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Assessment of insurance coverage and claims in rainfall related risks in processing tomato in Western Spain

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ABSTRACT

An extension of guarantees related to rainfall-related risks in the insurance of processing tomato crops has been accompanied with a large increase in claims in Western Spain, suggesting that damages may have been underestimated in previous years. A database was built by linking agricultural insurance records, meteorological data from local weather stations, and topographic data. The risk of rainfall-related damages in processing tomato in the Extremenian Guadiana river basin (W Spain) was studied using a logistic model. Risks during the growth of the crop and at harvesting were modelled separately. First, the risk related to rainfall was modelled as a function of meteorological, terrain and management variables. The resulting models were used to identify the variables responsible for rainfall-related damages, with a view to assess the potential impact of extending insurance coverage, and to develop an index to express the suitability of the cropping system for insurance. The analyses reveal that damages at different stages of crop development correspond to different hazards. The geographic dependence of the risk influences the scale at which the model might have validity, which together with the year dependency, the possibility of implementing index based insurances is questioned.

1. Introduction

Agricultural insurance systems are plagued by numerous problems that threaten their economic performance and continuity. Poorly designed policies, the effect of asymmetric information (where insurance purchasers have more information than the insurance companies about actual risk and behaviour), unfair loss adjustment procedures, and biases in setting premia are among the main factors that have caused agricultural insurance failures (Binswanger-Mkhize, 2012; Mahul and Stutley, 2010; Gulseven et al., 2011). As in most branches of insurance, the loss or damage of the insured good must be a direct effect of an unambiguously measurable event, which in the case of cropping is the partial or complete loss of harvest caused by an observable climatic hazard or anomaly.

Since the passing of the agricultural insurance law in 1978 (Antón and Kimura, 2011), the aim in the Spanish insurance policy has been to provide a broad and extensive coverage to all agricultural and livestock production enterprises (Antón and Kimura, 2011). The practical objective is to stabilize income in the primary sector by providing protection against adverse climatic events. Risks covered for plant production are mainly related to climatic adversities. Most important claims between 2003 and 2008 were related to hailstorm events with 43% of the reported claims, followed by frosts (19.3%), droughts (14.4%), wind (8.4%) and rainfall (7.4%) (Ruiz-Zorrilla, 2010).

Processing tomato farmers have benefited from expanded coverage since it was first offered in 1990. Additional risks related to rainfall have been progressively incorporated and the coverage has been extended to longer periods during crop development. It now includes damages caused by frost, hailstorms, persistent rainfall through the entire crop cycle and also floods caused by torrential rainfall. The insurance guarantees the production till mid-October and for a maximum of five months of the crop cycle. Damages from hailstorms are considered separately due to their distinct characteristics in frequency, scope, and type of damage. These expansions of coverage have been accompanied by a significant increase in claims in recent years. This suggests that damages related to heavy (over 40 mm in 24 h) or persistent rainfall (over a week with consecutive rainy days each with more than 0.2 mm) may have been underestimated. However, since the damages

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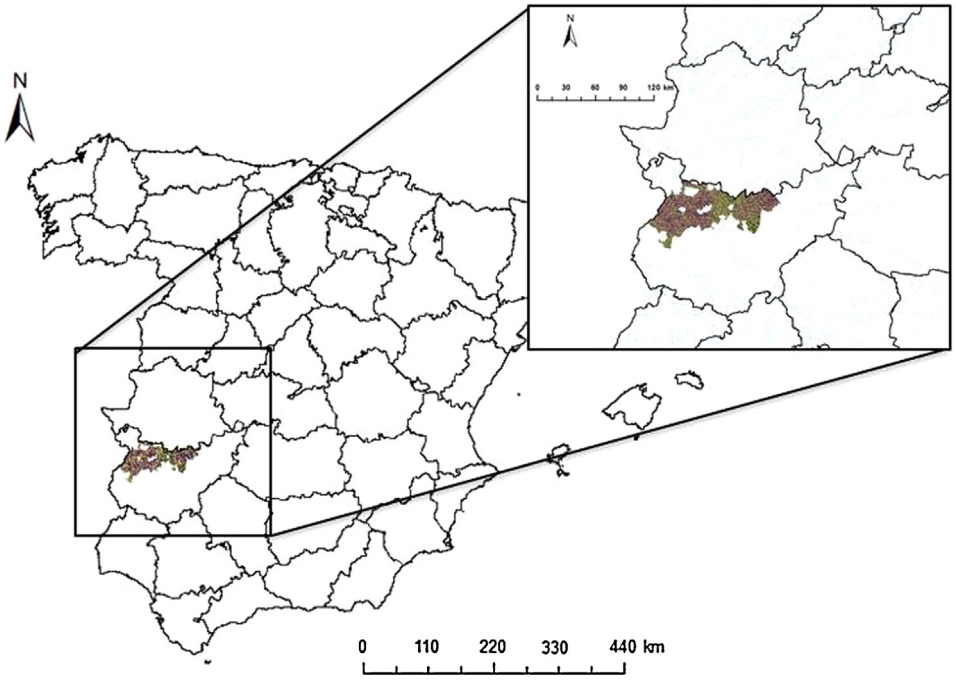

Fig. 1. Study region framed in the middle Guadiana river basin (W Spain).

covered by the current processing tomato insurance are insufficiently defined quantitatively in terms of meteorological variables, it is difficult to assess the frequency and magnitude of the crop losses.

If rainfall risk could be defined in terms of measurable weather variables, indemnities might be estimated by applying mathematical formulae to the observed weather data recorded in a given weather station, to which the local farmers purchasing the insurance policy would be associated. This could have two advantages. First, it might facilitate the valuation of current and future risk by using long weather data series and future climate projections. Second, it might simplify the payment of indemnities by improving the current system of visual (and/or sampling) assessment by experts, as it is currently done. Claims under such a Weather Index Insurance (WII) would be indemnified based on values obtained from an index that serves as a proxy for losses. Success of such a system requires that the index for observed weather events is strongly correlated with crop losses on all farms; otherwise it would produce false positives and false negatives. This is one of the reasons why WII has been little adopted in all countries where it has been offered commercially (Binswanger-Mkhize, 2012).

The objective of this work was to define the incidence of rainfall-related risks for processing tomato production in the Extremenian Guadiana River basin of W Spain in terms of measurable and objective variables. First, the risk related to rainfall was modelled as a function of meteorological, terrain and management variables using data from the recent period of broadest insurance coverage. Second, the resulting model was applied to the previous period with more restricted coverage in order to evaluate the possible impact of the extended coverage on the observed increase in claims. Results are used to discuss the opportunities to insure processing tomato against rainfall risks through a WII. To our knowledge, this is the first attempt to check the potential of WII for horticultural crops.

2. Materials and methods

2.1. Current damage appraisal for insurance payments

Indemnities are based on in-field evaluation made by loss adjusters of Agroseguro, the pool of insurance companies, following explicit monitoring procedures (Antón and Kimura, 2011). The procedure has the following steps: (a) the farmer files a notification of the event considered to have caused the observed crop loss; (b) Agroseguro checks the occurrence of the event and arranges the visit of a loss adjuster to the farm; (c) the adjuster gathers data, photos, and takes samples, recording all data in a tablet computer; (d) the adjuster either calculates the indemnity while at the farm or sends an offer within a few days; (e) the farmer can accept or reject the offered indemnity; (f-1) if it is accepted the payment is transferred within two months; (f-2) if it is rejected, Agroseguro reviews the adjustment and sends a new indemnity proposal; (g) if the farmer does not accept it, he/she must file a lawsuit. This whole process is subject to quality control procedures independently performed by both Agroseguro and the Consorcio de Compensación de Seguros, which is the public reinsurance entity in Spain.

2.2. Processing tomato sector

Spain is the fourth largest producer of processing tomato in the world, behind USA (California), China, and Italy. About 70% of the national production is harvested in the Guadiana River Basin in Extremadura, Western Spain (Macua-González et al., 2012). Yields average 80 Mg ha^{-1} fresh weight while best fields and farmers achieve 100 Mg ha^{-1}.

The study region is located in the middle of the production area (Fig. 1) in the province of Badajoz, W Spain. Summers are warm and relatively dry while winters are mild and wet. The average monthly rainfall and mean maximum and minimum temperatures for the town of Badajoz obtained from AEMET (the Spanish Agency for Meteorology) are presented in Fig. 2. The average altitude in the western area is 285 m and the dominant soils have silty clay texture (Badajoz County). The eastern area has an altitude of 430 m and the soils have a gradually greater content of sand (Don Benito County).

In the study area, production is organized through a technical committee that comprises tomato farmers, cooperatives and about fifteen tomato industries of different size that process the whole production of the region. This committee negotiates total cultivated area, prices, cultivars, quality standards and delivery calendars.