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Analysis of Factors Used by Farmers to Manage Risk: A Case Study on Italian Farms

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***Abstract*—**The study analyses the strategies Italian farmers use to cope with the risks that face their production. We specifically explore the potential and the limitations of the economic tools for climatic risk management in agriculture of the Common Agricultural Policy 2014-2020, that foresees contributions for economic tools for risk management, in relation to farms' needs, exposure and vulnerability of agricultural areas to climatic risk. We consider at the farm level approaches to hedge risks in terms of the use of technical tools (agricultural practices, pesticides, fertilizers, irrigation) and economic/financial instruments (insurances, etc.). We develop cross-sectional and longitudinal analyses as well as analyses of correlation that underline the main differences between the way farms adapt their structure and management towards risk. The results show a preference for technical tools, despite the presence of important public aids on economic tools such as insurances. Therefore, there is a strong need for a more effective and integrated risk management policy scheme. Synergies between economic tools and risk reduction actions of a more technical, structural and management nature (production diversification, irrigation infrastructures, technological and management innovations and formation-information-consultancy, etc.) are emphasized.

***Keywords*—**Agriculture and climate change, climatic risk management, insurance schemes.

I. Introduction

THIS study analyses the strategies Italian farmers use to cope with the risks that their production faces. This research has been conducted within the research project "Research and technical support on natural disasters, climatic and phytosanitary risks in agriculture and related policies", conducted by Council for Agricultural Research and Economics (CREA) and funded by the Italian Ministry of Agricultural Food and Forestry Policies in the period 2010-2015. The main aim of the project was to explore the potential and the limitations of the economic tools for climatic risk management in agriculture of the Common Agricultural Policy 2014-2020. It foresees contributions regarding economic tools for risk management in the II pillar (rural development), in relation to farms' needs, exposure and vulnerability of agricultural areas to climatic risk. These purposes are linked to the consideration that Italian agriculture has a higher degree of exposure and vulnerability to climatic risk as compared to other areas and other sectors. The production is concentrated on commodities with high added value and with significant economic relevance in terms of exports. Therefore, damages due to climate conditions equal in quantitative terms, correspond to higher economic losses. Moreover, the environmental and climatic conditions of Mediterranean countries are extremely heterogeneous and these factors render production more diverse and rich, but also entail higher risks for the territorial specificity of production. Given these considerations, risk management on farms has always represented an important element and, in certain cases, a decisive factor for the farms' very existence.

The economic/financial risk management tools are considered useful for their flexibility and adaptability at the stage of their definition as well as their application. In the context of climate change, such characteristics are even more important (and indeed useful) given the uncertainty associated with the effects and impacts of weather on production. Economic tools are then adaptable in terms of objectives and substance as different scenarios may unfold, e.g. contracts with objectives that can be modified in time and space.

The analysis of such issues in the international context demonstrates that the diffusion of risk management in agriculture through these economic tools, primarily insurances, is based on the possibility of benefiting from supportive public policies [1]. In most cases, public support is in fact targeted to the specific needs in each context: extreme climatic events in the EU and North America, and more recently also in Australia, as well as the objectives of agriculture and development in South America, are all important examples (the most frequent being agricultural insurance) [2], [3].

The topic of risk management in agriculture has always been at the margins of the European policies debate, so that the development of hedging instruments, particularly those covering production risks, referred to individual Member States (MS), creating prospects for intervention not evolved according to common paths. Many of these instruments have been developed along very different trajectories to a complex and heterogeneous set of risk management systems in different Member States which differ in the instrumentation available and the degree of coverage that these practices achieve [4].

With the phasing out of guarantees provided by the CAP to European farmers in terms of stabilizing markets, the issue of risk management tools is gradually acquiring an ever more important role [5]. This is reflected in a series of innovations that first appeared in the 2009 'Health Check' and then in the Commission regulation for rural development policy 2014-

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2020 (reg. 1305/13). It is now possible to use part of the EU funds in order to promote farmers' access to risk management tools [6]. This innovation therefore concerns only the allocation of resources and not the definition of the specific instruments to be applied in the MS concerned. The forecast in question seeks to promote the management of production risks through incentives for insurance policies and participation in mutual funds to cover direct losses from specific events impacting negatively on the quantity and quality of farm production, such as poor weather, crop and animal diseases, environmental accidents and so forth.

Referring to the Italian experience, since the 1970s there exists a National solidarity fund for natural disasters in agriculture, providing compensations for damages caused by natural disasters and partial coverage of the insurance premiums (until 2004, the insurance market has offered mostly single-risk hail insurances). The fund has been reformed in 2004 in order to promote insurance actions instead of compensations (decrees n. 102/2004 and n. 82/2008). With the evolution of the Italian policy scheme on risk management, several issues have emerged in different studies that require to be deepened and expanded in order to improve the risk management system [7]-[9]. In particular, the most critical and common points are:

- The lack of preliminary analysis on risk conditions (parameters, risk levels and interrelations) and risk assessment that explain and justify the choices made on policies and public aid;
- The lack of analysis on demand for risk management tools, with policies oriented more to the market supply (insurances); this tendency can create an inefficiency and ineffectiveness of policies and tools, with also an unbalance between contributions to premiums and ability of insurance companies to indemnify damages;
- In the Insurance plan, that defines the risks object of contributions, phytosanitary and sanitary risks have been inserted, but they are not covered by insurance contracts in the market;
- A low level of integration among the available risk management strategies (a reduction of exposure and vulnerability, risk transferring and acceptance) and a policy focus confined to the transfer of risk.
- Risk management through economic tools should represent just one component of a wider strategy. Only a multilevel approach (at farm and territorial levels, with managerial and structural measures) would ensure the effectiveness of policies in the long term.

In light of these considerations, it is important to evaluate the contributions that economic tools for risk management can bring in the context of new CAP, in relation to farms' needs and approaches. In order to contribute to this debate, the part of the research here presented considers the climatic risk at the level of farms. We consider hedging strategies that encompass the use of technical tools (agricultural practices, pesticides, fertilizers, irrigation) and economic/financial instruments (insurances, etc.). We developed cross-sectional and longitudinal analyses as well as analyses of correlation that underline the main differences between the way farms adapt their structure and management towards risk.

II. Methodology and Dataset

The database is taken from the Italian Farm Accountancy Data Network (FADN), the official instrument of European Commission for evaluating farm income and the impacts of the Common Agricultural Policy [10]. FADN provides very precise information at the individual scale (the main mission of FADN is farm accountancy) and the Italian sample is stratified according to the region, the economic dimension and the specialization of the farm. It provides outstanding information regarding the annual accounting of Italian farms, containing also technical data on farm management and data on insured farms [11].

A precise study of the operating expenses allows to identify and to measure with precision the roles of different risk management tools that are used by farmers to cope with risk, either technical or financial. In particular, within the FADN variables, the indicators chosen for the analysis of technical tools are:

- Diversification (numbers of different crops, mix crop-animals, etc.);
- Use of chemical inputs (pesticides and nutrients);
- Irrigation (presence and systems);
- Advice service (presence and type of service);
- Farm certification;
- Costs for maintenance;
- Investments in new techniques and machines.

The indicators chosen for the analysis of financial tools are:

- Savings;
- Insurance;
- Type of trade (wholesale, retail, consumers, cooperative regular VAT, cooperative special VAT, industry);
- Cash level of the farm;
- EU CAP payments.

The period of observation goes from 2005, according to the reform of the Italian law on insurance scheme in agriculture (decree 102/2004) that strongly enhanced the public contributions for insurance premiums, to 2012, last year of available certified data of FADN. Given the need for a longitudinal analysis, the sample is made up of 3,213 professional Italian farms that are continuously surveyed between 2005 and 2012. This balanced sample allows for comparisons among years and for a study of the dynamics of Italian farms regarding risk management.

Within the FADN database, the choice of the variables takes into account:

- The structure of the farm, considering its total, cultivated and irrigated area;
- The equipment of the farm through the mechanization, investments and amortizations;
- The activity of the farm, given total and sold production (SP), as well cost structure;
- The financial structure of the farm including fixed and operating capital as well as land owned;

- Risk management tools: crop insurance, consultancy and CAP payments;
- Crop production, considering both its characteristics (cultivated area, income, number of crops and cost structure) and operating expenses (seeds, water, chemical inputs, crop insurance, consultancy and certification);
- Livestock (area, income and expenses, number of product, insurance and certification);
- Transformed products (income and number of products).

A. Specific Categories

The analysis is carried out at the national level. However, for the sake of precision, the analysis has been broken down according to the main regions, farm production and economic dimension (Table I). Regions are grouped according three main areas:

- North: Valle d'Aosta, Piemonte, Lombardia, Trentino, Alto Adige, Veneto, Friuli Venezia, Giulia, Liguria and Emilia Romagna.
- Centre: Toscana, Marche, Umbria and Lazio.
- South and Islands: Abruzzo, Molise, Campania, Calabria, Puglia, Basilicata, Sicilia and Sardegna.

For a proper synthesis, some specific per area data are not illustrated in the figures, but commented if considered important.

Farm production is grouped according to these main categories:

- Specialization in field crops.
- Specialization in fruits and vegetables.
- Specialization in meat.
- Mix.

The economic dimension is also taken into account through the European Dimension Units (EDU) ranked in 7 classes. UDE 1 and 2 are not relevant due to the very low number of observations. UDE 4, 5 and 6 are the most numerous.

TABLE I
REPARTITION OF ITALIAN FARMS OF THE SAMPLE IN 2012 ACCORDING TO THEIR REGION AND SPECIALIZATION (N.)

Region	Field crops	Fruits/ Vegetables	Meat	Mix	Total
North	409	645	372	41	1,467
Centre	235	165	106	33	539
South/Islands	381	506	254	66	1,207
Total	1,025	1,316	732	140	3,213

III. ANALYSIS OF DATA

From a very general point of view, the structure of Italian farms of the sample has not changed much between 2005 and 2012 (Fig. 1). Over that period, the total area has only increased by 3.5 %, while the total usable agricultural area (UAA) rose at the same time from the same proportion. The irrigated UAA remains quite stable and represents on average 30% of the UAA in 2012. This result seems to indicate that the CAP did not affect the fundamental structure of Italian farms over the last years.

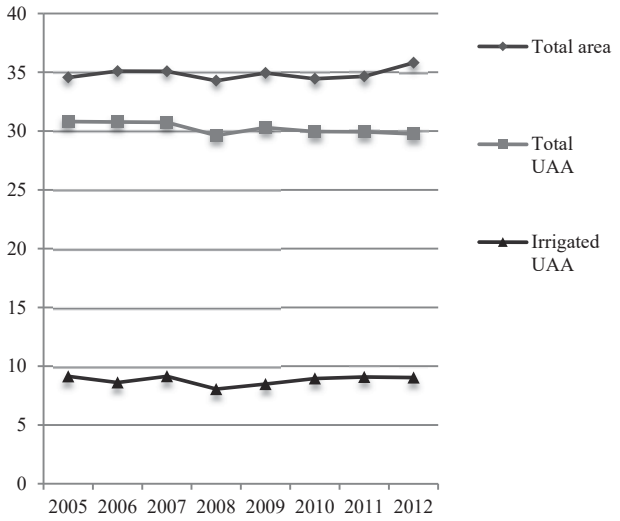

Fig. 1 Structure of Italian farms between 2005 and 2012 according to the sample (all farms, mean values in ha)

By contrast, the financial analysis of the same farms reveals notable changes (Fig. 2). The total and marketed production increased respectively by 14% and 16%. The most important change comes from the costs structure, which evolved towards a more flexible model. Fixed costs dropped by 37% while variable costs increased by 30% over the period. One should notice that variable costs include risk management practices such as buying crop insurance policies or chemical inputs. As a result, Italian farms reduce their break-even point, thus becoming less sensitive to changes in their income level while protecting it at the same time. Yet, amortizations are generally greater than investments regarding machinery, which may lead to a progressive obsolescence of production factors.

Charges devoted to risk management are classified among variable costs due to their optional and activity-dependent characteristics (Fig. 3). Observing in detail the structure of variable costs shows that expenses in risk management tools have notably increased. For instance, the costs of fertilizers and pesticides, which are commonly used to protect crop yields, respectively increased annually by 6% and 4%. Crop insurance premiums have increased by 2.2 times while the number of farms subscribing crop insurance policies rose by 1.5 times since 2005, when the reform of the national crop insurance system was implemented. Moreover, between 2008 and 2012, consultancy costs increased by 35%.

Water is a particular kind of input: while it is essential for crop production, it is subject to pressures on its availability due to drought episodes. Its use and related cost are fixed by specific policies, because of the public nature of water resources, so the cost is not subject to market dynamics. Over the period of study, the cost of water remained quite low compared to other inputs. It increased annually by 6% but this trend hides wide disparities among years, with the highest expenses being made in 2009 and not within the driest years.

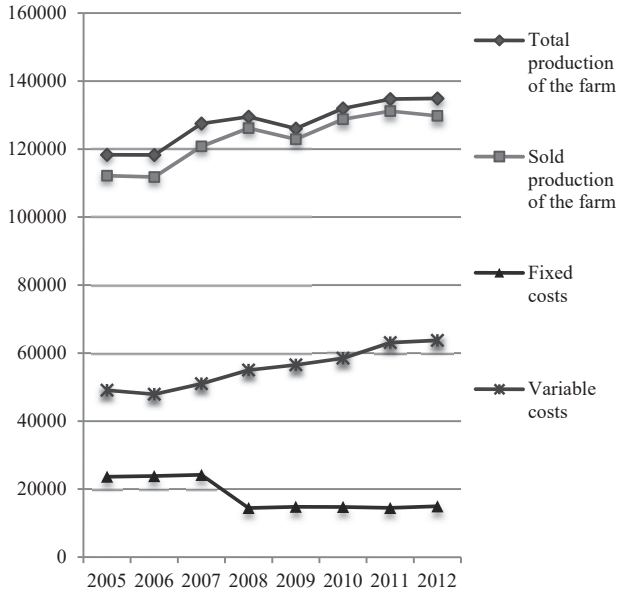

Fig. 2 Financial analysis of Italian farms between 2005 and 2012 according to the sample (all farms, mean values in euros)

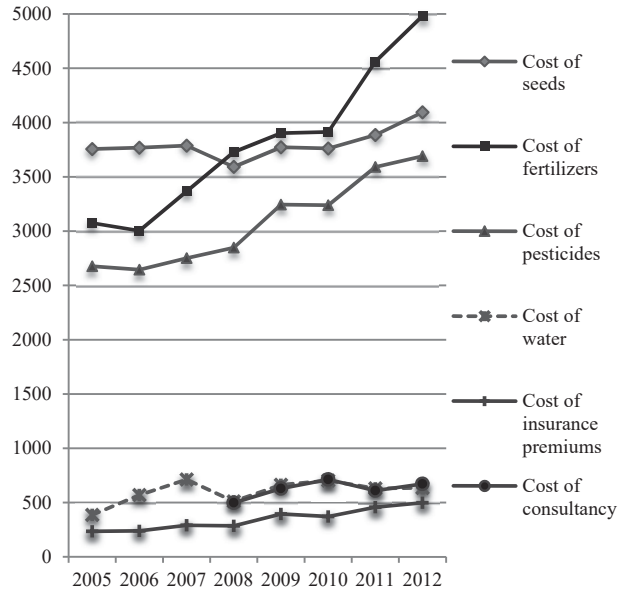

Fig. 3 Financial analysis of Italian farms between 2005 and 2012 according to the sample (all farms, mean values in euros)

The results clearly exhibit two trends that are amplified overtime: 1) Italian farms get significantly more coverage against natural hazards in the crop sector, whatever the instrument considered; 2) technical tools are preferred to financial tools, mainly for their flexibility and a limited cost per unit. For instance, an application of chemical inputs on crops can be done on request, while crop insurance subscription needs to be done before the season begins. Given the relative stability of the structure of farms included in the sample, we can infer that farmers combine rather than they substitute risk management tools.

There exist strong regional disparities among Italian farms (Fig. 4). Farms located in the Centre of the country are much larger (40 ha in 2012) than those located in the North and the South (respectively 27 ha and 29 ha in 2012). However, total production in the North and the Centre is somehow comparable while the South has very low levels of production. Moreover, farms located in the north of Italy use the most fertilizers, pesticides and crop insurance. Despite these structural differences, which denote a higher productivity when moving northward, we notice the same trends overtime that at the national scale, *i.e.* the stability of UAA and increases in total production. Indeed, the evolution of the cost structure is similar with a decrease in fixed costs and an increase in variable costs, with the main expenses made for managing crop risk dramatically increasing in all areas. The dynamics in the use of risk management tools differs among the location: the use of fertilizers increase the most in the North, the use of pesticides increase the most in the Centre and the use of crop insurance policies increase the most in the Centre. Despite huge annual variations, the cost of water remains broadly stable on average between 2005 and 2012, except in the Centre where it increases by 75% over the period.

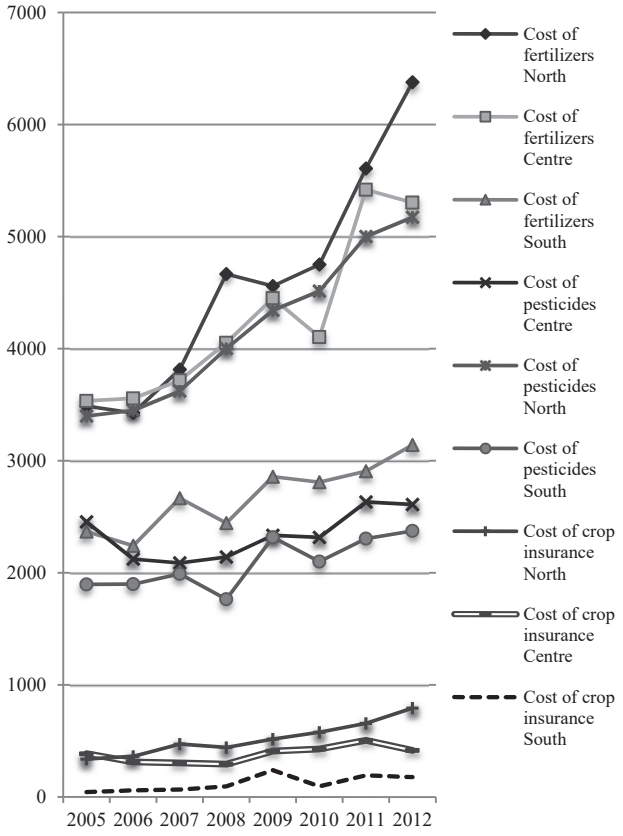

Fig. 4 Financial analysis of Italian farms between 2005 and 2012 per areas according to the sample (all farms, mean values in euros)

We differentiate four main types of farm production (field crops, fruits and vegetables, meat and mix). Studying the mix of production, which combines both crops and animals, leads to results difficult to analyze. The reason is the small number of farms classified in this category. Then, we compare the evolution of expenses devoted to crop or cattle insurance and to consultancy. These two instruments, whose use is strongly encouraged within the CAP for risk management, are available for all types of production. While insurance is used to hedge yield risk, consultancy aims at helping the farmer to adopt optimal practices.

The structures of farms that cultivate field crops and those that grow fruits and vegetables are clearly different (Fig. 5). The former are associated with a greater UAA and owned land as well as greater resulting production. As a result, farms cultivating field crops are the most insured. One must also note that crop insurance policies were primarily designed for this category of farms, which explains the strong and continuous increase of crop insurance subscription since 2003. The recent development of crop insurance policies devoted to fruits and vegetables offers these sectors a new opportunity to hedge their risks. Consultancy costs follow generally a positive and similar trend regardless of the crop considered. It also appears that farmers devote annually the same amount of funds to crop insurance and consultancy. Moreover, the use of these two instruments does not appear to be correlated, probably because they do not cover the same kinds of risks.

Meat production can also be insured and benefit from consultancy. However, expenses for both instruments remain very low. Since at least 2008 breeders have spent more money in consultancy than in livestock insurance. Such behavior may be explained by the relative inefficiency of current insurance tools in relation to the needs of farmers.

Referring to the influence of farm size (measured by its economic dimension) on risk management strategies, the results offer a contrasted view of crop insurance practices (Fig. 6). Except for the minority of farms belonging to UDE2 and UDE8, expenses in crop insurance are strongly increasing over the period 2005-2012: +764%, *i.e.* +31% annually, for UDE4, which includes a large number of Italian farms). However, such an increase is mainly due to a very low starting point (the legislative reform of 2004 started in 2005). In fact, only the biggest farms (UDE7 and UDE8) fully benefit from crop insurance with expenses rising annually by 18% and 13%, respectively. Similar observations can be made regarding the costs of consultancy as well as chemical inputs: medium farms are the most dynamic regarding risk management but only rich farms can afford the cost of the coverage.

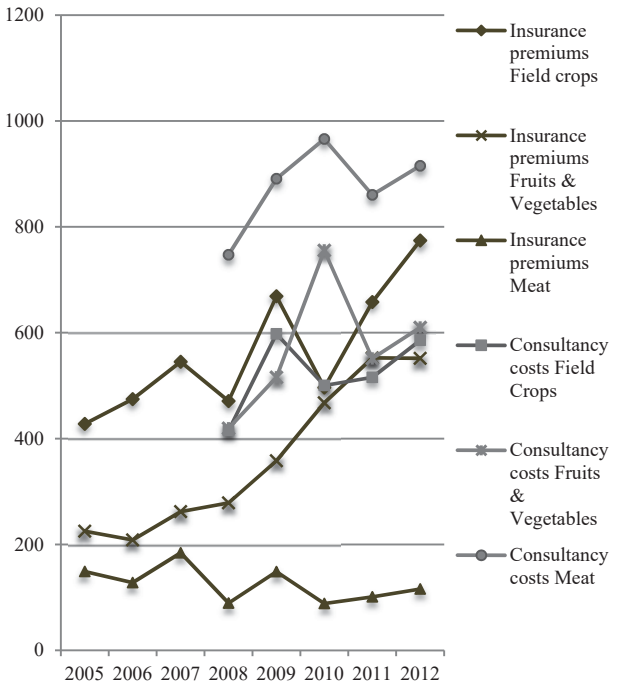

Fig. 5 Evolution of insurance and consultancy costs for Italian farms of the sample between 2005 and 2012 according to their production type (all farms, mean values in euros)

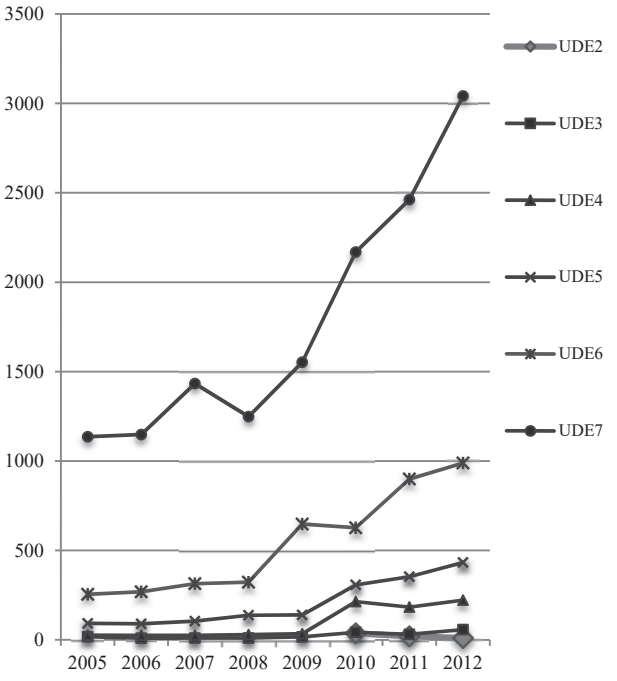

Fig. 6 Evolution of crop insurance premiums for Italian farms of the sample between 2005 and 2012 according to their economic dimension (all farms, mean values in euros)

A. Combination of Risk Management Strategies

Descriptive statistics can be complemented by an analysis

of the relationships between risk management strategies because farmers have the choice to use simultaneously many instruments. A convenient way to study dependencies among costs devoted to risk hedging (indicators described before), is to compute coefficients of correlations (CC). The indicators determine the degree to which two variables movements are associated, with a range comprised between -1 (perfect negative correlation, i.e. perfect substitution of instruments) and 1 (perfect positive correlation, i.e. perfect complementary of instruments), 0 meaning no correlation at all. The significance of the correlation coefficient (CC) is measured at the 5% level (denoted with a star in the tables), which is the standard confidence interval in statistics. Throughout the analysis, the large number of observations in the sample guarantees significance for most associations, even with very low correlation coefficients.

Regarding animal breeding, the number of products is almost independent of the sold production (SP) (CC = 0.18, close to 0) but is rather linked to the livestock units (CC = 0.84, close to 1) (Table II). The same relationship is observed between the level of insurance premiums and the livestock units. One should notice that crop insurance and certification are quite independent because these strategies correspond to different aims, i.e. protection versus valorization of the production.

TABLE II
MATRIX OF CORRELATION BETWEEN LIVESTOCK REVENUE AND RISK MANAGEMENT TOOLS ACCORDING TO THE SAMPLE (ALL FARMS, ALL YEARS)

CC	SP	Operating expenses	N. of products	Livest. units	Insur. Prem.	Being certified
SP	1.00					
Operating expenses	0.90*	1.00				
N. of products	0.18*	0.13*	1.00			
Livestock units	0.84*	0.85*	0.22*	1.00		
Insur. Prem.	0.27*	0.34*	0.11*	0.28*	1.00	
Being certified	0.04*	0.02*	0.18*	0.04*	0.02*	1.00

Note: * indicates a correlation significant at the 5% level

TABLE III
MATRIX OF CORRELATION BETWEEN CROP REVENUE AND RISK MANAGEMENT TOOLS ACCORDING TO THE SAMPLE (ALL FARMS, ALL YEARS)

CC	SP	N. of different crops	Cost fertil.	Cost pestic.	Cost water	Insur. Prem.	Cost consult.	Being certified
SP	1.00							
N. of different crops	0.08*	1.00						
Cost fertil.	0.68*	0.12*	1.00					
Cost pestic.	0.70*	0.09*	0.70*	1.00				
Cost water	0.38*	-0.02*	0.37*	0.39*	1.00			
Insur Prem.	0.29*	-0.02*	0.22*	0.31*	0.21*	1.00		
Cost consult.	0.29*	0.14*	0.46*	0.35*	0.12*	0.09*	1.00	
Being certified	0.01*	0.08*	-0.02*	0.04*	-0.03*	0.03*	-0.01	1.00

Note: * indicates a correlation significant at the 5% level

We notice that the costs of fertilizers and pesticides are largely linked to the sold production (Table III). Therefore, farms make such expenditures according to the level of income they are expecting. Conversely, the relationship between the sold production and the number of crops is very weak, which appears to be a choice linked to the cultivated area.

Crop insurance, consultancy and certification appear to be used independently of both the production structure (cultivated area, number of crops) and the context of risk management (chemical inputs). They are employed in specific contexts and not systematically. For instance, 18% of all Italian farms sell at least one certified product. This proportion varies among sectors but it systematically remains stable overtime.

Both the intensity of the correlations and their significance level are preserved among farm specialization, location and dimension.

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B. Focus on the Influence of Crop Insurance in Farm Management

In this sub-section, we focus more specifically on crop insurance subscription in order to understand which farms are insured and the consequences in terms of farm income and risk management.

Thanks to a changing institutional context, farmers who decide to subscribe to crop insurance policies are more numerous each year, passing from 0,08% in 2005 to 0,11% in 2012. This regular increase concerns all regions and specialties; however, we can notice strong disparities according to our sub-classifications (Table IV). For instance, being in the North of Italy doubles the probability of insuring the crops. Not surprisingly, farms specialized in field crops or

fruits and vegetables are more willing to insure their crops than farms that mix their production because the latter are more diversified. The economic dimension is finally a discriminant indicator because the larger is the farm, the more it is insured.

TABLE IV
PROPORTION OF INSURED FARMERS OF THE SAMPLE ACCORDING TO THEIR LOCATION, SPECIALIZATION AND ECONOMIC DIMENSION (ALL FARMS, ALL YEARS, IN %)

		Insured	Not insured
Region	North	12%	88%
	Centre	9%	91%
	South	6%	94%
Specialization	Field crops	11%	89%
	Fruits/Vegetables	13%	88%
	Meat	2%	98%
	Mix	4%	96%
Economic dimension	UDE2	5%	96%
	UDE3	5%	95%
	UDE4	6%	94%
	UDE5	9%	91%
	UDE6	13%	87%
	UDE7	15%	85%
	UDE8	14%	86%

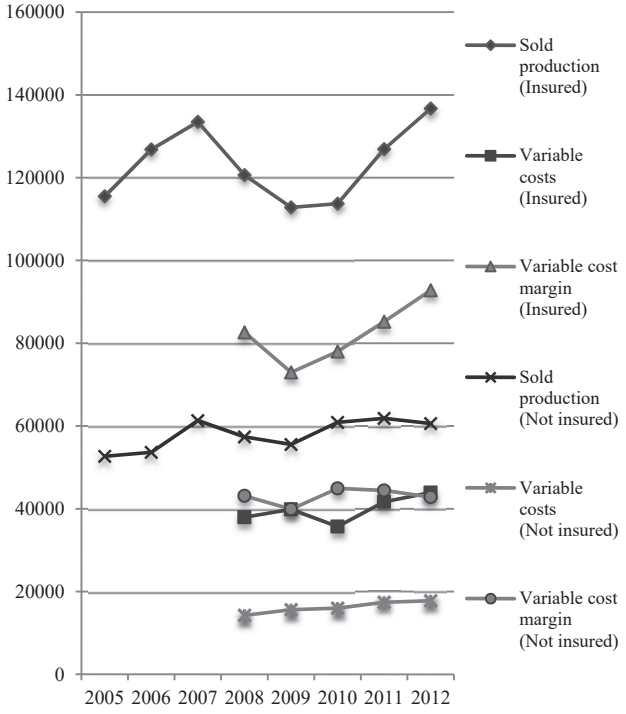


Fig. 7 Financial analysis of insured and non-insured farms of the sample between 2005 and 2012 (all farms, in euros)

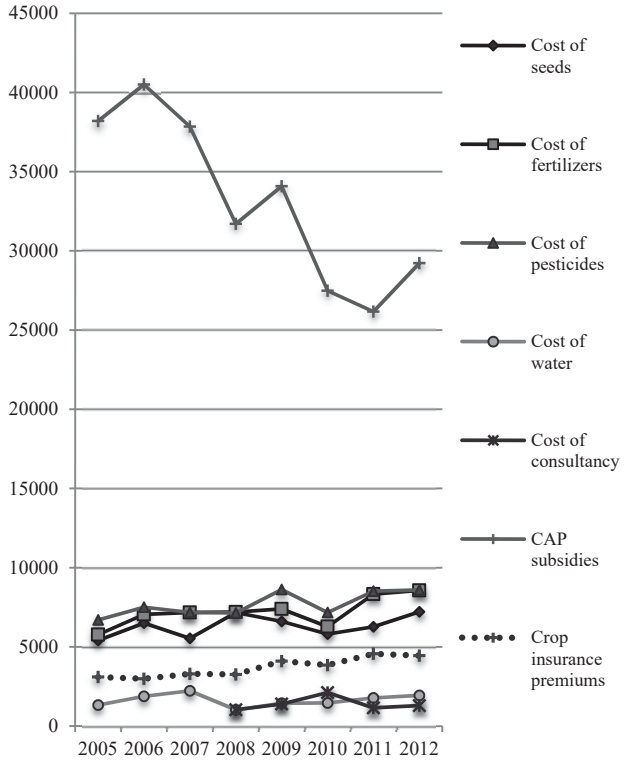
When considering the detail, it appears clearly that insured farms benefit from higher sold production which is quite volatile over time (Fig. 7). The charges induced by crop insurance premiums and the costs associated with other risk management strategies lead to an increase in variable costs after 2010 but this increase is more than compensated by a rise in the sold production. As a result, insured farms benefit from a higher variable cost margin. This indicator, which is computed as the difference between the sold production and the sum of variable costs, is associated with economic performance.

Non-insured farms benefit from a more stable sold production (+2% annually), which may justify their choice to avoid insurance. Yet, the level of variable costs increases at a higher rhythm (+4% annually), which leads to a continuous decrease of the variable cost margin since 2010. This result denotes a decreasing competitiveness of non-insured farms. Insured farmers benefit from higher CAP payments, because their farms are fundamentally larger (Fig. 8). Yet, these payments are very irregular. After a continuous pace of growth, they continuously decreased after 2006, despite a slight increase in 2009 and 2012. Non-insured farms are in an opposite situation because the CAP payments they receive increased by 10% between 2005 and 2012. CAP payments therefore seem more and more targeted toward small farms. The result is that European subsidies cover on average 100% of variable costs for non-insured farms while they only cover between 70% and 100% of such costs for insured farms. Given that context, it is not surprising to observe that non-insured farms increase their level of variable charges as CAP subsidies increase. Over the period 2005-2012, all charges increased, especially pesticides and fertilizers. Although very small, consultancy costs increased too. Facing a drop in CAP subsidies, insured farms tried to stabilize their variable costs by reducing drastically miscellaneous costs in favor of identified risk management tools. Between 2008 and 2012, the value of consultancy costs increased by 26%, while insurance premiums rose by 44%. A dichotomy between insured and non-insured farms could be observed regarding expenses in seeds: Being insured, a farmer is incentivized to select more expensive plants.

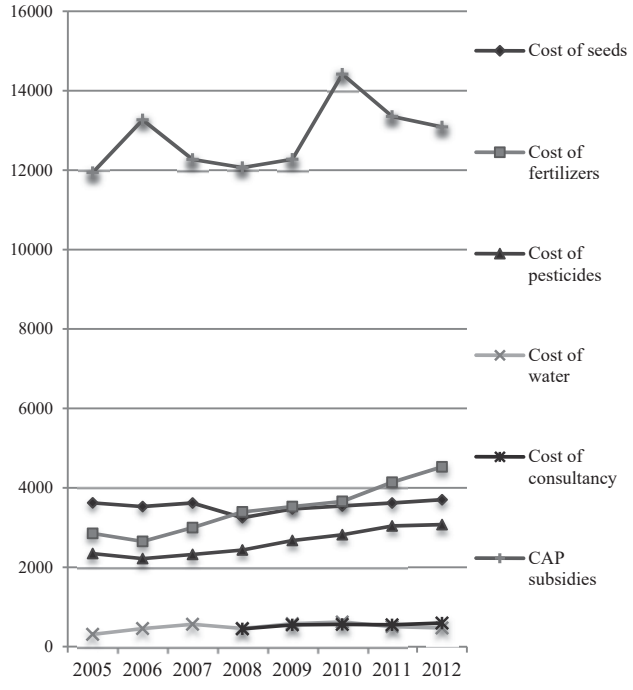
IV. CONCLUSION

Taking into account the methodological approach and the dataset, it is possible to find significant elements that should drive the design of the risk management tools in the new CAP and in the Italian risk management policy scheme. The following key points suggested by the analysis show that it might be more effective to rethink the policy design rather than to adjust it on a case-by-case basis.

Italian farms benefit from a wide range of instruments able to help them to face various risks. While their use is globally growing, such trends must be discussed and placed in the context of contrasted regions, productions and economic dimensions.



(a) Insured farms



(b) Non-insured farms

Fig. 8 Evolution of expenses for crop production between 2005 and 2012 for insured and non-insured farms of the sample (all farms, mean values, in euros)

The behavior of farms seems not to have really changed in order to adapt to climatic risks. Indeed, the structure of farms does not seem to be affected by the CAP during the period 2005-2012. In fact, only large and rich farms can afford all additional expenses required to hedge risk (crop insurance, pesticides, fertilizers, water and consultancy). They do so without changing their production structure overtime.

In case of a drop in the sold production, those farms, having a higher proportion of variable costs, are able to reduce their variables charges, thus getting more flexibility.

The observed trends of variable costs at the farm level exhibit a clear preference for technical tools instead of financial tools in order to hedge risk. Among the instruments, chemical inputs and water are the most employed. This situation creates also a stronger pressure on the environment in the preference for pesticides, fertilizers and water [12].

Insurance is marginally used, both to cover crop and animal yields, despite a trend favorable to its development. The trends of crop insurance expenses are positive only for big farms in income and size. The other categories where the greater part of Italian farms is inserted show a decrease in trend. The population of crop-insured farmers exhibits a different behavior compared to non-insured producers that is characterized by the development of alternative forms of risk management (consultancy and certification) and the regression of other forms of hedging.

The livestock sector is affected by climatic and sanitary risk, but concerned farms seem uninterested in the current financial tools. Within the crop sector, the trend of pesticides expenses denotes the lack of alternative and enough flexible management tools for dealing with phytosanitary risk. Therefore, sanitary risks need an alternative tool, likely a management designed at an upper scale, for instance through mutual funds.

Policy measures should have the objective to invert these trends, by improving or finding new tools more appropriate and convenient for farmers, in particular the small-medium ones. Such scheme could include for instance the enhancement of production diversification, irrigation infrastructures, advice services, technological and management innovations and formation-information-consultancy.

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