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The application of insurance as a tool for mitigating the effects of drought in agriculture

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SUMMARY – Many management models and instruments have been devised in the farming sector in response to the traditional uncertainty that has characterized agricultural activity since its origins. Starting from informal organization models, in recent years we have arrived at the use of insurance as the most effective tool for mitigating the risks arising from drought events. This text describes the benefits for rural society and a country's economy as a whole of the availability of insurance, and the requirements that should apply to an insurance model in order to achieve the best results. After defining the various instruments available for managing losses caused by drought, we review the results achieved in Spain in the development of drought insurance. The greater the development in agriculture, the more possibilities there will be for the implementation of insurance models, and in this respect, there are currently good prospects in the EU context.

Key words: Risk management instruments, agricultural insurance and drought.

RESUME – *"Application des assurances comme instrument pour l'atténuation des effets de la sécheresse en agriculture". Pour répondre à la traditionnelle incertitude qui a caractérisé l'activité agricole depuis ses origines, les modèles de gestion et les instruments qui ont été conçus dans le secteur agricole ont été nombreux. Il y a quelques années, en commençant par des modèles informels d'organisation, l'assurance était utilisée comme outil le plus efficace pour atténuer les effets économiques dérivés de la sécheresse. Dans ce texte sont décrits les avantages pour la société rurale et pour la propre économie nationale dérivés de la disponibilité de l'assurance, ainsi que les exigences devant accompagner un modèle d'assurance afin d'obtenir de meilleurs résultats. Après avoir défini les différents instruments disponibles pour la gestion des pertes occasionnées par la sécheresse, les résultats atteints en Espagne durant le développement de l'assurance sécheresse sont signalés. Au fur et à mesure que le développement du secteur agricole avance, les possibilités d'implantation de modèles d'assurance seront plus importantes. En ce sens, de bonnes perspectives sont actuellement enregistrées au sein de l'UE.*

Mots-clés : *Instruments de gestion des risques, assurance agricole et assurance sécheresse.*

Risk management in agriculture

In varying degrees, in the various countries and regions, all farmers have traditionally had to face the consequences of damage caused by climatic phenomena, pests, diseases and fluctuations in the markets for their supplies and products. Along with these risks, farms also have to face those characteristic of any economic activity.

The key to the success of farms as businesses, whatever their size, scale and context, lies in their ability to withstand such damage, overcoming damaging events and continuing the production cycle. Among all the risks that may afflict farms, drought is one of the main factors affecting the development of agriculture in a large portion of arable areas in temperate regions.

The literature available on the effects of risks on farms (Binswanger and Deininger, 1997; European Commission, 2001; Anderson, 2003a,b and Innes, 2003) allows us to define certain common issues in relation to their management: (i) farmers show a clear aversion to risk, and are willing to relinquish part of their revenue in order to reduce the variability of their income; (ii) farms of smaller size or in high-risk areas have to devote considerable financial resources to self-protection, thereby reducing their chances of building up a surplus for capital formation; (iii) in crisis situations, and in the absence of other instruments, the farm's own capital has to be drawn upon in order to stabilize disposable income; (iv) in rural areas in many developing countries, the financial and insurance markets are highly deficient and sometimes non-existent, making it hard for farmers to

access credit and insurance and so to be able to stabilize their income; and (v) from a general-interest perspective, it seems evident that the lack of risk management instruments in agriculture curbs economic development in the rural environment and in a country's agricultural economy.

Some instruments and strategies for the management of drought risk

The large scale of drought risk, given the intensity and variability of losses (in time and space) that it may cause, and the extent of territory that may be affected, makes it hard to put forward general recipes for its management. Drought risk management is further complicated by the importance, in the definition of strategies, of the socio-economic characteristics of the farms concerned.

These difficulties are heightened by certain specific characteristics of drought risk which distinguish it from other climatic perils, such as the facts that: (i) damage becomes apparent progressively, with losses that increase in line with the duration of the drought situation; (ii) the risk is systematic, so it affects a large number of producers; (iii) its most specific symptoms, which take the form of a fall in yield, may be masked by those of other phenomena or circumstances, making the damage hard to value; and (iv) in the design of coverage models special attention must be paid to technical and control issues, so as to reduce the impact of moral hazard and adverse selection.

The aforementioned difficulties in establishing uniform risk management models may be tackled with a wide array of strategies and instruments.

Strategies for drought risk management in farms

Producers may, at farm level, take various proactive measures so as to make them better placed to withstand the consequences of drought and to safeguard their activity, and in particular the following (Hardaker *et al.,* 1997):

(i) *Gathering of information* – given that producers' perception of risk is highly subjective, the gathering and compilation of information on the nature and effects of that risk is a good starting point for the management thereof. In this connection, data on the availability of water for irrigation and precise details of rainfall and its likely distribution are vital in order for the best crop decisions to be taken with a view to adapting to the phenomenon of drought.

(ii) *Reduction of risk exposure* – on the basis of the information available – the farm's technological resources and the environmental conditions – the producer has a certain margin in which to reduce the impact of risks by applying the precautionary principle and abandoning risky strategies, though this may cause a loss of income and higher costs. In relation to drought we should keep in mind, for example, that there are cultivars of many species that are more tolerant to climatic extremes, such as droughts or heat waves, and that certain growing or land management practices allow a better utilization of water resources.

(iii) *Diversification of production* – aimed at reducing variability in the farm's overall revenue, with a selection of activities whose revenue is minimally or negatively correlated. In many cases, and especially when risks are systematic, this can be achieved only with the spatial dispersal of production on sites with different environmental conditions. Diversification can also be achieved by branching into different economic activities.

(iv) *Flexibility* – understood as a farm's capacity to adapt to changing circumstances, i.e. flexibility in the farm's capital equipment, with productive assets that have multiple uses; flexibility in production, with products that have various uses or purposes; flexibility in marketing, with products with various market outlets or higher quality; and flexibility in costs, with fewer fixed costs and more variable ones.

(v) *Self-insurance or individual funds* – risk management based on the distribution of risk over time and the establishment of a reserve fund to which the producer pays in contributions in years with good financial results. This stabilizes income only in the event that sufficient resources accumulate in the fund after a number of years with no withdrawals.

Main instruments for the management of drought risk on farms

The aforementioned strategies have a very limited sphere of application, and are effective only against moderate fluctuations in revenue. Accordingly, to deal with damage on a larger scale, exceeding the producer's ability to handle it, we need to have recourse to instruments based on the distribution or transfer of risk to third parties, i.e. the "mutualisation of risk". The most notable ones are the following:

(i) *Informal instruments for the distribution of risk* – in undercapitalized or underdeveloped agricultural economies, farmers have on certain specific occasions found informal methods for distributing risk. These have on occasion been related to traditional forms of resource pooling, crop distribution or other types of reciprocity or solidarity among farmers. These are the most basic form of collective risk management, not currently of significance in the commercial agriculture of developed or developing countries (Townsend, 1995).

(ii) *Extraordinary public post-disaster aid* – where there are no formal instruments for risk management, after catastrophic damage that may jeopardize farm stability, governments are obliged to grant aid to those affected. Such aid may be given in various forms: tax aid, direct payments, subsidized loans, distribution of products, etc. One of the main objections made to the granting of such aid is that, since it is free to the producer, it removes the incentive to make use of other management instruments that are more effective but which require the farmer to make an outlay.

(iii) *Disaster or catastrophe funds* – in order for risk to be truly "mutualised" it is necessary for all the population exposed to the risk to make pre-established systematic and periodic contributions to a "common fund". After the occurrence of a disaster the capital in the fund is used to compensate those affected with the amounts specified in the fund's rule or operation, as it has no capacity for borrowing.

(iv) *Crop insurance* – insurance is a formal way of gathering up the risks to which a large group of individuals are exposed. Actuarial logic requires that the premiums paid by those who take out the insurance are sufficient to cover the expected indemnities for all the insureds, the insurance administrative costs, the legally required reserves, business profit in the insurance industry and the cost of reinsurance.

Lessons learned regarding the main tools for the management of drought risk

A suitable use of instruments for drought risk management requires a specific knowledge of the actual possibilities offered by each model and the limitations on its use (Table 1). The strengths and weaknesses set out below come from the results available from experiences put into practice in various countries.

There are naturally specific conditions applicable to the use of each system, which must be respected in order to achieve effective results and to prevent disappointments that may cause producers to reject the establishment of any risk management model (Pomareda, 1986; Roberts, 1989; Hazell, 1992; Skees, 2000).

In any event, both the Spanish experience and that available from other countries shows that agricultural insurance has the best chances of forming an effective model for the management of drought risk.

Insurance as a proven and efficient tool for the management of drought risk

Most developed countries, and even developing ones, have ample experience of the design and development of insurance models, albeit chiefly intended to cover simple risks such as hail or fire. Only a quite small number of countries have insurance models designed to cover the consequences of drought risk.

Although agricultural insurance cannot hope to cover all the risks liable to harm farm economies, the great impact of drought (Fig. 1) in local, regional and even national economies has led to the

development of more complex insurance systems allowing drought to be included in the list of insurable risks.

Table 1. Strengths and weaknesses of the main instruments for the management of drought risk

Strong points	Limitations to application
Extraordinary public post-disaster aid	
– Offers basic coverage of catastrophic damage to all producers in the affected area – The management costs are not very great – It may be applied homogenously to all the farmers affected – In the absence of other instruments it is the only tool available to the government in order to help producers affected by catastrophic damage	– It is awkward to implement – The affected producer receives the aid a long time after the occurrence of the damage – The aid granted is normally not enough to cover the damage sustained – Its implementation involves considerable difficulties in achieving the necessary funding and a correct evaluation of losses
Disaster or catastrophe funds	
– They cover certain kinds of damage, only for producers subscribing to the fund – Their management and application involve few administrative costs – They are applied with homogenous criteria for all the farmers covered by the fund – In the absence of other more developed systems, they are a first step towards rationalizing protection for agriculture	– For them to be sustainable, contributions must be obligatory and payment must be monitored – If there are public contributions, budgetary discipline is required for effective funding – The total indemnities cannot exceed the available resources, as such funds have no capacity for borrowing – They should not be applied discretionally. In order for them to be activated there should be an official recognition of the disaster – Their administrative requirements give rise to inefficiency in application, with delays in the processing of payments
Crop insurance	
– It may offer coverage adaptable to the working and risk conditions of each area, each crop and each producer – Damage is normally valued individually, taking into account the damage sustained on each farm – Its management by private insurance companies allows it to reach a high degree of efficiency – It constitutes one of the most effective management systems for agro-climatic and health risks	– It must be applied progressively, so a certain time is needed in order for a system to become satisfactorily established – In order for it to be sustainably developed, measures must be taken to facilitate the dispersion of risk – Appropriate measures must be taken to limit the impact of moral hazard – The individualized application of insurance entails greater management costs than for other systems – In order for the system to be widely developed, as regards the output and risks covered, public sector involvement is needed

Source: ENESA (2004).

The legislative framework developed in Spain since the passing of Law 87/1978 has made it possible to devise and implement an agricultural insurance system that has become one of the most effective instruments available to farmers to help safeguard their revenue from the consequences of drought and other risks that they cannot control, as is recognized by experts in the field and by the farm sector itself. The improvements introduced into the system in recent years have consolidated a model that is well-established and valued by farmers, notwithstanding which we need to keep working to increasingly refine it and better adapt it to the new trends in agriculture.

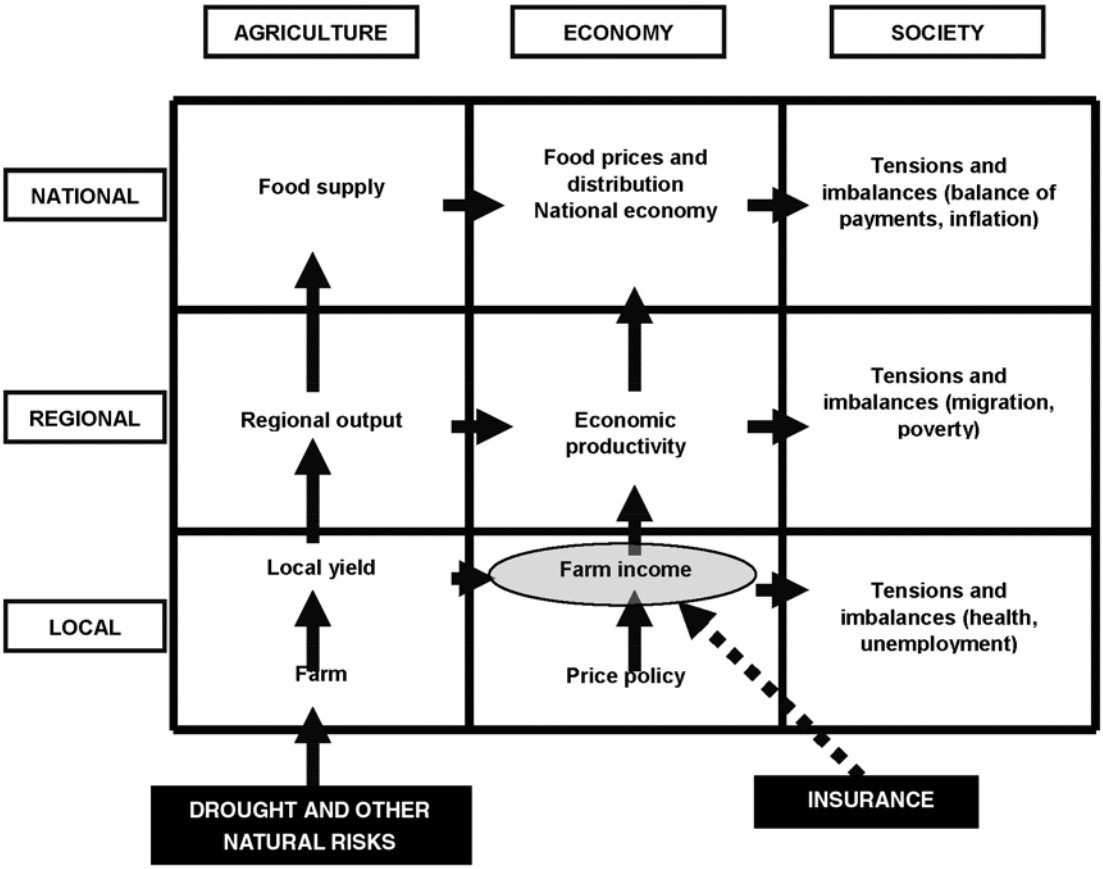

Fig. 1. Effects of insurance in controlling the consequences of drought and other natural risks (Burgaz, 2006).

Benefits of the availability of insurance models

The benefits for a country's farm sector of having an agricultural insurance system that works effectively, with actuarial guarantees and an ability to offer broad coverage against the main risks, such as drought, notably include:

(i) Allowing farmers to reduce their exposure to production risks that are beyond their control. This makes the farm's flow of revenue more stable and reduces the risk of bankruptcy (Fig. 2).

(ii) Wealth creation is encouraged by saving producers from having to devote financial resources to protecting themselves from risks that an insurance system can bear at a much lower cost, given its ability to offset losses between risks with independent causes.

(iii) It provides an automatic compensation mechanism in the event of disasters or catastrophes, saving the State from having to provide extraordinary measures and funds to compensate for damage occurring on farms.

Fig. 2. Proportion of insurance indemnity in annual income in the winter cereals sector in Spain, Burgaz (2003a).

Principles to be kept in mind in the definition of insurance models

Given the nature of the complete insurance system, based on guarantees and actuarial solidity, the definition of insurance models should observe certain basic rules, such as:

(i) They should not be set up as, or become in practice, mechanisms for generating revenue for farmers. Accordingly, they cannot, among other things, be used to offset the emergence of negative trends in any one sector of production. An analysis of many failed experiences shows the non-viability of models in which insurance is intended to take the place of other agricultural policies, especially those providing support to the farm sector.

(ii) Coverage cannot be provided for risks whose consequences are not independent of the insured's cultural and managerial practices. Insurance policies must therefore be suitably defined, with the inclusion of specific terms, deductibles and other incentives allowing behaviours arising from moral hazard and adverse selection to be controlled.

(iii) The terms of the insurance and the premiums must be established according to technical and actuarial criteria, which means that coverage cannot be provided for uninsurable risks. The reason for the failure of many projects developed in various countries in recent years is political interference in the determination of claim adjustment processes, indemnities and contract terms and insurance premiums.

(iv) For the large-scale implementation and development of insurance systems, the available experience shows the importance of private insurance activity being supplemented by a public involvement in certain specific tasks. The functions for which public agencies are best suited are those involved in providing a legal framework to guarantee the institutional stability of insurance activity, informing and advising producers, subsidizing the cost of insurance to farmers and establishing guarantees for insurers in the form of reinsurance systems.

(v) Availability of instruments for the supervision of insurance activity so as to guarantee the fairness of the terms applied to insurance contracts and premiums, preventing possible abusive applications of premium rates and moral hazard on the part of insurers.

Given the past prominence, especially in the Americas, of public insurance models in which the aforementioned principles were not observed, and most of which failed, an extensive bibliography has

been generated by the study of such experiences, and so a large portion of the literature on insurance in developing countries tends to give a pessimistic view. We should also note the importance, however, being acquired by the positive results of mixed pubic-private models that avoid many of the faults that gave rise to those failures.

Insurance models available in Spain for the coverage of drought risk

With regard to crop insurance as an instrument for risk management, in Spain we have concrete results for the three currently known insurance models, whose characteristics are summarized in Table 2. From lower to higher degree of development, these are: (i) index insurance; (ii) yield insurance based on geographic information; and (iii) yield insurance based on individual information.

Table 2. Insurance available in Spain to cover drought risk

Main characteristics	Insurable production	Results achieved in the season 2007/08
Index insurance (drought insurance on pasture)		
– The existence of an insured loss and the amount of indemnity are determined by geographic area on the basis of the average NDVI value in the pasture area obtained from NOOA satellite images – The cost of extra feed that has to be bought to make up for the lack of pasture is covered	Cattle, sheep, goats and horses	Total insured (no. of heads): 1,882,802
Yield insurance based on geographic information (integral winter cereals insurance)		
– Yield losses are covered, for any risk, below 65% of the average yield assigned to each farm – Each farm's average yield is determined on the basis of regional historical statistical data – The existence of an insured loss and the amount of indemnity are determined on each farm by means of an individual assessment	Non-irrigated winter cereals, pulses and sugar beet	Insured area (ha): – Winter cereals: 1,000,114 – Pulses: 15,483 – Sugar beet: 1,196 Insured production (000 t): – Winter cereals: 3,050.34 – Pulses: 13.97 – Sugar beet: 36.80
Yield insurance based on individual information (farm insurance)		
– Yield losses are covered, for any risk, below 70% of the average yield assigned to each farm – Each farm's average yield is determined on the basis of historical statistical data for the farm itself – The existence of an insured loss and the amount of indemnity are determined on each farm by means of an individual assessment	Non-irrigated winter cereals, oil and protein crops, almond and olive trees and wine vines	Insured area (ha): – Winter cereals, oil and protein crops: 1,897,815 – Almonds: 32,615, olives: 146,635, vines: 2,839 Insured production (000 t): – Winter cereals, oil and protein crops: 4,717.11 – Almonds: 12.87, olives: 335.34, vines: 15.27

Source: Compiled by author and Burgaz (2003b).

Future prospects for the development of insurance models for the management of drought risk

As is readily apparent to any observer of farming, the degree of uncertainty in the business results of farms and the volatility of producers' income has risen in recent years. And one of the most prominent factors in that uncertainty has been drought.

These circumstances have over the last few years led to the progressive inclusion in agricultural policy of aspects linked to the management of risks liable to jeopardize farm viability. In this framework agricultural insurance is important as an organized and regulated procedure for transferring risk to an institution specialized in managing it, such as the insurance industry.

This situation is especially apparent in the sphere of the European Union, bearing in mind the decisions taken in recent years by the Commission with a view to making agricultural policy more sustainable. One of the main novelties envisaged is to increase the responsibility of farmers in the management of their risks, which have been largely absorbed by the traditional Community policies of support to producers.

The most recent documents drawn up by the Commission point clearly to the advisability of providing instruments within the EU framework to allow farmers to improve their managerial capacity in relation to risks and agricultural crises.

As the new guidelines provided by the Commission are further specified and developed, there are grounds for optimism as to the future definition of policies for risk and crisis management, as confirmed in the recent Communication from the Commission to the Council and the European Parliament on preparing for the "health check" of CAP reform [COM (2007) 722 final]. The effective inclusion of insurance in the tools promoted by the EU will undoubtedly give a major boost in coming years to the development of insurance models, not only as regards climatic or natural risks but also with regard to the consequences of crises due to market risks.

The experience available in our country in the design and development of insurance should make us optimistic as to the possibility of developing more comprehensive models for managing all of these risks. As to other countries, we may say that agricultural insurance will expand and progress at a rate that will depend on the degree of commitment and involvement of government and the other players involved in an insurance model (farmers and insurers). In any event it seems clear that agricultural insurance will develop on various patterns, including a variety of risks and policy types.

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