RISK MANAGEMENT, VULNERABILITY, AND RISK PERCEPTION OF ORGANIC FARMERS IN SPAIN

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Abstract

This study analyses the specific risks that organic farmers must manage. Due to the special features of management of their productive system, and due to the specific characteristics of their cultivations, they must face different risks than conventional farmers. Even if the Spanish farmers rely on the insurance system to manage their risks, today organic farmers do not have specific insurance products to manage them.

The methodology and results presented in this study include the following: First, the primary information is compiled after the elaboration of more than 500 questionnaires to organic farmers of diverse Spanish regions. Second, the risk analysis is carried out by evaluating statistical, probabilistic, and stochastic properties of the organic production data. We evaluate and discuss the aspects of our study that relate to other international studies. Productions considered in this research are olive grove, vineyard, cereals, fruits, vegetables, nuts and, citrus fruit.

Specific risks of organic farming – in contrast with conventional farming – have been identified and quantified, showing the existing differences of perception, vulnerability and risk management, as well as the different risk level and recovery after an event of adverse climatic conditions. This research lays the foundations for the elaboration of a specific agrarian insurance for organic productions, which will serve in a near future, as a tool for the management of the specific risks of Spanish organic farmers.

Keywords

Risk management, organic farming, vulnerability, risk perception, stochastic simulation and agricultural insurance.

1 Introduction.

Agricultural production is exposed to special risks due to its dependency of the natural and climatic conditions, which originate strong oscillations of the prices and the supply of agricultural products, in combination with economic problems, natural catastrophes and shortage of energy. Last reforms of the CAP have gradually reduced the instruments of risks and crisis management, replacing them by direct payments to the farmers.

Agriculture is in a world-wide context based on a series of facts that are entailing a considerable increase of the risks in the development of the different agrarian activities. Aspects like the liberalization of the agrarian policies, the globalization of the agrarian interchanges, the increasing environmental restrictions, the frequent changes in the agrarian structure in which a great polarization of the power in the agro-alimentary chain exists, or those risks derived from the climatic change are even some of the causes by which farmers are seeing themselves forced nowadays, to develop a clear strategy of risk management in their cultivations (SUMPSI, 2006).

The responsibility of the prevention and the risk and crisis management related with the production, the methods of production, the commercialization and the stability of the rent, fall more and more to the own agricultural cultivations. These must be oriented by the market more and more. In this point is where organic productions are reaching more importance every time. Their benefits for the food security, environment, etc. already are recognized in numerous studies. This is the main reason which public policies support more and more to this kind of productive system.

In this document aspects related to risk management in organic farming are analyzed comparatively. These are the perception of the risk on the part of organic farmers, the vulnerability of their cultivations before natural catastrophes and risks of market, and the different tools and strategies from risk management available for these farmers nowadays in Spain.

2 Methodology

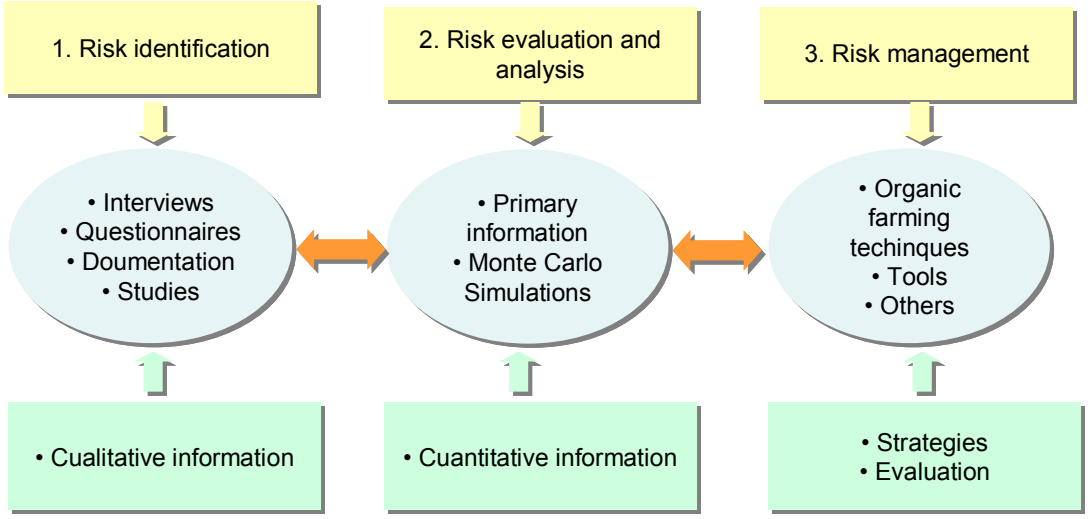
The analysis of the risk is used in different contexts, from the medicine to the poverty, the development to engineering (VOGT and SOMMA, 2003; BONACCORSO et al., 2003; UNISDR, 2006). In order to characterize the risk in social systems, like agriculture, it is important to analyze so much the consequences of a disturbance (for example, diminution of the production), and the agent who causes them (for example, hailstorm). In the context of the management of the agrarian activity, the risk concept is derived sometimes from sciences that study the climate and literature on securing systems.

These approaches study the risk generated by a factor of external danger to identify the potential damage that can cause, whereas social sciences study the internal dimension of the potential damage (WISNER et al., 2004). In agriculture, the characteristics of the internal dimension depend fundamentally on the geographic area and the social conditions. In this study both concepts of risk analysis with a double approach are combined, evaluating in the

first place the agent who produces the risk (external causes) and later the geographic dimension that has influence on the social conditions (internal causes of the risk).

A detailed risk analysis has to be based on a suitable valuation of the risk, the probability of occurrence, and the consequences that can entail (MADGE, 2005). For the establishment of suitable strategies of management, an exhaustive analysis of the risk based on a identification and evaluation of it must be made previously. Figure 1 summarizes the methodology design of this study, showing the phases of the risk analysis. First it is focused to the identification of each one of the risks which cultivations face. The second one consists in an evaluation of the risk, treating of valuing the affection level that these risks cause on them.

Figure 1. Summary of the methodology components of the study



Risk management (third phase) leans in the two previous phases, allowing to establish strategies of management in the cultivations, based in different techniques and tools available for farmers.

2.1 Risk identification

Under criteria of surface and relative importance of the commented productions of organic farming, and trying to include the higher amount of producing regions of our country, the most representative regions of these cultures have been chosen, being these the following ones: Andalucia, Aragón, Castilla y León, Castilla la Mancha, Cataluña, Extremadura, Murcia and Comunidad Valenciana. (Table 1).

Table 1. Surface of organic farming by regions 2006 (hectares)

Regions	Cereals	Vegetables	Citrus fruits	Fruits	Olive grove	Vineyard	Nuts
Andalucía	37.701	2.136	1.400	567	42.147	632	23.325
Aragón	24.929	68	-	221	1.365	468	688
Castilla León	5.749	110	-	11	8	574	10
Castilla la Mancha	15.621	394	-	114	7.791	4.864	3.895
Cataluña	2.027	234	29	137	2.318	1.377	764
Extremadura	8.674	65	-	1.054	35.036	436	1.393
Murcia	4.188	998	168	393	1.228	3.679	7.151
Comunidad Valenciana	2.240	319	517	370	2.030	2.516	4.003
Other regions	12.175	715	70	999	1.508	2.285	3.371
Total	113.304	5.039	2.184	3.866	93.431	16.831	44.600

For the elaboration of questionnaires a series of questions has been elaborated to determine what could happen, why and how, and how the agrarian cultivation can be affected, without forgetting any important risk that it could happen. In addition, the design of the questionnaire has included a series of questions destined to identify and to classify the cultivations based on its productive systems as well as the strategies of risk management used by them nowadays.

Surveys are divided in five great blocks (Table 2). A first block is referred the classification of the cultivations. Information of the operation of the cultivation as a whole has been obtained, analyzing the different cultures and surfaces, as well as the conditions of the cultivation and the polled farmers. Second block offers data of yields and sale product prices of last years for each culture. In addition, in this block includes questions destined to analyze the operation of organic products markets as well as their productive realities.

Third and fourth blocks analyze the importance that the farmer gives to each one of the identified risks, as well as, the apparent vulnerability of their cultivation and the capacity for the adaptation that can have organic farms regarding conventional ones. Last block is analyzes the knowledge and the valuation that polled farmers have on the different techniques and tools from risk management available nowadays, as well as the opinion that they have about the Spanish system of agrarian insurances, the differences between existing products and their fidelity to them.

Table 2. Summary of the questionnaire made to organic farmers

Block of questions	Obtained data
1. Classification of the cultivations	Information on the cultivation of the cultivation as a whole
2. Data of yields and sale prices of the product	Characterization of the reality of the market and organic product production
3. Risk Analysis: Identification	To identify the importance that the farmer gives to each one of the identified risks
4. Risk Analysis: Evaluation	To evaluate the affection level that each one of the risks has on the productions
5. Risk Analysis: Strategies and techniques of management	Valuation which the farmers do on the different strategies from risk management, especially the importance of the agrarian insurance system

The accomplishment of questionnaires has tried to include the higher number of representative agricultural productions of our country. The study has been focused in the following ones: cereals, vegetables, fruits, citrus fruits, vineyard, olive grove and nuts. Questionnaires include 192 productions of organic fruits (apricot, plum, apple, peach, pear and cherry), 136 organic cereal productions (wheat, barley, oats and rye), 72 of nuts (almond and hazelnuts mainly), 40 of organic citrus fruits, 51 productions of organic olive grove, 20 of organic vineyard and 36 of vegetables and flowers, doing a total of 547 productions distributed in 312 cultivations.

Table 3. Distribution of the number of made surveys

Regions	Cereals	Vegetables	Citrus fruits	Fruits	Olive grove	Vineyard	Nuts	TOTAL
Andalucía	59	21	25	56	13	5	42	221
Aragón	52	7	5	49	9	4	7	133
Castilla - León	1	-	-	-	-	1	-	2
Castilla la Mancha	21	2	-	1	9	4	12	49
Cataluña	1	-	-	-		-	-	1
Extremadura	-	-	-	14	1	-	1	16
Murcia	2	4	6	44	17	4	10	87
Comunidad Valenciana	-	2	4	28	2	2	-	38
TOTAL	136	36	40	192	51	20	72	547

With the purpose of validating the information contributed by the surveys, a series of personal interviews to professionals of the sector has been made. The objective has been to value some opinions of different agents with formation in the matter, separated totally of the production. Finally the results of the survey have been evaluated considering the existing information about risks in organic farming in our country (LABRADOR et al., 2006; COAG, 2006; GENERALITAT DE CATALUNYA, 2007).

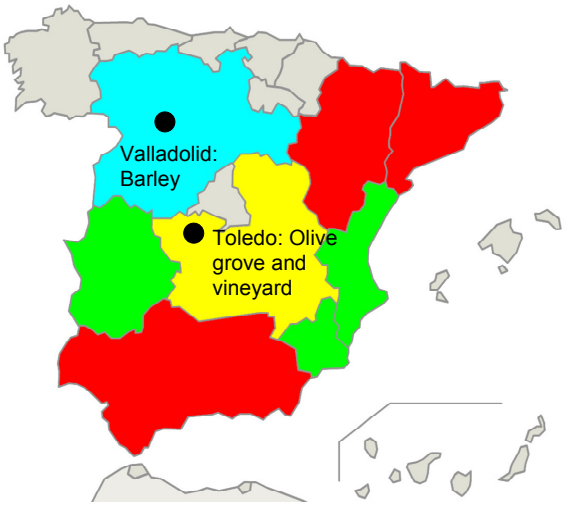
In these interviews, special emphasis has been made for evaluate the tools and strategies of existing risk management nowadays in these productions, as well as in the possible adaptation of the existing ones for conventional production. In addition, it has been deepened in the possible capacities that techniques of organic farming can have to mitigate and/or to manage the risk, finding out the level of affection of each one and the productions in which these risks have higher importance. Also information has been successfully obtained on the opinion that these professionals have about the Spanish system of agrarian insurances, identifying its strengths and weaknesses in relation to organic farming.

2.2 Risk analysis and evaluation

The quantification of the incidence that the different risks identified through the surveys have on most representative organic productions of our country has been made in this phase. The objective has been to value the level of risk which the cultivations are exposed, as well as the capacity of these to react before the incidence of any risk or catastrophe, based on the probability that they have to obtain income as well as the quantity of it (LIEN et al., 2006).

With the purpose of analyzing with higher detail the probability of occurrence of the risks, a comparison of the incidence that different risks have between organic and conventional cultivations has been made, using data from experimental cultivations. Three studies of comparative risk analysis between organic and conventional production have been made, including cereal productions, vineyard and olive grove pertaining to cultivations located in the regions of Valladolid and Toledo as it can be seen in Figure 2.

Figure 2. Space location of the experimental cultivations



The data have been used to define a model that explains the economic yield of the cultivations in absence of public aids. This model has been developed from the empirical data of prices, yields and direct costs of production (sowing, prunes, working, etc.), according to the expression: Profitability = Income - Expenses, or what is the same:

Value added (prices of market) (€/ha) = [Price (€/kg) x Yield (kg/ha)] - Production costs (€/ha)

It has been possible to compare the distribution of the probability of obtaining benefits that organic and conventional cultivations have comparatively, based on the productive variability of their main components as yields, sale prices of different products and direct costs used in each case.

In order to obtain the distribution functions, the method used has been the stochastic generation from a variable considered as the source of the inherent risk to the agrarian production. The selected variable is the income obtained by the agrarian activity according to the type of production (organic or conventional). The method followed in the stochastic generation of the synthetic series of data has been the Monte Carlo simulation that has been widely used to create great series of data from temporary series of observed limited data (ROBERT AND CASELLA, 1999).

In agriculture, this method has been used to characterize the statistical properties of the costs, prices, or yields like answer to external factors (IGLESIAS AND QUIROGA, 2006; BIELZA, 2006; GIBBONS and RAMSDEN, 2005; LOBELL and ORTIZ-MONASTERY, 2006; LIMAYE et al., 2004). The characterization of the distribution functions of the yields of cereal, olive grove and vineyard allows us to be able to establish the levels of risk for each one by kinds of production (organic or conventional).

In this case, Monte Carlo method has been applied to obtain distribution functions of the income perceived by farmers, consisting in a synthetic generation of variable series being used a Latin sampling Hypercube sampling method (JUST and WENINGER, 1999; ATWOOD et al., 2003). Monte Carlo simulations are an important component of calculation of probabilistic risk and uncertainty, since it allows generating random series of statistical distributions (ROBERT AND CASELLA, 1999). The technique Latin hypercube (MCKAY et al., 1979) is a variant of the technique of Monte Carlo simulation that uses a fixed combination of data used when the dependent variable (y) is function of a series of variables (x_1, x_2, ..., x_n) like in the example of the obtained rent.

In the present study, distribution functions used in the model have been “extvalue” in the case of yields and prices and “lognormal” in the case of the direct costs of production under criteria of allocation of functions that the computer program used develops (@risk). The number of made iterations has been 5000. Thanks to this kind of analysis, the quantification of the risks incidence identified on each production by means of the economic viability of them can be reached. This quantification is based on different levels of risk which these productions must face. So risk factor of each one can be obtained and a comparison between the different cultivations that allows us to value this risk of comparative form can be made.

2.3 Risk management and strategies

After the risk identification and evaluation in different organic and conventional productions, the analysis of existing risk management strategies and tools nowadays has been made, analyzing their utility, their effectiveness and their level of implantation in each case. For it, codes of good agrarian practices followed by organic farmers and characteristic agrarian techniques of organic farming have been analyzed to study the capacity of these productions to mitigate and/or to manage each risk. Furthermore, the opinion that the farmers have about the Spanish system of agrarian insurances has been analyzed. Thus, aspects like the levels of

hiring, the predisposition to sign, the hiring of the different products by organic farmers, etc. have been studied.

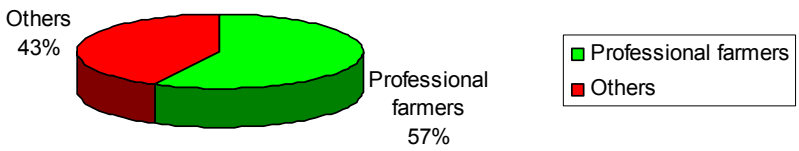
Finally, a revision of the different techniques that are being applied at the moment outside the cultivations to manage the risk has been made. In addition, also the opinion of farmers and professionals of other countries has been analyzed on the matter (HANSON, 2004; MADGE, 2005). Furthermore, the viability of the techniques of insurance in this kind of productions has been analyzed from the results that are being obtained in the rest of productions of our country. In addition, risks for which the usual practices of risk management in organic farming are insufficient and therefore it is precise to apply new strategies, have been determined.

3 Results

3.1 Classification of organic farms

More than 68% of polled farms share several organic cultures in the same cultivation (just cultures included in the study). The average size of polled farms (it includes only agricultural productions) is 53.74 has, something superior to which indicate the data of MAPA, where average size of organic cultivations in Spain is 24.2 has (MAPA, 2006). This difference can be understood if we consider that most (191) of the cultivations of the survey, mainly have majority production the one of cereals, cultivated in zones of dry land with extensive models, where surfaces are usually higher than those of intensive systems of production, fruits plantations in the Mediterranean zone. 57% of polled farmers are professional farmers (more from 50% of his rent it comes from agriculture), value quite similar to those of conventional agriculture (MTAS, 2007).

Figure 3. Percentage of professional organic farmers of the study



Polled farmers are producing by the organic farming system in our country since 6-7 years. In addition, 97% of the cultivations are registered in the registry of organic cultivations. It is important to emphasize that to be able to obtain the organic certification, it is necessary a period of transition that usually lasts about three years approximately. 71% of polled organic farmers belong to some agricultural cooperative, which denotes the high level of economic association that exists in this sector, aspect that can make it more competitive in the market.

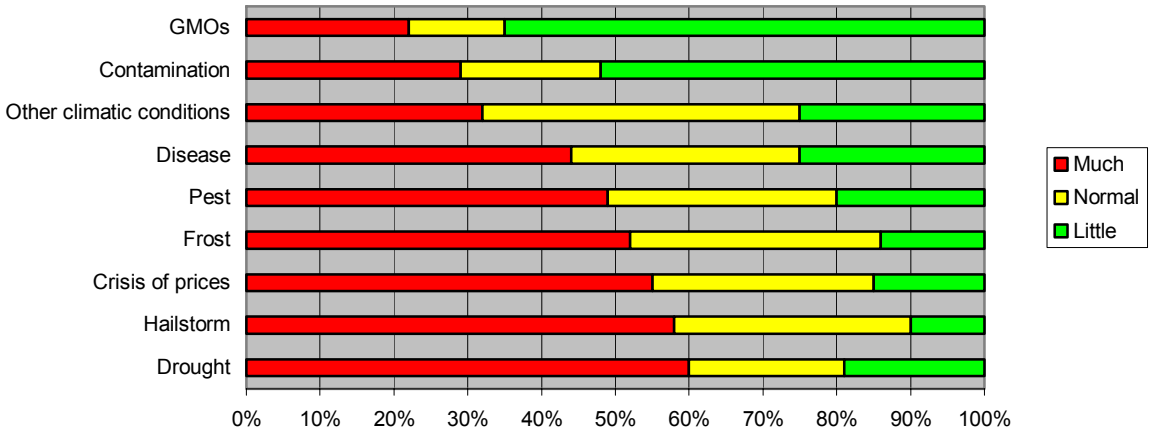
22.11% of polled farmers affirm that they have problems in the supplying of organic seeds, especially in cereal cultures like wheat, barley or oats. In addition, almost the 18% of them affirm that their organic production has problems to fulfil the requirements demanded by the effective norms of quality. The homogeneity of calibres, the appearance of damages in the fruit due to pests and the obtaining of a minimum calibre, are the main problems that organic farmers are facing nowadays, especially by e farmers of organic fruits and vegetables.

The destiny of the productions is highly varied. The most habitual destinies are the consumption in fresh in inner market, market for the export, the industry, catering trade or the supplying of specialized stores or restaurants. Similarly, the used channels of commercialization are quite diverse. The sale through an association or agrarian cooperative, the installation of swap-meets or fairs, the provision at home and even the sale in the own property mainly in productions of fruits and vegetables are the most common ones. In vineyard and olive grove, the product sale is mainly made by the agrarian cooperative and, in the case of cereals it is mainly sold to the animal feeding industry. On the other hand, it is important to emphasize more that only 20.2% of polled farmers promote their products, being the used channels for it, the celebration of fairs and markets, the own cooperatives or even Internet.

3.2 Risk identification and perception

As it is possible to be observed in figure 4, although the scientific studies are numerous that affirm that the handling of the ground by means of an organic system diminishes considerably its vulnerability to certain risks (LAMPKIN, 2001; LACASTA, 2001), polled farmers affirm that the drought is the risk that worries more to them (60% of the polled ones say to have much risk of drought). Nevertheless, the results thrown by the personal interviews made to experts in organic farming, demonstrate that risk perception that organic farmers have is sensibly more pessimist than the one than could come off the analysis of the different techniques and applied investigations from organic agriculture (LIEN et al., 2003).

Figure 4. Risk perception of organic farmers



In addition to the drought risk, hailstorms, crisis of prices and frosts are the risks that worry organic farmers too. 58% of polled ones affirm that its cultivation has much risk of hailstorm,

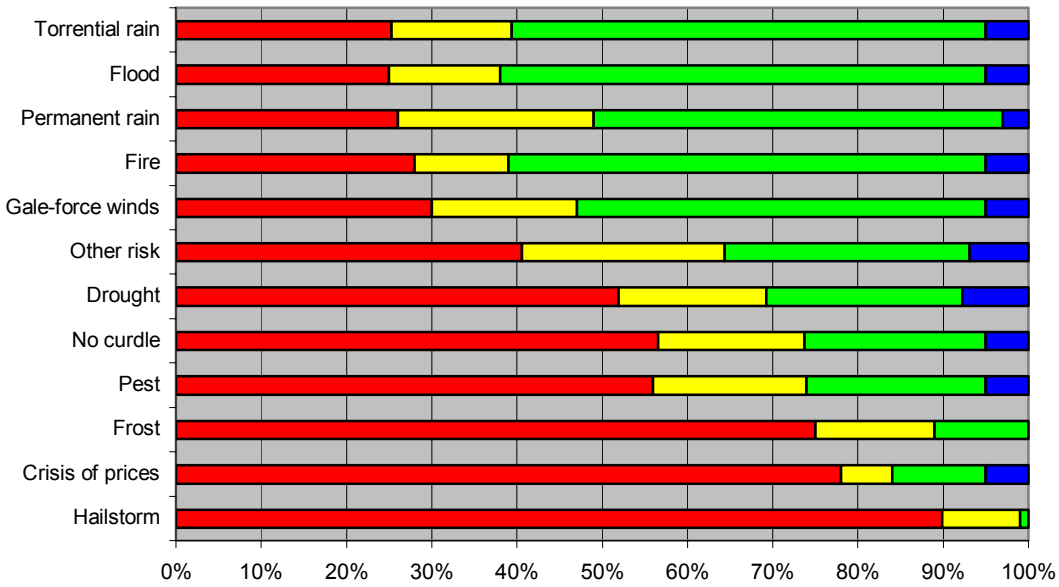
and the percentage of them which affirm to have a medium risk of this phenomenon (32%), do of this risk one of most important to consider in the design of any tool of risk management.

It is important to note that the percentage of organic farmers that affirm to have much risk of crisis of prices (55%) is so elevated. One of the great motivations that have taken to the conventional farmers to change their production system to an organic one has been the higher remuneration than their products have, nowadays, in the market. For that reason, aspects like the development of the markets will be analyzed in next sections, doing special emphasis in the remuneration perceived by the producer, by each one of the products that sell.

Some studies demonstrate that these grounds (organic management) have higher capacity of reaction the frosts because of their capacity of water retention (COWGER, 2007). Nevertheless, a 52% of polled farmers affirm to have in their cultivation much risk of frost and a 34%, average risk compared with conventional ones. On the other hand, it is important to note the number of farmers that affirm to have much risk of contamination by GMOs (22%), considering that nowadays these varieties just have been developed for maize cultures in our country (not including in the study).

As it is possible to be observed in figure 5, in the case of the conventional farmers, the risks of hailstorm, fall of prices in the market, frosts and the pests, seem to worry more. Therefore seems reasonable to affirm that the risks which conventional farmers give higher importance are very similar to those of the organic farmers. The percentage of organic farmers that thinks to have much risk of drought is 60%, whereas the percentage of conventional farmers with the same perception is 52%. It happens the same with other risks like hailstorm (90% and 58% respectively), frost (75% and 52% respectively), etc., which seems to go related with the affirmations of the experts interviewed for present study.

Figure 5. Risk perception of conventional farmers



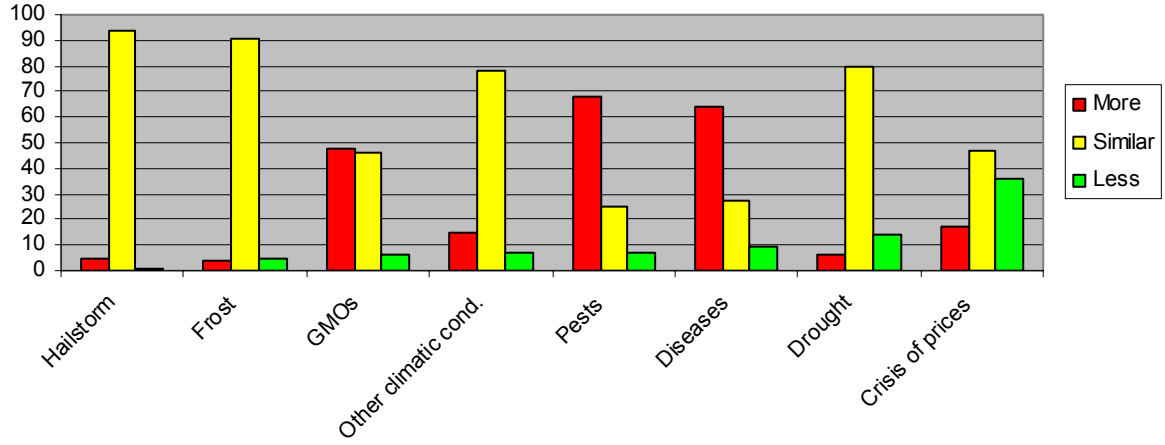
3.3 Vulnerability of organic cultivations

Existing studies of organic farming try to emphasize the virtues that the management of the ground from the point of view of the organic production has (LAMPKIN, 2001; SEAE, 2006; SIMÓN, 2002). Some of the own practices of this system can considerably improve the capacity of adaptation and/or mitigation of the plant to certain risks which it faces. Similarly, these techniques can contribute to improve the capacity of reaction of the own plant, in the case of having occurred a certain risk. In this respect it is important to emphasize that, according to a recent study elaborated by the Service of Agrarian Investigation of USA (USDA, 2001; USDA, 2004), the use of own techniques of organic farming as the mixture of varieties in the cultivation, can emulate the natural variability of the old heterogeneous varieties, allowing the culture a higher flexibility of answer as opposed to conditions of stress like pests, diseases, drought, frost, etc. (COWGER, 2007).

Nevertheless, some times, the opinion of farmers totally does not agree with the opinion of professionals or scientists dedicated to this matter. Organic farmers tend to affirm, that the level of affection of the different risks in their productions, mainly pests and diseases, are elevated. Nevertheless, some studies demonstrate that in most of the cases, these risks have a magnitude similar or inferior to those of conventional productions, being organic agriculture, the economic the more viable alternative in some cases (LACASTA, 2001; CLAVAGUERA, 2006). Even, it is possible to emphasize that most of the professionals interviewed for the present study, agree in affirming that techniques used in organic agriculture can help to prevent and to mitigate the effects caused by the different risks.

As it is possible to be observed in figure 6, organic farmers consider that the affection that have on their cultivations because of the risks of hailstorm, frost, drought and other climatic adversities is similar to the affection that conventional productions have. Nevertheless, between a 60% and a 70% of them considers that the affection of diseases and pests are superior in their organic productions. Furthermore, almost a 50% of them consider having higher risk of contamination by GMOs than conventional farmers. On the other hand, as it is possible to be observed in the right part of the figure 6, a 40% of the polled farmers almost consider that the risk of crisis of market prices affects them less than to conventional farmers.

Figure 6. Compared vulnerability of organic farms



Nevertheless, experts interviewed affirm that organic productions can have higher capacity to react to adverse a climatic event like the drought, the frost, the wind or the hailstorm positively as opposed to. A higher proportion of organic matter present in the ground, contributes to conserve better the humidity and, therefore, considering that the water necessities are smaller, it makes these productions less vulnerable to drought. Furthermore, vegetal covers contribute to reduce the vulnerability against frosts, since they provide a higher humidity to the ground. The agricultural by-product management provides a higher potassium feeding and, therefore, a better water retention in the ground. In addition, organic products have minor amount of water in their composition, together with their higher adaptation to the conditions of the surroundings, make these products less vulnerable.

3.4 Comparative analysis of the economic yield of the organic cultivations compared with the conventional ones: field test

After risk perception, potential vulnerability and others have been studied, a comparative study of the economic viability of real cultivations that share identical productions in organic and conventional has been made. So it has been introduced the temporary variable in the study for value the behaviour of the different cultivations throughout the years. In table 4 the statistical description of each one of the variables considered in the model for each production is detailed (cereal, olive grove and vineyard).

Table 4. Statistical description of the data used in the model

	Mínimo	Máximo	Media	Desv. típ.	Asimetría		Curtosis	
	Estad.	Estad.	Estad.	Estad.	Estad.	Error típico	Estad.	Error típico
CC_Price_€_kg	,1156	,1334	,1225	,0054	,875	,717	,726	1,400
CC_Costs_€_ha	302,36	539,20	424,39	60,98	-,211	,717	3,102	1,400
CC_Yield_kg_ha	1408,98	3412,19	2443,73	586,30	-,013	,717	,478	1,400
CE_Price_€_kg	,1685	,2140	,1864	,01488	,906	,717	,108	1,400
CE_Costs_€_ha	262,58	303,55	282,67	14,04	,061	,717	-1,201	1,400
CE_Yield_kg_ha	1500,00	2200,00	1936,66	202,11	-1,095	,717	2,390	1,400
OC_Price_€_kg	,3338	,6227	,4755	,1098	,266	,687	-1,753	1,334
OC_Costs_€_ha	373,13	518,36	457,96	55,13	-,587	,687	-1,246	1,334
OC_Yield_kg_ha	477,00	1833,24	1108,96	448,32	-,020	,687	-1,235	1,334
OE_Price_€_kg	,4006	,7472	,5706	,1318	,266	,687	-1,753	1,334
OE_Costs_€_ha	291,04	404,32	357,20	43,00	-,587	,687	-1,246	1,334
OE_Yield_kg_ha	73,0083	2558,76	882,76	896,04	,822	,687	-,690	1,334
VC_Price_€_kg	,2193	,6965	,4031	,1558	,821	,687	,138	1,334
VC_Costs_€_ha	761,37	1057,70	934,45	112,49	-,587	,687	-1,246	1,334
VC_Yield_kg_ha	3666,40	6895,68	5360,23	1186,08	-,047	,687	-1,551	1,334
VE_Price_€_kg	,2631	,8358	,4838	,1870	,821	,687	,138	1,334
VE_Costs_€_ha	779,32	1082,62	956,47	115,14	-,587	,687	-1,246	1,334
VE_Yield_kg_ha	2071,36	6712,00	4532,06	1375,46	-,242	,687	-,250	1,334

CC: Conventional barley, EC: Organic barley; OC: Conventional olive grove; OE: Organic olive grobe; VC: Conventional vineyard; VE: Organic vineyard

It has been verified that most of the times, productive yields are lower in organic production systems that in conventional ones. Nevertheless, at the same time, it has been observed that the variations or oscillations of yields and prices are quite smaller in organic productions than in conventional ones. This fact, together with the higher value than organic products have in the market, causes that in some cases organic cultivations are more viable economically than conventional ones.

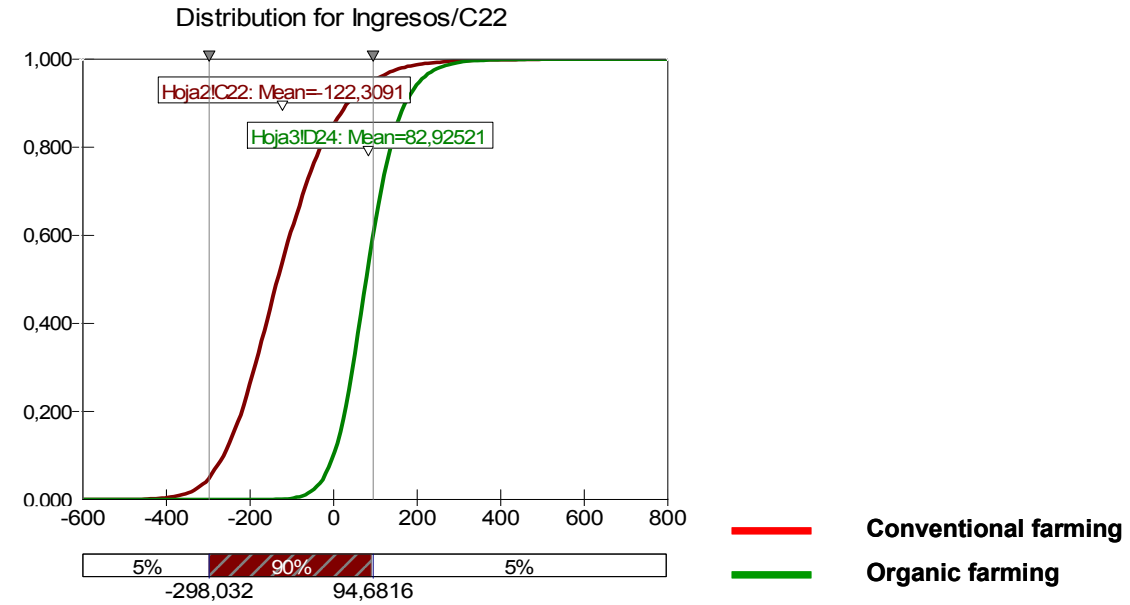
From the experimental data of these cultivations, the distribution functions have been obtained by their stochastic generation from a considered variable like the source of the inherent risk to the agrarian production. The selected variable is the profit (income less direct costs) obtained by the agrarian activity according to the type of production (organic or conventional).

First case contemplates an example of culture of barley in a cultivation situated in the region of Valladolid (Castilla y León). As it is possible to be observed in table 4, the existing difference as far as the asymmetry analysis demonstrate the smaller direct costs of production of organic and conventional barley in this cultivation, which is a determining factor in the economic result of this cultivation. Similarly, it is clear that yields in conventional barley are higher, whereas prices are lower.

As it is possible to be observed in figures 7 and 8, the analysis made by Monte Carlo simulations demonstrates the higher probability that organic barley cultivations have

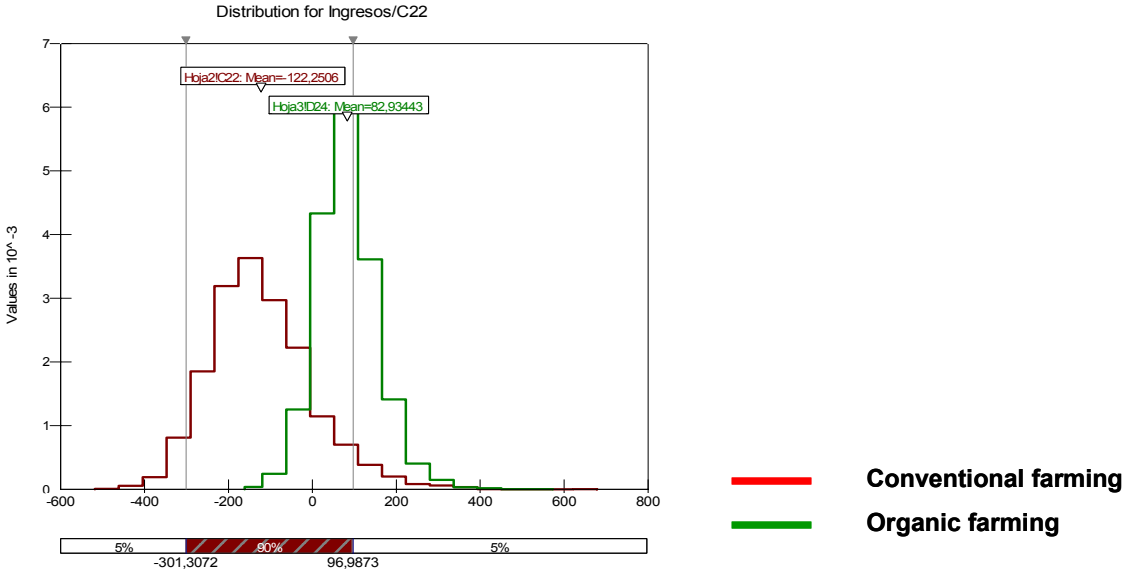
compared with conventional ones. In the axis of the "x" is represented the value of the profit (€/hectare) that can be obtained in each productions in absence of amortizations and aids to the production in equality of conditions. In the axis of "y" is represented the probability that both production systems have to obtain profits in the same conditions. As it is possible to be observed, the cultivation of organic barley, represented in green, has a higher probability of obtaining profits than the conventional one, represented in red.

Figure 7. Probability of obtaining and quantity of the profit obtained in the cultivation of organic and conventional barley: Cumulative curve



In the histogram pertaining to the production of organic barley, a higher leptokurtosis is observed, which indicates a smaller variability of the results of the model and, therefore, a smaller risk of obtaining a bad economic result in the cultivation.

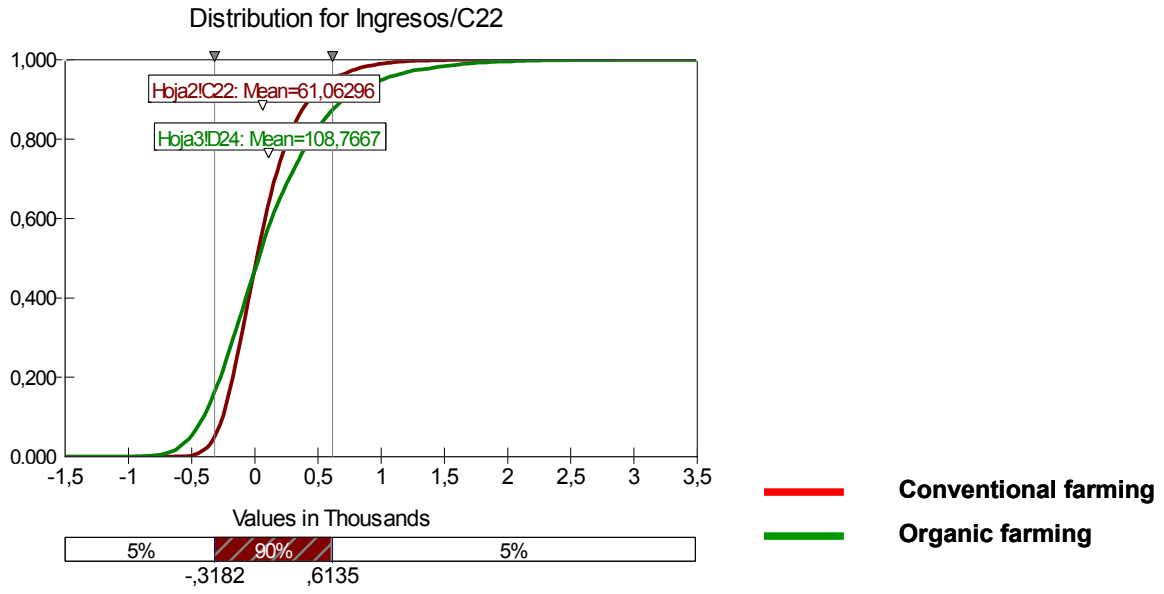
Figure 8. Probability of obtaining and quantity of the profit obtained in the cultivation of organic and conventional barley: Histogram



In the second case, an identical test has been made in an olive grove cultivation located in a dry land situated in the region of Toledo. It can be deduced from the results of table 4 that, in the case of the olive grove, the smaller differences that the analysis of the asymmetry of direct costs of production, demonstrate that these costs do not lodge so many differences as in the case of the barley. Nevertheless, there are some differences in the yields which are a bit higher than in the case of the barley, like it happens with the data of prices.

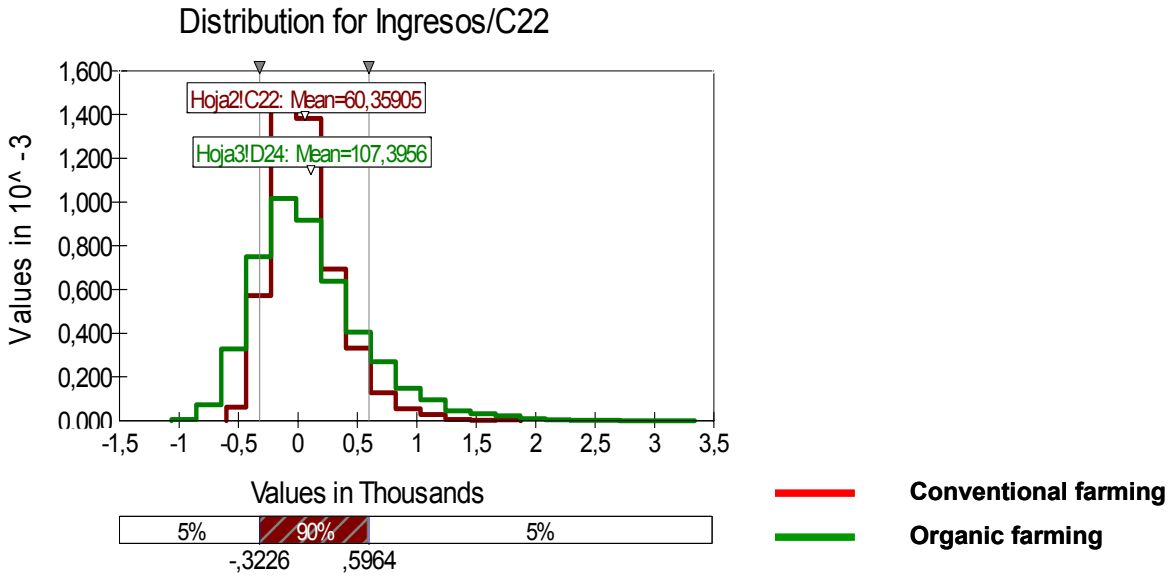
As it is possible to be observed in figures 10 and 11, the differences between the probability of obtaining profits between the organic system and the conventional one, are more reduced than in the previous case. Even considering the differences of prices perceived by organic farmers (20% higher), the yields and the production costs of the dry land olive grove (organic and conventional) make the profitability of both productions almost equal in absence of aids. Even so, in the figure it is possible to not how the probability of obtaining income superior to 0 is similar in cultivations of organic and conventional olive grove. Nevertheless, these results emphasize that perceived average income in cultivations of organic olive grove, in absence of aids are similar than conventional ones.

Figure 9. Probability of obtaining and quantity of the profit income obtained in the organic and conventional cultivation of olive grove: Cumulative curve



In the histogram pertaining to the production of organic olive grove a higher leptokurtosis is observed, reason why exists a smaller variability in the obtaining of profits and, therefore a smaller risk of obtaining a bad economic result in the cultivation.

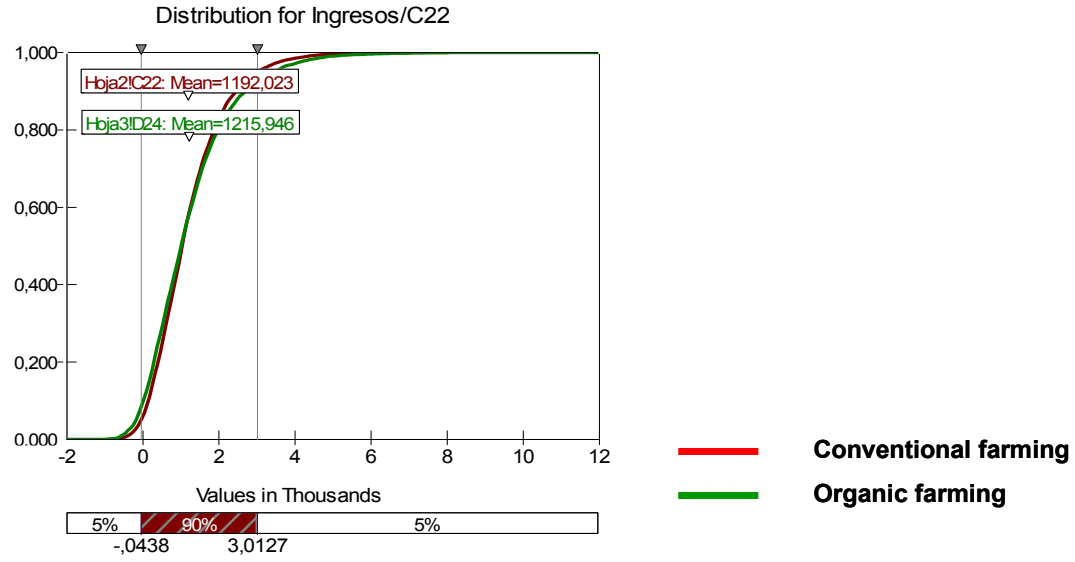
Figure 10. Probability of obtaining and quantity of the profit obtained in the cultivation of organic and conventional cultivation of olive grove: Histogram



Last case of present study has been made in a cultivation of vineyard in a dry land situated in the region of Toledo. The existing differences of productive yields between organic and conventional vineyard productions of this cultivation are clearly compensated because of the higher quantity of the prices perceived by the organic grape and the similarity of direct costs of production.

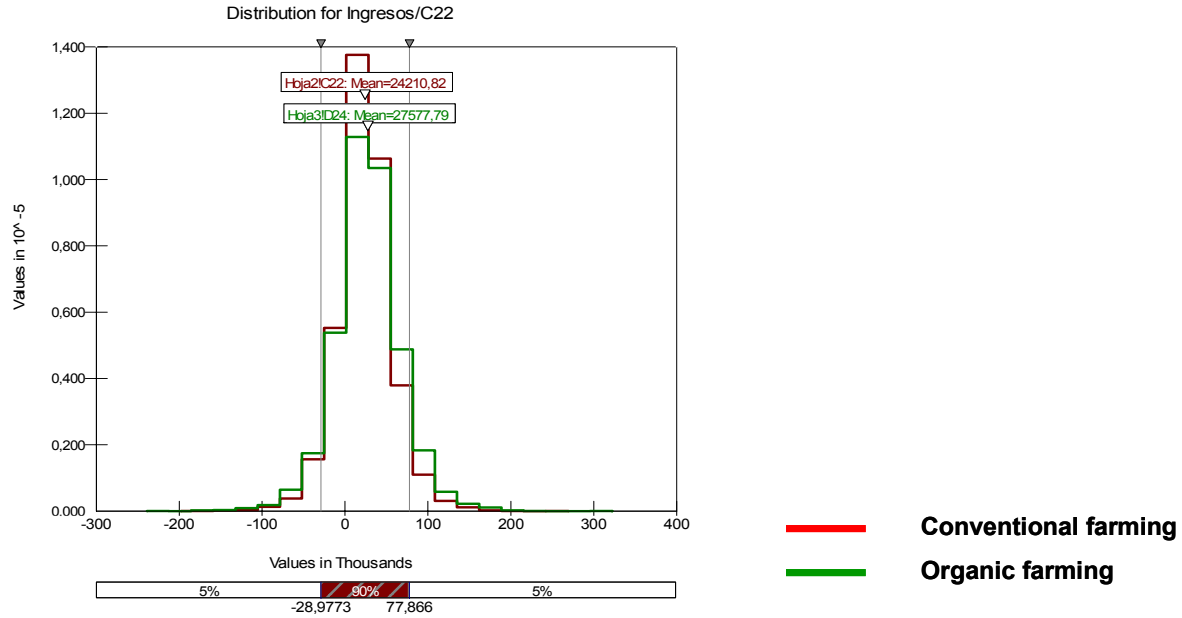
As it is possible to be observed in figures 11 and 12, the probability of obtaining profits in this cultivation of organic and conventional vineyard is practically identical. It is important to consider that the average profit obtained in the cultivation is considerably higher than in both cases studied previously. In addition, in this case, direct costs of production are more reduced than those of the culture of olive grove.

Figure 11. Probability of obtaining and quantity of the profit income obtained in the cultivation of organic and conventional vineyard: Cumulative curve



The curtosis analysis throws almost identical results in both productions, reason why it can be deduced that, in this cultivation, the economic variability is similar so risk faced is very similar.

Figure 12. Probability of obtaining and quantity of the profit obtained in the cultivation of organic and conventional vineyard: Histogram



Different productions, on the different handlings, the irrigation, on the economic balance of the different organic and conventional cultivations can vary considerably.

3.5 Strategies of risk management in organic farms

Nowadays numerous strategies exist at the disposal of farmers to manage the risk of their agrarian cultivations. These strategies can be very different, either they are developed in the same cultivation or outside it either they are related with the production or with market, etc. The strategies that organic farmers follow differ a lot from those used by conventional ones, mainly, because of the nature of the different used productive systems in each case. In addition, the tools available for risk management which they can use differ so much, aspect analyzed in the present section.

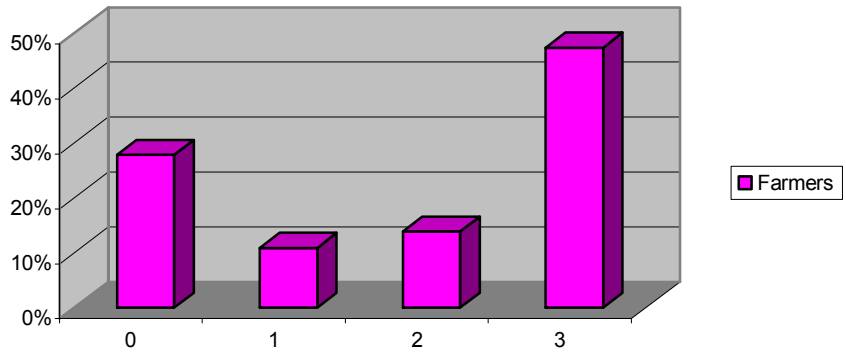
Most of the existing strategies nowadays for the risk management in cultivations of organic agriculture and the stabilization of the rents of the farmers, are developed by they themselves within the own cultivation. The culture of species of opened pollination for obtaining of own seed resistant to diseases and pests, the introduction of variability by means of the crossing with traditional seeds, the delayed plantation to diminish the risk of frosts, the accomplishment of adapted irrigations, the rotation of cultures and the diversification of cultures, varieties and dates of sowing, are some of the most habitual examples.

Nowadays, the use of external strategies of risk management like vertical integration in organic productions, the markets of agrarian futures, etc. becomes very difficult because of the reduced size of the cultivations and the limited development of the sector. Nevertheless, in

Spain there is a great tradition and formation in agrarian insurances. Organic farmers do not have specific products designed to be able to cover own risks in these productions, although there are many of them that have signed an agrarian insurance last years, which demonstrates certain insurance culture of these farmers.

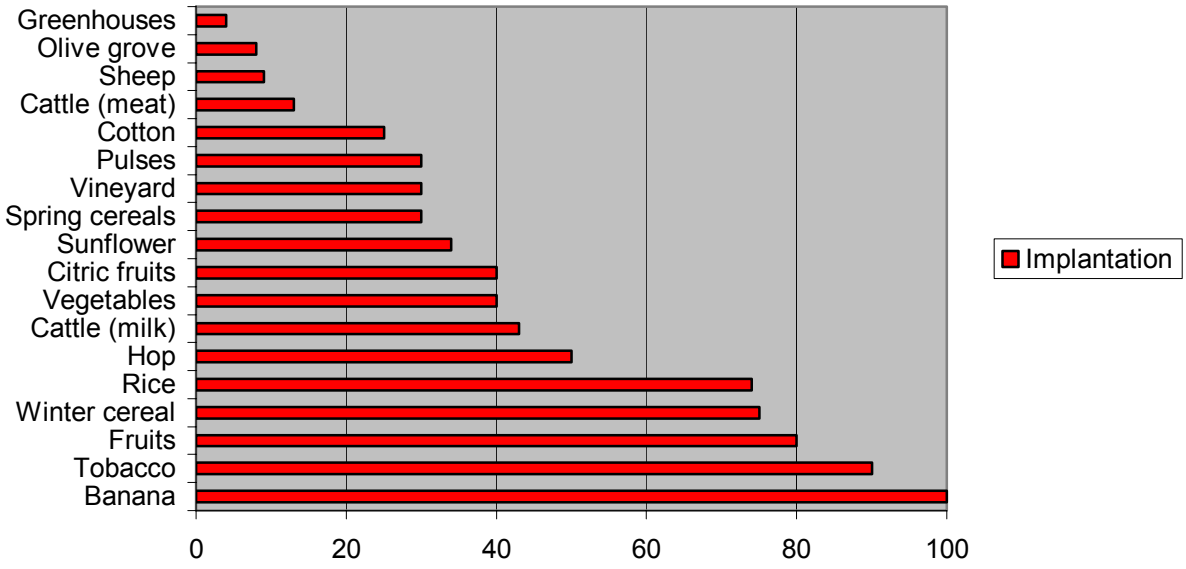
100% of polled organic farmers know the system Spanish agrarian insurances system. A high percentage of them have signed to the agrarian insurance in the last 3 years (72%). As it is possible to be observed in figure 13, organic farmers affirm that they have signed an agrarian insurance three last years at least once (47%).

Figure 13. Number of years that organic farmers have taken out an agrarian insurance



It is possible to affirm that the levels of agrarian insurance implantation in conventional productions of our country are so varied. As it can be observed in figure 14, there are some sectors whose level of insurance implantation is consolidated (cereals, banana, tobacco…), whereas there are other sectors where this level is still considerably low (olive grove, vineyard, etc.).

Figure 14. Level of agrarian insurance implantation classified by sectors (2006)



Experts in organic farming consulted know the advantages and limitations of the present system of agrarian insurances of our country. They agree that nowadays adapting the existing insurance products to the reality of the organic productions, these can be very useful for farmers. They affirm that agrarian insurances prices would have to be adjusted more, characteristics of culture, yields, etc., in each one of the present lines of the insurance, to later design a specific insurance of cultivation for the organic productions.

Furthermore these farmers affirm that insurance premiums must be adapted to the specific risks that organic productions have and new risks as the contamination by plant protection products, the contamination by organisms modified genetically, etc. must be included. In general, they think that the existing products would have to be developed transitorily, although they do not agree with which they would be the high-priority ones.

4 Conclusions

Organic farming represents an already consolidated model which has a great potential development, since they constitute a productive system that fits perfectly in the political directions of future for the agrarian sector. Organic farming is adapted to guarantee the sustainability of an agrarian model, based on the oriented cultivations to obtain products of high quality. Furthermore, it is possible to be affirmed that, nowadays, organic farming is able to generate numerous beneficial impacts in the environment, social and economic beneficial impacts, etc. These are the reason which the institutions of the European and national agrarian policy are betting more and more by this kind of farming.

The practice of organic farming tries to emulate the natural diversity of natural ecosystems and the biological level of diversity that confers higher stability to the agro-system, allowing a higher flexibility of answer against productive risks like pests and diseases or climatic risks like drought or frosts. This causes that many organic cultivations have a smaller vulnerability against climatic risks and, in special, against to risks derived from the behaviour of the agro-alimentary markets, reasons these that could justify a higher public support of the institutions to the development of this kind of farming.

The physical dimension of the cultivations varies fundamentally based on the productions and the zone in which they are. The average size of the cultivations dedicated to organic farming in our country is 24.2 has. The familiar character of them, compared with conventional ones is higher. As well, it is important to emphasize the high level of existing diversification in the cultivations of organic farming, which is in addition, sensibly more elevated than in conventional ones. More than half of the polled organic farmers of the study are professional farmers, which demonstrate a high level of qualification that exists in this activity.

The average of years that organic farmers are practicing this modality of production is 6-7 years, which demonstrates an average level of maturity that exists in these farmers, once overcome the period of conversion from conventional to organic farming. Almost all the organic productions are registered at organic cultivations registry. The knowledge and the perfect identification of the cultivations dedicated to organic farming and their characteristics, is absolutely necessary for the elaboration of a specific insurance form organic cultivations.

Certain deficiencies of the supplying of organic seed in organic cereal productions have been demonstrated. The destiny of the productions is highly varied and it depends of the different productions. Whereas the organic cereal is given almost in its totality to the transforming animal feeding industry, the grape and the olive are usually given to the agrarian cooperatives. Nevertheless, the habitual destinies of the productions of organic fruit are the fresh consumption in national markets and the export. Furthermore, the used channels of commercialization are quite diverse and also depend on the culture that treats. The commercialization through associations or cooperative organizations is the most habitual one.

The channels of organic product commercialization have great possibilities of development and growth. Nevertheless, it is important to consider that an uncontrolled growth of these channels can cause a imbalance of the markets and affect to one of the great pillars of this productive system, the recognition of the quality of these products that the market by means of an elevated price, makes.

Risk perception depends of many variables as the kind of culture, the zone in which is the cultivation, the formation of the own producer, the special characteristics of the cultivation, etc. It can be affirmed that, in general, organic farmers have minor risk sensation than conventional ones. The risk that worries more to organic farmers of our country is the drought, whereas the one that worries more to the conventional farmers is the hailstorm. Nevertheless, experts in organic farming consulted affirm that risk perception that farmers have is sensibly more pessimist than the one than it could come off the analysis of the different techniques and applied investigations. In spite of it, it seems reasonable to affirm that risks which conventional farmers give higher importance are very similar to which they worry to organic ones.

Among climatic risks, besides drought, hailstorm and frosts are the risks that worry more to organic farmers. Nevertheless, there are many organic farmers that identify the crises of prices like a potential risk. It is important to emphasize this because one of the great motivations that organic farmers have to change their production from organic to conventional has been the higher remuneration that their products have nowadays in the market. Furthermore, the possibility of opening an alternative route to improve the commercialization and the directed obtaining of aids to these productions has been one of the most important motivations for them.

The high number of organic farmers that affirm to have a high risk of contamination by GMOs, considering that nowadays these varieties just have been developed for maize cultures in our country (not including in the study), must be noted. A higher development of these technologies and varieties, can suppose, in the short term, a serious risk for organic farmers considering that, a cultivation contaminated by GMOs, automatically loses the organic certification. This affects directly to the price perceived for their products and indirectly to the economic balance of their cultivations. In addition, a high level of aware exists in the sector with respect to this problem.

Most of organic farmers consider that the level of risks affection of pests and diseases in their cultivations is so elevated and higher than in conventional ones, mainly in cultivations of organic fruits and vegetables. The lack of formation and investigation of new techniques to mitigate these risks is something that supposes some troubles to these farmers. Nevertheless, it seems to indicate that in most of the cases these risks have a similar or inferior magnitude

than those of conventional productions, being organic farming the more profitable economic alternative in some of these cases.

The higher amount of organic matter present in the ground of organic cultivations, contributes to conserve better the humidity and, therefore, it makes them less vulnerable to drought. Similarly, vegetal covers contribute to reduce the vulnerability against irradiation frosts, since they provide a higher humidity to the ground. The agricultural by-product management provides a higher potassium feeding and, therefore, a better water retention in the ground. The use of pads can diminish the risk of drought and frosts. On the other hand, organic products have less amounts of water in their composition, together with their higher adaptation to the conditions of the environment make these products less vulnerable to the deterioration with the passing of time.

Although the productive yields are lower in most of organic production systems that in conventional ones, it has been observed that the variations of yields and prices are much smaller in productions dedicated to organic farming. Furthermore, the higher prices that organic products have in the market cause that in many cases, organic and conventional cultivations have at least the same economic viability than the conventional ones. It is important to note that in cereal productions of some dry land zones, where without public aids is more profitable the organic production than the conventional one. In other studied cultivations like olive grove and vineyard it is not possible to affirm the same because the results are very similar in organic and in conventional productions.

Most of the existing strategies nowadays for the risk management in cultivations of organic agriculture and the stabilization of the rents of the farmers, are developed by they themselves within the own cultivation. Nevertheless, these techniques are not always enough to manage all risks in productions with continuous growth, especially climate risks. This is the reason for develop another kind of tools for risk management as the agrarian insurances which can be useful to guarantee the stability of the rents of these organic farmers.

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