegetation. High-risk areas appear to have a scattered layout, with some concentration in some areas including southern Spain, the Alps, Romania and Bulgaria, north-western Scotland and south of the Rhine valley.

The geographic patterns still need additional validation, but the different approaches followed lead to coherent layouts.

## 9.2. The level of development of agricultural insurances

This study shows the high diversity of agricultural insurance systems in the EU-27 Member States. Most information comes from fact sheets collected by experts or consultants in the different countries. In the absence of a legal mandate to collect the data, the amount of information received is very heterogeneous, with generally better information in countries with public systems or public support in that field.

The development of agricultural insurance schemes in each country is linked to two main factors:

— **risk level** and typology (hail, drought, excessive rainfall at harvest or flowering time, frost kill, etc.); and

— **the Member State’s policy** to support the system. For non-systemic risks (hail), the private sector offers suitable insurances. For insurance products offering a comprehensive cover (including systemic risks) there is a direct relationship between insurance development and public support.

## 9.3. Public aid

Public aid or compensation for agricultural losses are given on an ad hoc basis in most countries, regardless of the policy on insurances. When insurance is not subsidised, it is common to provide aid through compensation schemes, or through calamity funds, often partially financed by the agricultural stakeholders (on a voluntary or compulsory basis). There is public compensation in the form of ad hoc aid, calamity funds or both in most Member States (in Ireland, Luxembourg and the UK for livestock only).

In the EU-27, the yearly average of public aid through these forms is more than EUR 1 billion. However, some data on ad hoc aid for livestock are missing; therefore the figure is probably underestimated. In the UK, 35 % corresponds to livestock diseases. Significant amounts correspond to different crop (and to a minor extent livestock) perils in France (25 %), Italy (10 %) and Germany (10 %).

An inverse relationship appears between the quantities spent in insurance subsidies and the quantities spent in public *ex post* compensation. This means that it is possible to reduce ad hoc aid through fostering insurance. This does not necessarily mean that in this way public expenditure becomes more or less efficient.

## 9.4. The volume of agricultural insurances and subsidies

The total amount of agricultural insurance premiums in the EU is around EUR 1.5 billion per year, with a public subsidy of approximately EUR 500 million. The average amount of loss compensations paid by insurances to farmers is close to EUR 1.1 billion, close to the amount of public compensation in the form of ad hoc aid and calamity funds.

Agricultural insurance schemes are fostered in a number of countries, not only though subsidies but also through regulations. In these countries, apart from the existence of public subsidies to the insurance premiums, the law forbids that ad hoc measures or disaster funds compensate for damages that could have been insured. The 2006 regulation (EC, 2006a) has made a step forward in this direction. From 2010 on, it imposes a 50 % reduction of public compensation for those farmers who did not take up certain insurance cover. In order to obtain the full compensation, they need to have insured at least 50 % of their average annual production and the statistically most frequent climatic risks in their Member State or region. This measure will partially avoid the potentially negative effect of public compensation on the insurance demand and the insurance market, and will also encourage farmers to further improve their risk management. However, the effects of public compensation on insurance, be it subsidised or not, should be further analysed in order to understand which is the best policy to follow.

The development of insurance schemes in the livestock sector is generally lower than in the crop sector. Livestock risk management relies on sanitary assistance programmes; major crises (diseases with high externalities) are covered by public aid.

## 9.5. Technicalities and insurance market

Some technical aspects, such as triggers and deductibles, are very important for actuarially sound insurance systems. The WTO agreements also impose some constraint on technicalities, in particular the 30 % deductible to authorise public compensation to damages or subsidies to insurance. Reinsurance is of great importance, mainly in the case of systemic risks. Reinsurance is usually done in the international reinsurance market. The most typical reinsurance modalities are stop-loss and quota-share reinsurance. The development of agricultural insurance schemes is hindered by the high cost of reinsuring systemic risks such as drought. Some countries offer some kind of public reinsurance. This is the case in Spain, Italy and Portugal.

The insurance market in the EU-27 is also very different from one country to another. However, apart from some cases of monopoly, we find the common characteristic that in most countries there are few market players, with one or two dominant companies on this very specific sector of agricultural insurance. This suggests that there is a need to promote competitiveness in the sector. This could result in the lower cost of insurance products and could facilitate access for farmers. Also mutual insurance companies effectively managed by farmers and with a return of the profits to the farmers could be promoted or protected by the regulations.

## 9.6. Towards an EU-wide harmonised insurance?

The existing insurance level is generally insufficient to smooth significant income reduction in bad years. The risk management tools available in the Member States could be further developed. However, given the heterogeneous situation in the Member States, the interest of a harmonised EU-wide system of agricultural insurances is debatable. Conditions for a feasible EU-wide insurance scheme are analysed and classified into: (a) decisions of the policymakers (political criteria); (b) decisions of the private sector: insurers, reinsurers and farmers (socioeconomic); and (c) technical conditions.

The possible amount of costs of a hypothetical EU-supported insurance system has been roughly quantified for a few hypothetical scenarios, under given assumptions. The rough costs estimation of some of them indicates that a 50 % subsidy to the national premiums of all the countries, assuming an insurance demand of 40 %, would be approximately of the order of magnitude of EUR 1 billion for income insurance, EUR 0.5 billion to EUR 0.6 billion for yield insurance on arable crops, EUR 0.23 billion to EUR 0.37 billion for area index insurance for cereals and EUR 0.2 billion to EUR 0.4 billion for fruits. However, these estimations rely on strong hypothesis that need further analysis, such as the assumption that the average premium rate of an extended system would be similar to the average premium rates for the currently existing insurance schemes. The calculations should be improved, in particular by taking into account yield and income variability based on data at farm level that were not available for this study.

Among the different types of insurance analysed, revenue insurance would be more expensive but more efficient as an income stabiliser, while indirect index insurance would be cheaper and easier to manage but usually less correlated with farmers' income.

Altogether, given the high diversity of risks and of socioeconomic backgrounds in the EU-27 Member States, it does not seem advisable to settle on a homogeneous common insurance system. Some alternatives can be a set of actions to encourage national systems:

— facilitating/subsidising the composition of databases, preferably at the farm level;
— providing public reinsurance;
— partially subsidising national systems;
— establishing a common regulatory framework for these actions and adequate control tools. This common framework should always set the level of public support within the limits established by the WTO agreements (WTO, 1994), and take into account the current EU legislation: Regulation (EC) No 1857/2006 (EC 2006a) and the guidelines (EC 2006b).

## 9.7. Further research and improvements

The analysis and mapping of risks in the Member States could be further improved through more accurate maps and cross-checking their results with observed yield losses and farmers' income variability.

On the other hand, data from some countries are still missing or incomplete. It is especially difficult to collect the information from the private insurance companies when there are no public subsidies. For example, much information is missing from the Netherlands and from the French non-subsidised insurance products. No information at all could be collected for Malta.

Lastly, the simulated insurance scenarios presented in this report are only a first step to assess the potential of the different insurance products. Nevertheless, more in-depth studies are scheduled to evaluate in more detail the income risk losses and income risk management possibilities from FADN individual data. Another challenging issue is the analysis of various possible index insurance schemes that could be based on meteorological and agrometeorological parameters. Moreover, it would be worth exploring the potential use of those indices as a control tool for estimating the potential public compensation for catastrophic losses.

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# Glossary

**Adverse climatic event which can be assimilated to a natural disaster:** According to EC 2006a, weather conditions such as frost, hail, ice, rain or drought which destroy more than 30 % of the average annual production of a given farmer in the preceding three-year period or a three-year average based on the preceding five-year period, excluding the highest and lowest entry.

**Adverse selection:** A situation in which the insured has more information about his or her risk of loss than does the insurance provider and is better able to determine the soundness of premium rates. As a consequence, the level of risk in the insured population is higher than in the total population (Harwood et al., 1999).

**Agricultural production contract** A contract by which a producer (sometimes called a 'grower') agrees to sell or deliver all of a designated crop raised in a manner set forth in the agreement to a contractor and is paid according to a formula established in the contract.

**Asymmetric information**: Relates to the problem that the buyer of insurance and the insurance company may not have the same information as regards the probability of losses occurring. Asymmetric information refers to one or both of these problems: 'adverse selection' and 'moral hazard'.

**Basis risk:** Risk associated to the differences existing between the index on which a risk management tool is based and the actual value experienced by the farmer.

**Blanket insurance**: A single insurance policy that covers one or more broad classes of persons or property, without identifying the specific subjects of insurance in the contract.

**Bonus/malus**: Premium discounts/charges when over a certain period of time no claims/claims are made.

**Calamity fund**: A fund organised and managed by the government or local authority, in which provisions are made periodically by the government and sometimes also through contributions (taxes, etc.) from the private sector. The fund covers the losses when a calamity or disaster situation is approved by the government.

**Catastrophe fund:** See 'calamity fund'.

**Co-insurance:** An insurance policy provision under which the insurer and the insured share costs incurred after the deductible is met, according to a specific formula. More generally it consists in a sharing of risk between the insurer and the insured.
It can also refer to the case where a number of different insurers subscribe to a single insurance policy.

**Common market organisation**: A set of measures that, when operated together, enable the European Union to manage a market for a specific agricultural product. The purpose of such market management is to provide, on the one hand, farmers with an outlet for their products and a steady income and, on the other hand, to ensure that consumers have a secure supply of food at reasonable prices. There are some 17 common market organisations. Together they cover around 90 % of the output of farms in the European Union (http://ec.europa.eu/agriculture/glossary/index_en.htm#cmo).

**Consequential losses due to an animal disease**: In insurance contracts, consequential losses are indirect losses, a reduction in the value of property that is a result of a direct damage loss. They are usually associated with a time element or to other remote or indemnification type losses. Consequential losses are different from ensuing losses since consequential losses are indirect losses and not direct damage losses, whereas ensuing losses are further or additional direct damage losses that have been initiated by the original direct damage cause of loss.

**Co-reinsurance**: A requirement that the reinsured bears, in addition to the deductible, a portion of the cover under the treaty un-reinsured and for its own account. It intends to ensure that the reinsured retains an interest in loss minimisation even after the deductible has been exceeded.

**Cumulative loss ratio:** The ratio of total indemnities to total earned premiums during the base period, expressed as a decimal.

**Deductible or excess** (French: *franchise*)**:** The portion of an insured loss to be borne by the insured before he is entitled to recovery from the insurer. It may be in the form of an amount in euros, a percentage of the value of the insured property ('straight deductible') or a percentage of the loss ('relative deductible').
In a policy providing a deductible clause, it is the amount which must first be subtracted from the total damage incurred before determining the insurance company's liability. Several types are used.

**Direct losses due to animal disease:** Direct financial loss due to mortality or morbidity of livestock or crop plants can vary from insignificant to catastrophic. In many cases the direct losses would be modest and would fall on a small number of farms. One of the major determinants of the magnitude of the direct losses will be the rapidity with which the disease is noticed and diagnosed.

**Disappearing deductible:** Establishes the insurer's liability for an increasing proportion of the loss, as the total damage rises above the deductible, until the deductible finally 'disappears'. Then the insurer is liable for the entire amount.

**Enzootic disease:** the constant presence of a disease or infectious agent in an animal (non-human) population within a given geographic area and considered the usual prevalence of a disease within a focus. An enzootic disease condition in animal populations serving as agent reservoirs can, on occasion, explode into an epizootic disease that results in dramatic illness and sometimes significant death in susceptible populations.

**Epizootic disease:** The occurrence of a disease in an animal population with the frequency of illness or mortality in clear excess of normal expectancy.

**European size unit (ESU):** The economic size of farms is expressed in the farm accountancy data network in terms of European size units. The value of one ESU is defined as a fixed number of EUR/ECU of farm gross margin. Over time the number of EUR/ECU per ESU has changed to reflect inflation, from EUR 1 000/ESU in 1980 to EUR 1 200/ESU in 2002 (http://ec.europa.eu/agriculture/rica/methodology1_en.cfm).

**Franchise or franchise deductible:** Deductible in which the insurer has no liability if the loss is under a certain amount, but once this amount is exceeded, the entire amount is paid in full. Deductible below which nothing is payable and beyond which the entire amount of the sum insured is payable. The franchise deductible establishes the insurer's liability for the entire amount of damage once the deductible amount is exceeded in a loss.

**Gross aid intensity**: According to EC 2006a, the aid amount expressed as a percentage of the project's eligible costs. All figures used shall be taken before any deduction for direct taxation.

**Insurance mutual:** Company providing mutual insurance (see 'mutual insurance').

**Insurance policy**: A contract of insurance describing the term, cover, premiums and deductibles.

**Loss ratio**: Ratio of the annual claims paid by an insurance company to the premiums received expressed as a decimal.

**Moral hazard**: In the case of insurance, moral hazard refers to an individual's change in behaviour after having taken out an insurance policy. The change in behaviour results in an increase in the potential magnitude and/or probability of a loss.
Tools that insurance companies generally use to minimise moral hazard include:

— deductibles or co-payments (the insured has to bear part of the loss: a fixed amount or a percentage of the total loss);
— no-claim bonuses (see 'bonus/malus');
— checks to verify whether the insured takes the precautionary measures agreed upon to prevent losses;
— indemnification based on an objective index which cannot be influenced by the insured.

**Mutual fund**: (1) An open-end investment company that invests money of its shareholders in a usually diversified group of securities of other corporations. (2) In agricultural insurance contexts, mutual fund is used to design a farmers' owned stabilisation fund. They have no own legal personality and are based on a private contract or agreement. Their statute asks for monetary annual contribution but there is no guarantee or legal title of compensation.

**Mutual insurance:** Insurance method in which the policyholders are the owners of the insuring company. So, there are no shares or shareholders but, tax related and legally, they are equal to share companies.

**Premium**: A regular periodic payment for an insurance policy.

**Quota-share provisions**: Specify what percentage of premiums and loss exposure the private company will retain, with the residue being passed on to the reinsurer.

**Reinsurance:** There are two main types: excess of loss or stop-loss reinsurance and proportional or pro-rata reinsurance. Stop-loss reinsurance: see 'stop-loss provisions'. Proportional reinsurance: there are four types of structure: quota-share reinsurance, variable quota-share reinsurance, surplus reinsurance and surplus reinsurance with a table of lines. Quota-share reinsurance is the most common: The reinsurer assumes a set percentage of risk for the same percentage of the premium, minus an allowance for the ceding company's expenses.

**Relative deductible** (French: *Franchise relative* or *Franchise proportionnelle*): Deductible consisting of a percentage of the loss to be borne by the insured

**Risk:** Uncertainty (i.e. imperfect knowledge or predictability because of randomness) in outcome that might involve adversity or losses. Two aspects of risk can be distinguished: variability and downside risk, i.e. the probability of extreme low values (Hardaker et al., 1997).

**Risk aversion:** Economic agents are risk averse when they have a preference for a certain outcome over an uncertain outcome with equal expected value (Hardaker et al., 1997).

**Standard gross margin (SGM):** The standard gross margin of a crop or livestock item is defined as the value of output from one hectare or from one animal less the cost of variable inputs required to produce that output. The concept of SGM is used to determine the economic size of farms, which is expressed in terms of European size units (ESU). This concept is used by the farm accountancy data network and in the farm structure survey organised by Eurostat.
Definition (http://ec.europa.eu/agriculture/rica/methodology1_en.cfm).

**Spot market (also cash market):** A market in which commodities such as grain, gold or crude oil are bought and sold for cash and delivered immediately.

**Stop-loss provisions:** specify the maximum amount of loss that the company will have to cover before the reinsurer covers the additional losses (Skees and Barnet, 1999).

**Straight deductible or deductible** (French: *Franchise absolue* or *Franchise déduite*): A deductible that is a constant value (as a specified amount).

**Systemic risk:** As opposed to risks like fire and burglary, systemic risks are dependent risks. A lot of people suffer a loss at the same time. Systemic risks result in many people making a claim at the same time with the effect that the premiums paid into a pool are not sufficient to cover the loss incurred, which may threaten the solvency of the insurance pool. An example for systemic risks is price risk. All producers suffer from price downturns at the same time. Measures insurance companies can take to deal with systemic risks include reinsurance, geographic spreading and the use of capital markets.

**Transparent aid:** Defined by the 2006 regulation as ‘aid measures in which it is possible to calculate precisely the gross grant equivalent as a percentage of eligible expenditure *ex ante* without need to undertake a risk assessment (for example measures which use grants, interest rate subsidies, capped fiscal measures)’.

**Trigger:** See ‘franchise’.

**Vertical integration:** in microeconomics and strategic management, the term describes a style of ownership and control. Vertically integrated companies are united through a hierarchy and share a common owner. Usually each member of the hierarchy produces a different product or service, and the products combine to satisfy a common need. It is contrasted with horizontal integration. Vertical integration is one method of avoiding the hold-up problem.

**Zoonosis** (zoonoses, plural): An infection or an infectious disease transmissible under natural conditions directly or indirectly between humans and other vertebrates. The transmission must be between animals and humans, and the direction of transfer is immaterial. There are four principal types of zoonoses: (1) anthropozoonosis: diseases acquired from other vertebrate experiencing enzootic or epizootic disease (e.g. plague, rabies, leptospirosis, arboviroses, trichinosis, toxoplasmosis, scrub typhus); (2) zooanthropozoonosis: diseases primarily of human origin that may be acquired by other vertebrates (e.g. amebiasis, tuberculosis); (3) amphixenosis: diseases common to humans and other vertebrates (e.g. influenza, salmonellosis, Chagas disease, schistosomiasis, leptospirosis, certain mycoses); (4) parazoonosis: accidental or incidental infections of humans with animal disease agents (e.g. cysticercosis, toxocariasis, hantaviruses, other arboviruses).
World Health Organisation (http://www.who.org.mv/EN/Section40/Section41_94.htm).

# List of acronyms

| | |
|---|---|
| AIDA | agricultural income disaster assistance — Canada |
| AGR | adjusted gross revenue |
| AWU | annual work unit |
| BSE | bovine spongiform encephalopathy |
| CAIS | Canadian Agricultural Income Stabilization |
| CAP | common agricultural policy |
| CAT | catastrophic cover insurance |
| CCPs | counter-cyclical payments |
| CCS | Consorcio de Compensación de Seguros — Spain |
| CEA | Comité Européen des Assurances |
| CES | Comité Économique et Social Européen |
| CMO | common market organisation |
| CRC | crop revenue cover |
| CSF | classical swine fever |
| EC | European Community |
| ECHO | European Commission Humanitarian Aid Department |
| ENESA | Entidad Estatal de Seguros Agrarios — Spain |
| ESU | European standard unit |
| EU | European Union |
| FADN | farm accounting data network |
| FAO | Food and Agriculture Organisation |
| FMD | foot-and-mouth disease |
| FNGCA | Fonds Nationale de Garantie Contre les Calamités Agricoles — France |
| FSN | Fondo di Solidarietà Nazionale — Italy |
| GRIP | gross revenue insurance plan |
| GRP | group risk plan |
| GRIP | group risk income protection |
| IP | income protection |
| IPCC | Intergovernmental Panel on Climate Change |
| JRC | Joint Research Centre (European Commission) |
| LGM | livestock gross margin |
| LFA | less-favoured area |
| LIFFE | London International Financial Futures and Options Exchange |

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|---|---|
| LRP | livestock risk protection |
| MPCI | multiple peril crop insurance — USA |
| OECD | Organisation for Economic Cooperation and Development |
| OIE | World Animal Health Organisation |
| PET | potential evapotranspiration |
| PI | production insurance — Canada |
| RA | revenue assurance |
| RSM | relative soil moisture |
| SFP | single farm payment |
| SGM | standard gross margin |
| SMU | soil monitoring units |
| UAA | utilised agricultural area |
| UGB | *unité gros bétail* |
| UN/ISDR | United Nations International Strategy for Disaster Reduction |
| UK | United Kingdom |
| US/USA | United States of America |
| WLSOW | water limited storage organ weight |
| WTO | World Trade Organisation |

European Commission

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**Abstract**
Agricultural producers face a series of risks affecting the income and welfare of their households. These are mainly production risks related to weather conditions, pests and diseases, market conditions, liberalization policies, climate change, etc. In recent years the European Union has been considering a possible integration of risk management in the common agricultural policy and is analysing risk and crisis management strategies to provide an improved response to crises in the agricultural sector.
This report reviews the agricultural risk management systems in the EU-27 (candidate countries Turkey and Croatia are also analysed) with a special focus on types of agricultural insurance. The study contains a collection of data on the realities and modalities of agricultural insurance in Europe. This information mainly comes from fact sheets filled in by experts or consultants from the different European countries and data from the European Committee of Insurers (CEA). Many of these data were unpublished because there is no obligation for the insurance companies to report to the EU institutions.
The report quantifies and maps different types of risks, from climatic risks to yield and revenue risks. The role of Governments in helping farmers to face disasters is analyzed for every country: providing aid ex-post and offering or subsidizing insurances. The Member States definitions of crisis and disaster when authorising state aids are described and contrasted with the EU and international legislation. Aid is sometimes given on an ad-hoc basis through compensation schemes, or funds partially financed by the agricultural sector (on a voluntary or compulsory basis). Mutual funds, calamity funds and ad-hoc payments existing in European countries are summarised. The levels of ad-hoc payments per country are compared.
Agricultural insurances are fostered in a number of countries. The different types of agricultural insurance systems and key figures in each country are analysed. Some technicalities are described, such as reinsurance, triggers and deductibles. The relationship between Government involvement and insurance development is highlighted. Usually private companies insure only hail and fire, and the government subsidies and public reinsurance are needed to make possible the insurance of agricultural systemic risks.
One conclusion is that the risk management tools available in the Member States (MS) could be further developed. Conditions for a feasible EU-wide insurance scheme have been analysed. The possible amount of costs of an EU-supported insurance system has been roughly quantified for a few hypothetical scenarios. However, given the heterogeneous situation in the MS, the interest of a harmonised EU-wide system of agricultural insurances is debatable.

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