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# Perspectives on risk management as climate change adaptation measure in Italian agriculture

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## **INTRODUCTION**

In recent years, economic risk management tools in agriculture have been the subject of a renewed interest and profound evolution, not only for their increasing diffusion in national policies in support to agriculture but also in relation to the important role that they could have in adapting agriculture to climate change. This is because all scenarios currently taking shape show an increase of volatility in climate conditions and extreme events. In addition, agriculture is indeed the most exposed and vulnerable sector to such volatility. Mediterranean and Italian agriculture is particularly fragile in relation also to the wide variety of ecosystems, microclimates and environmental conditions, as well as the variety of agricultural production based on the quality and territorial specificity of its products.

The contribution that economic tools for risk management can bring in this context is related in particular to their flexibility and adaptability to farm needs. In order to be effective, these tools need strong integration in a wider framework of policies and actions on climate change adaptation. Moreover, it is crucial that, when designing these tools, consistency with other key agricultural objectives is ensured, most notably food security and environmental sustainability. Starting from an analysis of tools currently in use at international level and taking into consideration the Italian experience in risk management at national level (the National Solidarity Fund), this paper aims at highlighting both the potential and limitations of risk management tools in the context of climate adaptation and possible or necessary policies and future directions.

## **IMPORTANCE OF RISK MANAGEMENT FOR AGRICULTURE**

According to the generally accepted economic meaning, risk is a component of a company's activity related to the expectations of an economic result that may not be fulfilled owing to unforeseen events in the planning–production–sale process. In business management, planning seeks to consider all factors that may influence the expected result. However, there are some external factors with unpredictable behaviour that generate uncertainty and potential risk. Generally speaking, the above concepts concern all business activities. However, the agricultural sector presents important peculiarities, as production is strictly correlated to environmental and climate factors that, by their very nature, are hardly subject

to management control. In short, agriculture has a higher exposure (to climate events) and higher vulnerability (to the consequences of events).

In particular, the production risk associated with adverse weather conditions<sup>1</sup> (generally speaking, “climatic risk”), understood as the risk that the yields or the quality of production are lower than expected owing to the effect of adverse meteorological or environmental events, has always been considered as a matter of priority and perceived as medium/high risk (in terms of likelihood and damage).

The concept of climatic risk may encompass also the behaviour and diffusion of physiopathologies and parasitic attacks, which appear in the long term to be abnormal as a result of exceptional events.

Agriculture in the Mediterranean basin has a higher degree of exposure and vulnerability to climatic risk compared to other areas for the following reasons:

- It is based on the quality of production rather than on quantity, that is, on production with high added value and with significant economic relevance also in terms of exports. Therefore, equal damages in quantitative terms, correspond to higher economic loss;
- Environmental and climatic conditions of countries of the Mediterranean, most notably Italy, are extremely heterogeneous. This factor renders production more diverse and rich but also entails higher risks for the territorial specificity of production.

Given these considerations, risk management in farms has always represented an important element and, in certain cases, a decisive factor for the farms’ very existence.

In this already complex contest for risk management, climate change (CC) raises fundamental questions regarding the future of agricultural production. Compared with baseline scenarios, in fact, climate change increases the level of uncertainty and variability of the environmental conditions under which agriculture operates and thus heavily influences cultivation cycles, agricultural practices and farm management.

Recent and ongoing studies<sup>2</sup> highlight the possible effects of CC on the agriculture of the Mediterranean, most notably Italian, taking into consideration the main climatic variables in different zones of the Member State and, in certain cases, simulating the effects of such changes on specific aspects such as yields, water availability and phytosanitary conditions.

These studies broadly converge in predicting an increase of approximately 1.5–2 °C by 2050 and of 3 °C by 2050, in particular in southern Italy, accompanied by a decrease in annual precipitation and an increase in the frequency of alluvial rain. Such a scenario entails, *inter alia*, a worsening of the desertification process in the most southern regions of the peninsula – not only coastal areas – accompanied by a higher risk of floods.

The supposed repercussions on the biotic component concern in particular the phenological development of agricultural cultivations: not only is a concentration and

<sup>1</sup> The definition of adverse weather conditions is not clearly defined at international level. According to the European Commission’s community guidelines for state aid in the agriculture and forestry sector 2007 to 2013, national disasters include earthquakes, avalanches, landslides and floods. The Commission does not acknowledge the insurgence of plant and animal diseases or exceptional events unless the latter are particularly calamitous (in terms of diffusion) for which the Member State justifies the exceptional nature of such event.

<sup>2</sup> Projects financed by CLIMAGRI, Agrosenari Programme, AdaptAlp.

shift of floristic areas towards cooler and more internal zones being reported, but also, and more importantly, a displacement of all phenological phases, which varies according to the specific cultivation (more pronounced in long-term cultivations, less pronounced in short-term ones)

Concerning productivity, the common understanding – yet to be verified in more specific situations – is that the increase in temperatures and the decrease of precipitations may cause a reduction in production owing to the impacts on irrigation (less water available), cultivation systems (modification of cultivation cycles, hazardousness of pathogens, modification of the entomological component) and on animal production. For instance, scenarios on phytosanitary conditions reveal that higher temperatures may favour the development of pathogens also due to the cultivations increased thermal and water stress, thus subject to higher vulnerability, and to the arrival of new pathogens typical of subtropical areas .

Moreover, the impact of the increase of temperatures on animal health and well-being is also being debated: notably, the effect of high temperatures on the nutrition of the breeding stock (reduced appetite and reduced productive and reproductive capabilities as a result of increased stress)

In short, even if agriculture has always adapted naturally to the environmental conditions in which reproduction occurs, the ongoing climatic changes put forward specific problems, such as:

- the speed of the changes in relation to the ability of agri-ecosystems to self-adapt;
- the increasing frequency and the higher magnitude of extreme meteorological events such as drought and floods;
- the uncertainty of climate change scenarios;
- the global production of food: while climate changes may create new production opportunities, they may generate more important preoccupations regarding the ability of agricultural systems to ensure food security for an increasing world population.

The above considerations complicate the context in which business choices take place. The latter become increasingly more uncertain regarding the type and quantity of production and regarding the execution of practices, i.e. seeding, irrigation, phytosanitary intervention and harvesting (when, how, how much). In other words, farmers are today faced with the choice, on the one hand, to continue operating as usual (entailing a higher risk), or investing in a more complete risk coverage, adapting the farm and its management.

Therefore, beyond CC mitigation policies, there is no doubt that considerations and solutions need to be sought in order to adapt agricultural practices to the unfolding climate and environmental scenarios.

## **CLIMATE CHANGE ADAPTATION STRATEGIES AND RISK MANAGEMENT**

It follows that, inside climate change adaptation strategies, risk management at local and farm levels represents one of the most important elements and key challenges. There are different typologies of actions available, most notably:

- Structural: actions for the improvement of business infrastructure and of the territory in order to reduce the exposure and vulnerability to the effects of CC.

- Management level: improvement of farm and territorial management (business planning, innovation and modernization of management, diversification of activities and production), decision-making support and early warning for drought, floods, landslides and pathogenic attacks.
- Economic: financial and economic tools to cover risk such as insurance, compensation funds, mutual funds, investment funds, etc.

Concerning in particular the latter category, traditional associated tools are considered useful, compared, for instance, with structural or infrastructural investments, for their characteristics of flexibility and adaptability at the stage of definition as well as application (contracts with subject and objectives that are modifiable in time and space). In the context of CC, such characteristics are even more important (and indeed useful) given the uncertainty regarding the effects and impacts on production. This is because economic tools are adaptable in terms of objectives and substance as different scenarios may unfold.

The analysis of 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 (Pontrandolfi and Nizza, 2011). In most cases, public support is in fact targeted to the specific needs of each context: adverse 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 cases in point (the most frequent being agricultural insurance).

In this historical context, the main challenge is how to adapt risk management tools as currently being carried out in various countries in order to make them tools for CC adaptation, building on two fundamental considerations.

The transformation of the climatic asset is going to modify (is modifying) the behaviour of the main variables that impact risk distribution both in terms of pattern and of measurement, mainly that of production.

Tendentially, an increase in general levels of risk is to be expected, as well as an intensification of uncertainties and question marks regarding the behavior of the main reference parameters (first and foremost temperature, precipitation and yield).

In summary, if tools and policies for risk management are to be devised that are functional also for adaptation objectives, it will be necessary to review the phases of the process, taking into account the change scenarios as elements for both the risk identification (taking into account also emerging risks) and assessment phases (re-assessment of risks given the changing scenarios).

Given the above considerations, the choice of strategies and objectives should also undergo review and adjustment where needed, always keeping in mind the goal of maximizing the effectiveness of the interventions.

## **EVALUATION OF ECONOMIC RISK MANAGEMENT TOOLS IN AGRICULTURE IN ITALY**

Italy is among the countries with a strong tradition of risk management through economic and financial tools. This is mainly because of its particular geographic, morphologic, climatic and production characteristics, which determine strong heterogeneity, and thus

complexity, of variables as well as higher exposure and vulnerability to risk associated to meteorological and climatic conditions. Since the 1970s, the insurance market had offered single-risk hail insurance policies with the partial coverage of the “National Solidarity Fund for Natural Calamities in Agriculture” established and dedicated to the financial compensation of farmers hit by natural calamities. The fund was subjected to an historical turn with the 2004 reform (legislative decree 102/04), which changed its principles and economic tools. The underlying objective is to promote, via the activation of public funds, prevention actions to address damage, in areas hit by natural calamities or extreme events, to agriculture and zootechnical production, farms and production plants. The types of intervention foreseen are as follows:

- a. Measures addressed at providing incentives for the stipulation of insurance contracts: aid for payments of insurance premiums consists of a public contribution up to 80 percent of premiums for contracts with a damage threshold of above 30 percent. The signing of the insurance policies is voluntary and can occur in individual or collective form through agricultural consortia or cooperatives.
- b. Compensative interventions for damage to production, infrastructure and production plants: aimed at helping the economic recovery of farms that have suffered more than 30 percent of damage in their gross saleable production.

This approach responds to two different risk management strategies (Pontrandolfi and Nizza, 2011):

- Transfer of risk to third parties, traditionally associated with insurances and generally used for risk management with medium probability of the event happening and with a medium degree of damage.
- Acceptance of risk generally associated with low probability events with a high degree of damage for which the onus appears to be on the farmer to accept to run the risk.

It is important to highlight that the principle of exclusion is foreseen for both types of tools, which is not always applied in other countries: it is not possible to give compensation contributions for insurable damages (included in the annual agricultural insurance plan, approved by ministerial decree of the Ministry of Agriculture)

The 2004 reform and its evolution in 2005–2009 highlight the national policy choice to give more weight to insurance interventions, which today cover around 80 percent of the available funds, compared with public interventions for damage compensation.

Furthermore, in recent years, the demand for and offer of insurances has widened and diversified: the introduction of new insurance types (pluri-risk and multiple risk), in addition to traditional ones (single-risk of hail), has certainly contributed to the diffusion of insurances in areas where they were traditionally lacking. In recent years, there has been a constant increase of pluri-risk policies, which today cover approximately 46 percent of the agriculture insurance market (Razeto, 2011). Pluri-risk insurances linked to unfavourable meteorological conditions (drought, hail, floods) have had a significant diffusion.

At legislative level, a number of already existing opportunities arise from combining EU and Italian law, even if some of them are not considered implementable or of interest for Italy (Table 1). As seen from the table, contributions for insurance premiums can also derive from the Common Market Organisation (CMO) for Wine and Fruit & Vegetables, even if

**Table 1: Allowed tools and risk typologies covered by EU and Italian law**

Type of risk	Allowed risk management tools		
	National framework	European Framework	
	National Solidarity Fund	Reg. 73/09	CMO
Climatic adverse events	<ul style="list-style-type: none"> <li>• insurance</li> <li>• compensation funds</li> </ul>	<ul style="list-style-type: none"> <li>• insurance</li> </ul>	<ul style="list-style-type: none"> <li>• insurance</li> </ul>
Plant diseases and pest infestations	<ul style="list-style-type: none"> <li>• insurance</li> </ul>	<ul style="list-style-type: none"> <li>• insurance</li> <li>• mutual funds</li> </ul>	<ul style="list-style-type: none"> <li>• insurance</li> </ul>
Epizootics	<ul style="list-style-type: none"> <li>• insurance</li> </ul>	<ul style="list-style-type: none"> <li>• mutual funds</li> <li>• insurance</li> </ul>	
Environmental		<ul style="list-style-type: none"> <li>• mutual funds</li> </ul>	
Market			<ul style="list-style-type: none"> <li>• common investment funds in CMO in fruits;</li> <li>• mutual funds in CMO for wine</li> </ul>

to date only the premiums for the Wine CMO have been utilized. Since 2010, for the first time in the history of the Common Agriculture Policy (CAP), some contributions for risk management tools come directly from the CAP as amended by Regulation 73/2009/EC (“Heath Check” regulation). Specifically, Italy has implemented Article 68 (d) relating to contributions for insurance policies, regarding it as an important opportunity for risk management in the country. Italy is now one of the most active Member States in pointing out the importance of risk management in agriculture in EU policies.

Currently in Italy public contributions for insurances and compensation funds are available. An issue discussed is obviously that of the ability of the system and of insurance policies available in the market to satisfy the exact needs of the agricultural sector with regard to the occurrence and damage caused by adverse meteorological events. The most debated topics are the following:

- At legislative level, the lack of legislative tools that are complementary or supplementary to insurances and compensation funds and that are able to manage other levels and types of risk currently not covered (market, disease, price risks).
- The insurance base is still considered to be excessively low (approximately 18 percent of national production) despite significant public contributions.<sup>3</sup>
- The disparity in geographical distribution with a predominance of premiums in northern Italy (70–80 percent) and enterprises and insurance companies of central and southern Italy that are reluctant to use insurances.

It is worth noticing that, among the needs for innovation that have emerged in recent years, the introduction and diffusion of new tools enabling wider choice and freedom for action to farmers in difficulty, have emerged in particular, given the increase in the frequency of adverse events linked to CC. Mutual funds have spurred a certain degree of interest. Experience with the latter, albeit contingent and intermittent, has demonstrated to be almost always positive. In general terms, the existence of mutual funds that do not benefit from public contributions may imply that the agricultural sector has enough

<sup>3</sup> Ministero delle Politiche Agricole Alimentari e Forestale (Ministry of Agriculture, Food and Forestry), 2010.

confidence in such a tool. Funds are not seen in contrast with insurances but rather as important and potential complementary tools that are able to cover types and especially levels of risk that are non-insurable: According to an INEA analysis on mutual funds, it has emerged that the stronger competition ensured by the very existence of a fund is generally considered to have a positive effect on insurance policies (they tend to decrease) and their typologies. Essentially, the most evident positive effect is the placing on the market of different risk management tools. Finally, a consideration emerging from the agriculture sector on the conditions of risk: in the areas where insurance premiums paid are much higher than compensation received, the investment in a mutual fund may be considered more effective and useful.

### **OPPORTUNITIES EMERGING FROM CAP POST-2013 REFORM**

Following the European Commission's communication adopted in November 2011 on future directions for CAP post-2013, a proposal for a Regulation on rural development has been put forward and is currently being negotiated. The proposal, for the first time, introduces in the European Union a comprehensive policy framework of measures and tools for risk management in agriculture. The proposal acknowledges that the agricultural sector is more vulnerable than other sectors to suffer damage to its production potential as a result of natural disasters. Therefore, support to farmers for the recovery of the agricultural assets damaged by natural disasters as well as support for risk management is required. Most notably, the proposal introduces a specific measure for risk management, providing support for:

- crop, animal and plant insurance premiums against financial losses caused by adverse climatic events or by animal/plant diseases or parasitic infections (art. 51);
- mutual funds;<sup>4</sup>
- to pay financial compensation to farmers for losses suffered as a result of the outbreak of animal or plant diseases or environmental incidents (art. 52); contributions may include: the administrative costs of setting up the mutual fund, spread over a maximum of three years in a degressive manner; the amounts paid by the mutual fund as financial compensation to farmers; interest on commercial loans taken out by the mutual fund for the purpose of paying the financial compensation. No contribution of public funds is accepted to the initial capital of the fund (paid by farmers);
- an income stabilization tool, in the form of financial contributions to mutual funds to compensate farmers that have suffered a loss of over 30 percent of their income<sup>5</sup> (art. 53). Payments by the mutual fund to farmers shall compensate for not more than 70 percent of the income lost.

The income stabilization objective in the CAP reform deserves particular attention. Income as a variable is not a component of risk. Income is the final result, while the risk factors are the variables influencing the result.

<sup>4</sup> By "mutual funds" we mean a regime recognized by the Member State, in line with its legal system (Member States define rules for the establishment and management of funds), which allows member farmers to cover themselves and to benefit from compensative payments in the case of economic losses.

<sup>5</sup> Income reductions must be in excess of 30 percent of the average income of the previous three years or of a three-year average based on the previous five years excluding the highest and lowest years in terms of income. Income is referred to as the sum of revenues that the farmer receives from the market, including any form of public support.

In any case, in the emerging global context, the choice of income stabilization tools represents an emerging and much debated issue since the recent market crises as well as price volatility have emphasized the need to find new ways for income stabilization in agriculture to complement traditional income support measures (present in all Member States via different support policies and tools). On this subject, an intense debate at political and technical level has emerged, including at European level, in the perspective of the future CAP. Some countries have initiated studies and evaluations on the subject (France, Spain, Italy) in order to look at the most problematic aspects, that is, the definition and the calculation of income (links to fiscal systems and historical data analysis) as well as the integration with other tools in order to avoid overcompensation.

The major opportunities arising from a new system would certainly reside in the potential synergies between risk management tools and other rural development measures of a more structural and management nature. The latter can contribute to a reduction of risk exposure and of the farms' vulnerability, first and foremost agro-climatic-environmental measures, production diversification, irrigation infrastructures, technological and management innovations and formation-information- consultancy.

Some concerns about the new system are instead given by the modalities and timing of the rules foreseen for rural development (multi-annual contracts, complex administrative procedures), which might not be in line with the traditional needs of risk management, which necessitates immediate actions for the farm to recover following the damages suffered (it is crucial that contracts be annual and reimbursements are immediately effective).

## CONCLUSIONS

Based on the above, several observations arise on the opportunities offered by economic risk management tools with regard to the objective of adapting agriculture to climate change. There is no doubt that this type of tool may be useful to farms in order to address the increase of climatic risk, in particular considering the uncertainty and complexity of factors involved. In the presence of unforeseeable and extreme events, both in terms of occurrence and magnitude, risk coverage can represent a means for the very survival of the affected farms.

Given this premise, it is however important to highlight that risk coverage through economic tools cannot itself represent the answer to CC, as its intervention limitations as well as its effectiveness largely depend on the conditions in which risk coverage operates, that is, at business and territorial level, where actions are taken to reduce the risk factors within acceptable limits. In other words, economic tools operate within the limits of the risk curve (likelihood and impact of events). If the latter are modified as a result of CC, without rebalancing interventions of another nature, the economic tools may result as ineffective (i.e. insufficient financial coverage of damages or lack of incentives to activate insurances)

By means of example, if flood phenomena increase and the area is not safeguarded from hydrological risks, an economic risk management tool would not suffice to cover the damages caused by an extreme event. Similarly, the tools would lose effectiveness and ability to intervene (claims for damages) if the business does not undergo structural (i.e.



anti-hail nets, improvement of irrigation supply, maintenance of ditches, strengthening and adjustment of infrastructure, etc.) and management-level (risk planning, farm innovation and modernization, diversification, farm advisory system and early warning system) improvements to reduce the impact of CC.

A further point worth underlining concerns the environmental and economic sustainability of economic tools and their consistency with the strategic objective of food security. With regard to environmental sustainability, the main concern is the occurrence of “maladaptation” phenomena, that is, a worsening of the farms’ levels of attention, maintenance and innovation – and thus of land, water and soil management – given the presence of an economic tool covering possible damages. The same concern may arise in relation to the food security objective, as these tools safeguard the farmers’ incomes. The latter are important for the livelihood of rural communities; however, they do not guarantee production levels, which, generally speaking, are the most affected by the impacts of CC. While it is obviously difficult to estimate the impacts of a wide diffusion of risk management tools on production levels, it represents nonetheless an element worthy of consideration when designing support policies.

These considerations are even more relevant when operating in a national or international policy context: when choosing to allocate public funds to risk management, the ineffectiveness of these tools would imply inefficiency of public spending.

It is thus of crucial importance that risk management tools are placed within a more general integrated risk management strategy for the adaptation of agriculture to CC, which clearly defines complementary actions and structural, management and economic synergies as well as ensuring consistency with other strategic objectives.

At the same time, to exploit the potential of these tools in order to sustain adaptation policies, an update and review of existing tools is needed. First, as mentioned above, a review of risk analysis, including, where possible, the emerging risks in relation to CC as well as rethinking priorities as a result of new climatic conditions, would be necessary. In this context, it is also important to highlight the need for improving the planning process of risk at both business and policy level defining risks, priorities and objectives, and only at a later stage choosing the most appropriate tools for specific conditions. Currently, in fact, the opposite approach seems to prevail in many countries. In other words, there is a tendency to adapt, in some occasions to “force”, the existing tools available on the market to manage risks. This approach necessitates higher public funds in order to provide incentives for their use as otherwise these tools would not be available on the market. An example are insurances, which are indeed a very widespread and useful tool, but nevertheless are encouraged also for levels and typologies of risks (i.e. phytosanitary) that are not insurable on the basis of the insurance system’s evaluation criteria. Therefore, it also appears necessary to widen the choice of economic tools currently available to farms, which should be able to choose among several options in consideration of their specific needs, thus ultimately improving the efficiency of public expenditure. The analysis of the international context underlines nonetheless that risk management in agriculture cannot, at present, be set apart from public support policies. Therefore, efforts to increase the diffusion of these tools in agriculture need to be accompanied by investments.

Finally, one last consideration arises from the uncertainty of climatic scenarios. In order to support agriculture in these sensitive historical times, while encouraging *ex-ante* tools that cover risks preventively, it appears necessary to ensure the existence of solidarity funds of a compensatory nature (*ex-post*). This is because the difficulty in appreciating the distribution and the intensity of extreme events renders agriculture more vulnerable if only *ex-ante* tools are utilized.

In conclusion, risk management through tools of an economic nature should represent just one component of a wider adaption strategy. Only a multilevel (at farm and territorial levels, with management and structural measures), integrated and consistent (which takes into account various global strategic objectives such as sustainability and food security) approach is able to ensure the effectiveness of the policies used in the long term.

In summary, the conditions for effectiveness are:

- integrated planning and programming of actions;
- innovative actions : new solutions to new problems, favouring prevention;
- sustainability of actions.

## REFERENCES

- Pontrandolfi, A. & Nizza, G. 2011. Prospettive della gestione del rischio in agricoltura. Riflessioni per un sistema integrato per la PAC post 2013, INEA, Roma.
- Razeto, G. 2011. Campagna assicurativa (2010): un primo bilancio. Convegno assicurazioni e gestione del rischio in agricoltura: nuovi strumenti ed innovazioni operative. Perugia 26 gennaio 2011.