Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2015/4/4

MORE INSURANCE SUBSIDIES FOR EUROPEAN FARMERS – IS IT NEEDED?

Anna Lorant[1] - Maria Fekete Farkas[2]

[1] PhD student, Faculty of Economics and Social Sciences, Doctoral School of Management and Business Administration
[2] Professor, Faculty of Economics and Social Science, Institute of Economics and Methodology
Szent István University, 1. Páter Károly Street, 2100 Gödöllő
Email: anna.lorant@gmail.com, Farkasne.Fekete.Maria@gtk.szie.hu

Abstract: *In addition to traditional sources of uncertainties, such as market price volatility and animal and plant health-related risks, the impacts of climate change have recently become a major concern in the agricultural sector throughout the world. Insurance has been commonly proposed as a key instrument in farm risk management, and agricultural insurance schemes have become more widespread both in developed and developing countries. We conducted a case study in the UK to investigate farmers' risk perception and willingness to pay for crop insurance by using contingent valuation method (CVM). Similarly to the experience from developing countries, we found that farmers are less willing to pay for insurance, however they do take actions to reduce their risks. While these results suggest that the provision of premium subsidies to European farmers can be justified; in order to avoid counter-productive policy outcomes, one may consider the introduction of a risk-based approach in agricultural risk management.*

Keywords: *agriculture, risk management, insurance, climate change, risk reduction* (JEL classification: Q14)

Introduction

In addition to traditional sources of uncertainties, such as market price volatility and animal and plant health-related risks, the impacts of climate change have recently become a major concern for both farmers and policymakers throughout the world, including both developed and developing countries. Extreme weather events already cause substantial losses in the agricultural sector; for instance the European heat wave in 2003 caused grain-harvest losses up to 20% in the affected regions (IPCC 2014) and led to a fall of more than 23 million tonnes in cereal production compared to the previous year (UNEP 2004). The drought affecting some of the major bread baskets (Europe, Russia, Canada and Australia) in 2007 had serious adverse effects on the global grain supply, which led to rapid price increase worldwide. The frequency and intensity of these extreme weather events is likely to increase in the future (IPCC 2012). A recent report suggests that the risk of a 1-in-100 year production shock is likely to increase to 1-in-30 or more by 2040 (Bailey et al. 2015). While the food security implications of these changes are unquestionable, the income security and the survival of rural population is also in danger. The latter one is especially relevant in the context of developing countries, where agriculture has still a key sector both in terms of its contribution to the economy and employment.

While the latest report by the Intergovernmental Panel on Climate Change (IPCC) stresses the need to adapt the food systems to climate change, it also notes that farmers in some regions are already taking actions. The report defines adaptation as reduction of risks and vulnerability through "adjusting practices, processes, and capital in response to the actuality or threat of climate change" (IPCC 2015, p. 513). A wide range of adaptation options is available, process-wise the literature often differentiates between autonomous and planned adaptation. Autonomous adaptation refers to the introduction of incremental changes in existing systems, which are reactive in nature. Planned adaptation on the other hand, is proactive and can mean the adjustment of a broader system (IPCC 2015).

At individual level, farmers have different options to reduce, mitigate and cope with disaster risks. Risk reduction aims at reducing the probability of the occurrence of disasters for instance by making appropriate technological decisions. Risk mitigation, on the other hand, aims at reducing the potential impacts of such events (e.g. via the diversification of production), while coping mechanisms are in place to relieve the impact of risky events once they have occurred, e.g. by borrowing from neighbours or selling financial assets (OECD 2009). At national level, policymakers pursue different strategies to deal with agricultural risks. Most OECD countries for instance either put emphasis on training, competitiveness, liberalization and compensation for catastrophes, or alternatively they rely extensively on (subsidized) insurance mechanisms (Meuwissen et al. 2008). The Health Check of the European Union (EU) Common Agricultural Policy (CAP), followed by its recent reforms suggests that the EU as a whole is moving towards subsidized insurance as a main tool to manage agricultural disaster losses. Taking into account these policy developments, our study focuses on farm insurance as an adaptation tool in the agricultural sector.

In 2011, agricultural insurance premiums worldwide amounted to an estimated USD 23.5 billion, almost four fifth coming from the advanced markets (Swiss Re 2013). And while agricultural insurance penetration is still really low in emerging countries, insurance has been strongly promoted as an essential element of risk management strategies in those regions (Swiss Re 2013). Indeed, recent policy developments suggest that not only developed countries but also developing countries increasingly rely on insurance instruments in agricultural risk management (Wang et al. 2011). Considering the recent interest, it is imperative to study the challenges faced by agricultural insurance especially in terms of uptake and the potential role public sector can play. Several studies are available that investigate the risk management decision-making process of farmers and their perception and willingness to pay (WTP) for insurance, especially in the context of developing countries. WTP studies focusing on Europe are less common, although in the light of the current policy developments they could potentially provide useful insights.

Our case study from that UK investigates farmers' risk perception and their willingness to pay for insurance. The remaining parts of the paper are organised as follows: section 2 provides a brief overview of the relevant literature and introduces the case study. Section 3 describes the methodology, while section 4 presents the results of the case study, followed by some concluding remarks in the last section.

Background

The management of agricultural disaster risks is of significant interest for European policy-makers, as well as for private insurance companies that, although often with public support, provide coverage for farmers against the various climate risks. Following the CAP Health Check in 2008 and recent reforms of the European agricultural policy, there is a clear direction within the EU to move towards subsidized agricultural insurance as a potential tool to manage disaster and other types of risks in the sector as well as to contribute to farmers' income stability. As agriculture is one of the very few sectors that are largely governed at European level, and national competencies are limited compared to other sectors, the above described policy development will have important implications for all Member States. For instance, as a consequence of the CAP Health Check that allowed Member States to reallocate some of their direct payment budget and spend it on insurance premium subsidies for farmers, Hungary has recently introduced a new agricultural risk management scheme. The new scheme is a public-private partnership and one of its core elements is subsidized insurance that is partly financed by the EU. Hungary is only one example but it well demonstrates how much EU developments in the field of agricultural policy influence policymaking at Member State level. The recent CAP reforms were preceded by a long preparatory procedure. Already in 2006, the European Commission conducted a detailed assessment of agricultural insurance markets and other risk management approaches in Member States (Bielza et al. 2008) and provided intense support for research on the topic. Finally, as part of the general EU policymaking procedure, detailed impact assessments were conducted that investigated various aspects of the proposed reforms including the changes in the risk management approach (European Commission 2011). Despite these long preparations, with few exceptions (Liesivaara and Myyräwe 2014) little is known about the WTP of European farmers for insurance, as most studies of that kind are focusing on developing counties.

Ali (2013) considers index-based insurance as an important risk management tool and conducted a survey to investigate Pakistanis farmers' WTP for crop insurance. He identified various factors (such as economic status, membership of local organisations) influencing farmers' WTP bids and suggests the introduction of premium subsidies to make the insurance scheme more successful. Similar studies were conducted among African cocoa farmers by Falola et al. (2013) and Danso-Abbeam et al. (2014) that highlight the importance of awareness raising and education. In addition, Falola et al. (2013) also emphasise the significance of affordable premium rates, without the explicit notion of subsidies, to encourage the uptake of policies. Contingent Valuation Method (CVM) was used to estimate farmers' WTP for crop insurance in Malaysia and findings confirm interest from farmers' side to buy crop insurance coverage, again at affordable rate (Abdullah et al. 2014). The need for subsidized crop insurance premiums is also empathised by the World Bank in the context of Latin-American and Caribbean countries (World Bank 2010). While based on these studies one could conclude that premium subsidies, in general, are required to develop well-functioning crop insurance schemes in developing countries, it remains unclear if and to what extent premium subsidies are necessary in developed countries.

The case study

The case study was conducted in the United Kingdom, where flood insurance in general has been debated for a long time. While flood insurance penetration is virtually 100 percent in the residential sector, traditionally the government do not provided any premium subsidies for these policies; the high penetration is the outcome of the special agreement between the public sector and the insurance industry, which had been in place for decades and expired last year. Since then policymakers and industry representatives have been desperately trying to put together a new agreement with questionable progress (Surminski and Eldridge 2015). The financing of crop losses caused by floods, on the other hand, clearly gets less attention.

One company is dominating on the non-subsidized, private agricultural insurance market in the UK (Bielza et al. 2008). Coverage available for growing crops (only for hail) and livestock (for several disease), but the schemes are not compulsory. Penetration rate is rather low, only 6.9% of the total agricultural area is insured. Coverage for flood risk is available only for farm buildings and machinery, but not for growing crops (Bielza et al. 2008) despite the magnitude of the damages. In 2007, 42000 ha farmland was flooded in England and the national total flood damage cost for the agricultural sector was estimated at £50.7 million representing 1% of the gross value added of the agricultural industry in the country (Posthumus et al. 2009). The largest losses occurred in horticultures in field level, while arable farms were more affected at farm level due to their bigger size. The more recent 2014 winter floods were comparable in terms of affected lands (44410 ha) but the estimated total damages were lower due to the differing land use and the timing of the floods (ADAS 2014).

Methodology

A survey instrument was developed and implemented to collect the necessary data for the research. The pre-tested questionnaire that contained seven, both open and closed-ended questions, was sent to UK farmers with recent flood experience by post. Participants were asked about their general background and land-use practices, risk perception and willingness to pay (WTP) for crop insurance against flood risk that is currently not available in the UK market. The 2007 summer flood in the UK caused significant damages to agricultural producers, which led to intense policy discussions about agricultural flood risk financing thus the focus of our research. Farmers' WTP was measured in a hypothetical market by using contingent valuation instrument. Respondents were asked to state their maximum willingness to pay at different risk levels and land uses. It was done by open-ended questions, which means no value was suggested to them, but to make it easier to state their bids the average damage costs per year were represented in every case.

Both descriptive (to show incidence) and analytical methods (to identify relationship) were used for the data analysis. Variables – such as risk tolerance – were tested for seasonality effects by using paired t test that allowed to identify any potential statistically significant difference between summer and winter values. A simple linear regression model was built to assess the link between the WTP bids and flood damage costs, which first required the application of box cox transformation in order to reduce the number of outliners and improve the distribution of residuals, thereby get a better, more robust model. The quantitative data analysis was supported by qualitative data collected via dedicated survey questions.

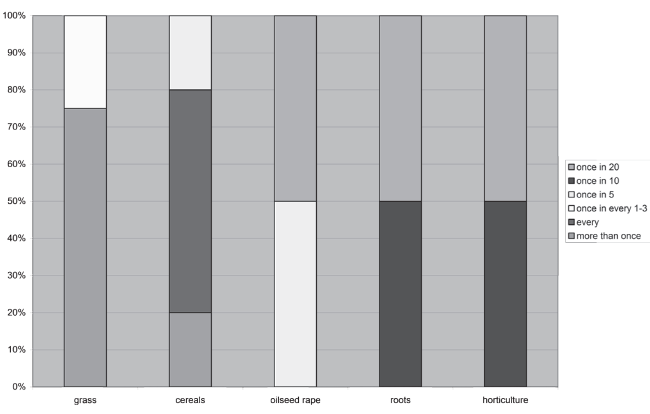
Results and discussions

Farmers interviewed have a total of 2692ha farmland, of which, on average 35.6% was affected by floods. One third of the farmers have no insurance at all, while those with insurance policies, more likely have coverage for machinery and animals (dairy and livestock farmers). Although limited insurance coverage for growing crops was mentioned by many farmers, it is certainly not the main reason behind low crop insurance penetration as more favorable insurance conditions, e.g. the potential introduction of seasonal insurance (coverage for events occurred during the summer period), did not trigger significant interest from the farmers' side.

Relationship between flood frequencies and land uses

Descriptive statistics were used to investigate if there is any special relationship between land uses and flood frequencies. We considered five different land-uses, including grass, cereal, oilseed rape, roots and horticulture that differ in terms of economic output, which has important implications when calculating the agricultural costs of flooding. In most cases, flood damage costs are between the gross output (total value) and gross margin. When flood occurs nearer to the point of harvest costs are closer to the loss of gross output, less savings in harvesting costs plus clean-up costs. However gross margins can be used for broad estimations of flood damages (Penning-Rowsell and Chatterton 1977). Gross margin is the difference between gross outcome and variable costs and it indicates which crops are more profitable. Thus floods cause higher losses in fields where crops with higher gross margins („more profitable crops") are grown. In our sample horticultural cropping and vegetable production have the highest gross margins, which suggests that the highest losses can be expected at these land-uses. Figure 1 below shows the different land-uses and flood frequencies in the sample. It is clear that there is a converse relationship between crop values and flood frequencies. More often flooded fields are usually used for pastures (grass) or cereal production while less frequently flooded fields are more often used for, oilseed rape and vegetable production, or as horticulture.. For instance, while 75% of the grasslands can be found on those fields that are, on average, flooded more than once in each year, then vegetable and horticulture production tends to concentrate on fields that are flooded once in every ten years or less. Farmers are growing less valued crops on flood frequent fields and more valued crops on less affected fields. By doing so, they reduce their risks (potential losses), which can of course potentially reduce the need to take out flood insurance policy.

Figure 1: land uses and flood frequences in the sample



Farmers risk tolerance

As mentioned above the timing of floods can have important cost implications. Therefore survey participants were also asked about their summer and winter risk tolerance in order to investigate the relationships between risk tolerance, seasonality, crop values, farm types and actual flood risk. Our hypothesis was that winter floods are more tolerated as, in line with the previous discussions, they more likely cause less damages. Based on 36 observations, table 1 below confirms our hypothesis as the mean (and the median) summer risk tolerance is lower (0.3371) than the same variable during the winter period (0.5679). The table indicates that farmers, on average, tolerate summer floods (April – September) once in every 36 months, while winter floods (October-March) are accepted once in every 22 months (1.8 years). The lowest reported flood tolerance is 100 years (1:100 return period) for summer floods and 33 years for winter floods.

Table 1: Farmers's summer and winter risk tolerance

Variables	N	Mean	Median	Minimum	Maximum	Standard deviation
Summer risk tolerance (floods/ year)	36	0.3371	0.20	0.01	1.5	0.46
Winter risk tolerance (floods/ year)	36	0.5679	0.33	0.03	1.5	0.48

We used paired t-test to compare the means of the two groups (summer and winter risk tolerance) and confirm if the above found difference between the groups is significant. On average the difference between summer and winter flood risk tolerance is 0.23081, which indicates that farmer are willing to accept 0.23081 more winter floods during the October-March period than in the April-September period each year (Table 2). The outcome of the paired t-test can be summarised as follows: $t(35) = 4.009$, $p < 0.0005$. Due to the means of the two groups and the direction of the t-value, we conclude that there is a statistically significant difference between farmers' summer and winter flood risk tolerance (and winter floods are better tolerated).

Table 2: Difference between summer and winter risk tolerance of farmers in the sample

tolerance	Mean	Std. deviation	Std error	Lower (95%)	Upper (95%)	t	df	Sig (two-tailed)
Winter-summer risk	0.23081	0.34541	0.05757	0.11394	0.34768	4.009	35	0.000

c) Estimation of farmers' willingness to pay for insurance

The demand for insurance was estimated through investigation of the relationships between annual damage cost and farmers' WTP bids. Table 3 presents the summary statistics of these two variables. As it indicates the total number of observations was 80, and the distributions of both variables have skewed coefficients. The large proportion of zero WTP bids (41%) shows, that farmers would not pay for insurance in almost half of the cases (most likely when the damage costs were below £60), while their highest bid was 200 pounds. On average, they are willing to pay 20.03 pounds per hectare.

Table 3: Summary statistics – flood damage costs and farmers' willingness to pay for insurance

Variables	N	Zero value	Mean	Median	Mini-mum	Maxi-mum	Variance	Std. dev.	Skewness
Flood Damage Cost (£/ha)	80	0	257.66	180.0	30.0	1000.0	66228.1	257.35	2.11
WTP for flood insuranc e (£/ha)	47	33	20.03	18.0	0.0	200.0	1665.0	40.8	2.30

In order to investigate if there was a statistically significant association between farmers' WTP bids and the annual damage costs, a correlation was computed, $r(80) = 0.7206$, $p = 0.000$. The direction of the correlation is positive and significant at the 0.001 level, which means that there is usually a higher willingness to pay at higher predicted damage costs and vice versa. As a next step, a linear regression was conducted that required the box-cox transformation of the variables to fulfil the linearity assumption. Table 4 below shows the outcome of the regression analysis with the transformed variables. The outcome (R Square =0.4272, $F = 33.556$, $p<.001$) indicates a positive association between farmers' WTP and expected damage cost.) The R square value indicates a large or larger than typical effect, which means that almost half (42.71%) of farmers' WTP (dependent variable) can be predicted by the flood damage costs (independent variable). We should, of course, note that damage cost is not the only variable that influences willingness to pay decisions of farmers, however WTP bids can be estimated quite well from the loss values (it is consistent with the high B value of the damage cost in the model). The equation found is WTP = 0.0237 + 0.4255*Damage Cost, which suggests that if the damage cost is zero pounds, then the model predicts that the WTP for flood insurance is 0.0237 pounds per hectare.

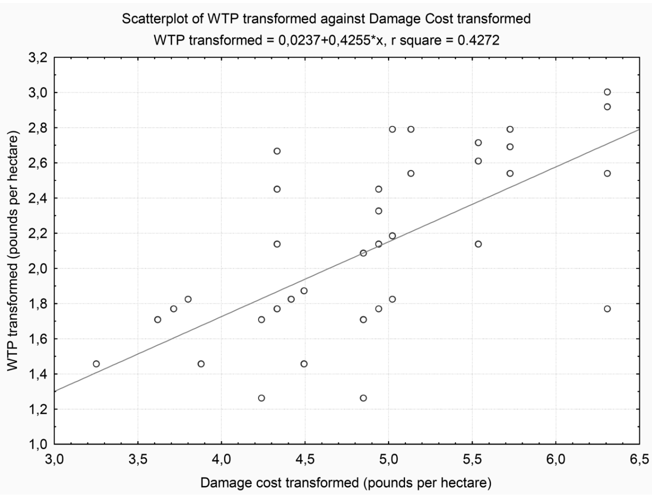
Table 4: Regression result

N = 47	Beta	Std. Err. of Beta	B	Std. Err. of B	t(45)	p-level
Intercept			0.02367	0.3597	0.0658	0.9478
Trans-formed damage cost	0 .653577	0.1128	0.42551	0.07345	5.7927	0.000001

R = 0.65357 R Square = 0.4271 Adjusted R Square = 0.4144
F (1, 45) = 33.556 P = 0.000 Std. Error of Estimate = 0.3543

Figure 2 below visualizes the relationship identified between the WTP bids of farmers (pounds per hectare) and the predicted flood damage costs (pounds per hectare) after the box-cox transformation. The regression line predicts 42.7% of the WTP bids based on the flood damage costs. One might assume that farmers in the sample are risk averse as they are willing to pay proportionately more to avoid higher damage costs (Slovic 2000). Figure 2 indicates that this threshold is around 5 pounds per hectare; above that value farmers tend to willing to pay more than the estimated model values (observations are above the regression line).

Figure 2: Relationships between WTP for flood insurance and potential flood damage costs



Conclusions and policy directions

Insurance has been promoted worldwide as a key element in agricultural risk management. It has been also commonly accepted that well-functioning agricultural insurance schemes require strong support from the governments' side, not only in the form of appropriate regulatory environment, but also often by the provision of premium subsidies. Indeed, several studies from developing countries report low willingness to pay for insurance among farmers and stress the need for subsidies in order to keep premium rates at affordable levels. However farm insurance is also heavily subsidized in many developed countries, one of the most notable example being the US where generous subsidies cost millions of dollars to taxpayers each year (Babcock 2013). The Health Check and the recent reforms of the Common Agricultural Policy suggest that the EU itself is moving towards subsidised agricultural insurance.

Considering these recent policy developments and the relative lack of studies investigating European farmers' attitude towards crop insurance (compared to developing countries), we conducted this case study to investigate the willingness to pay of farmers in the UK for crop insurance. While their low willingness to pay seem to justify public premium subsidies, it is also clear that farmers are taking actions to reduce their risks, which can be especially efficient in case of more frequent, low impact events. Experience from the US suggests that heavily subsidised farm insurance can potentially lead to biodiversity loss (Faber et al. 2012) and discourage farmers to take adaptation actions (Skees 1999). European policymakers should carefully consider these potential implications of farm insurance subsidies. In line with the suggestions made by the OECD (OECD 2011) one may argue for a risk-based approach that distinguishes between low, medium and high-risk layers (Mechler et al. 2014). Low-risk layer represents very frequent events with low impact; in which case diversification and other risk reduction strategies (e.g. appropriate water management practices) could be efficient. Managing these risks should be the responsibility of the farmers themselves. The medium-risk layer includes less frequent, but not catastrophic events and it is often argued that risk-financing mechanisms, including insurance, are well placed to deal with these risks. Finally, high-risk layer events require outside interventions, for instance by the government or international agencies, to cover the losses.

Reference

ABDULLAH A M, AUWAL A G, DARHAM S AND RADAM A (2014) Farmers willingness to pay for crop insurance in North-West Selangor Integrated Agricultural Development Area (IADA), Malaysia. Journal of ISSAAS 2: 19-31. Available from http://www.issaas.org/journal/v20/02/journal-issaas-v20n2-03-abdullah_etal.pdf [Accessed: 31st October 2015].

ADAS (2014) Impact of 2014 Winter Floods on Agriculture in England. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401235/RFI7086_Flood_Impacts_Report__2_.pdf [Accessed: 31st October 2015].

ALI A (2013) Farmers' Willingness to Pay for Index Based Crop Insurance in Pakistan: A Case Study on Food and Cash Crops of Rain-fed Areas. Agricultural Economics Research Review 2: 241-248. Available from: http://ageconsearch.umn.edu/bitstream/162145/2/9-Akhter-Ali.pdf [Accessed: 31st October 2015].

BABCOCK B (2013) Taxpayers, Crop Insurance, and the Drought of 2012. Environmental Working Group, Washington. Available from: http://www.ewg.org/research/taxpayers-crop-insurance-and-drought-2012 [Accessed: 2nd September 2015]

BAILEY ET AL. (2015) Extreme weather and resilience of the global food system (Sythesis report). Available from: http://www.foodsecurity.ac.uk/assets/pdfs/extreme-weather-resilience-of-global-food-system.pdf [Accessed: 31st October 2015].

BIELZA M ET AL. (2008) Agricultural Insurance Schemes, AGRI-2005-0321, Italy: European Commission.

DANSO-ABBEAM G, ADDAI K NY AND EHIAKPOR D (2014) Willingness to Pay for Farm Insurance by Smallholder Cocoa Farmers in Ghana. Journal of Social Science for Policy Implications 1: 163-183. Available from : http://jsspi.com/journals/jsspi/Vol_2_No_1_March_2014/10.pdf [Accessed: 31st October 2015].

EUROPEAN COMMISSION (2011) Commission Staff Working Paper – Impact Assessment: Common Agricultural Policy towards 2020 (Annex 6). Available from: http://ec.europa.eu/agriculture/policy-perspectives/impact-assessment/cap-towards-2020/report/annex6_en.pdf [Accessed: 2 nd September 2015].

FABER S, RUNDQUIST S AND MALE T (2012) Plowed Under: How Crop Subsidies Contribute to Massive Habitat Losses. Washington: Environmental Working Group. Available from: http://static.ewg.org/pdf/plowed_under.pdf [Accessed: 2nd September 2015].

FALOLA A, AYINDE O E AND AGBOOLA B O (2013) Willingness to Take Agricultural Insurance by Cocoa Farmers in Nigeria. International Journal of Food and Agricultural Economics

1: 97-107. Available from: http://www.foodandagriculturejournal.com/97.pdf [Accessed: 31st October 2015].

IPCC (2014) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1132 pp.

IPCC (2012) Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Available from: http://ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf. [Accessed: 2nd September 2015].

LIESIVAARA P AND MYYRÄWE S (2014) Willingness to pay for agricultural crop insurance in the northern EU. Agricultural Finance Review 4: 539 – 554. DOI: 10.1108/AFR-06-2014-0018

MECHLER R ET AL. (2014) Managing unnatural disaster risk from climate extremes. Nature Climate Change 4: 235-237. DOI 10.1038/nclimate2137. Available from: http://nature.com [Accessed: 2nd September 2015].

OECD (2011) Managing Risk in Agriculture Policy Assessment and Design. Paris: OECD Publishing.

OECD (2009) Risk Management in Agriculture: A Holistic Approach. Paris: OECD Publishing.

Penning-Rowsell E and Chatterton J (1977) The Benefits of Flood Alleviation. 1st ed, England: Saxon House, Teakfield Limited.

POSTHUMUS H, MORRIS J, HESS T M, NEVILLE D, PHILLIPS E AND BAYLIS A (2009) Impacts of the Summer 2007 Floods on Agriculture in England. Journal of Flood Risk Management 3: 182-189. DOI: 10.1111/j.1753-318X.2009.01031.x

SKEES J R (1999) Agricultural Risk Management or Income Enhancement?. Regulation 22. Available from: http://globalagrisk.com/Pubs/1999 Agricultural Risk Management or Income Enhancement jrs.pdf. [Accessed: 2nd September 2015].

Slovic P (2000) The Perception of Risk 1st ed, London: Earthscan Publications Ltd.

SURMINSKI S AND ELDRIDGE J (2015) Flood insurance in England – an assessment of the current and newly proposed insurance scheme in the context of rising flood risk. Journal of Flood Risk Management. DOI: 10.1111/jfr3.12127

SWISS RE (2013) Partnering for food security in emerging markets. Zurich: Swiss Reinsurance Company Ltd.

UNEP (2004) Impacts of Summer 2003 Heat Wave in Europe. Environment Alert Bulletin. Available from: http://www.grid.unep.ch/products/3_Reports/ew_heat_wave.en.pdf [Accessed: 31st October 2015]

WANG M, SHI P, YE T, LIU M AND ZHOU M (2011) Agriculture insurance in China: History, experience, and lessons learned. International Journal of Disaster Risk Science 2: 10-22. DOI: 10.1007/s13753-011-0007-6. Available from: http://link.springer.com/article/10.1007/s13753-011-0007-6 [Accessed: 31st October 2015]

WORLD BANK (2010) Agricultural Insurance in Latin America: Developing the Market (Report no. 61963-LAC). Washington: The World Bank