



Empirical analysis of factors influencing farmers crop insurance decisions in Pakistan: Evidence from Khyber Pakhtunkhwa province



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ABSTRACT

Pakistan is the world's most susceptible country to extreme climatic events, such as floods. As such, for many years, the country has faced the risk of losses from natural calamities without crop insurance. However, in recent years, the national government has undertaken crop insurance initiatives in Pakistan. Consequently, there is limited knowledge available on the adoption of crop insurance in Pakistan. To fill this gap, this study aims to examine the factors influencing the adoption of crop insurance as a risk management strategy by Pakistani farmers. Primary data were collected from 400 farm households through a structured questionnaire in four flood-prone districts of the northwestern regions (Khyber Pakhtunkhwa). A probit model was used to analyze the relationships among dependent and independent variables. Risk attitude and risk perception of floods for each farm household were calculated and used as independent variables. Age, farming experience, education level, risk perception of floods, land ownership status, landholding size, access to credit, access to information sources, agricultural extension services, and distance from river were significantly associated with farm households' decisions to purchase crop insurance. The findings of this study are expected to guide government, insurance companies, and policymakers in implementing crop insurance. Further the government should subsidize and frame a crop insurance policy and awareness about crop insurance should be improved for betterment of small farmers.

1. Introduction

Climate change is projected to be a global environmental threat and development concern, especially in developing countries, which are severely affected by the negative effects of climate-induced events owing to low adaptive capacity and inadequate resources (Abid et al., 2015). It is estimated that by the middle of the 21st century, climate change is likely to affect global food security with the largest number of people affected in South Asia (Hijioka et al., 2014). Along with climate change, the frequency and severity of natural disasters have increased over the past several decades (Field, 2012; Wang et al., 2012; Zhang et al., 2013; Huong et al., 2017; Huong et al., 2018).

Among different natural hazards to which humans are exposed and give rise to fatalities, floods are the most common and leading cause of economic and social risks for people. In particular rural populations in developing countries are always vulnerable to flood events owing to low adaptive capacity and resources (Fahad and Jing, 2018; Shah et al.,

2017). The intensity and severity of flooding incidents in developing countries are mainly associated with environmental and climatic changes. However, some human-made factors, such as human encroachment onto rivers, could lead to flooding incidents (Gaurav et al., 2011; Shifeng et al., 2011).

Pakistan, which is the focus of this study, is one of the countries most affected by floods. Floods in 2010, 2011, and 2014 caused massive damage to forestry, fisheries, livestock, infrastructure, tube wells, animal sheds, people, seed stocks, fertilizers, houses, and agricultural equipment. Furthermore, almost 250,000 farm households and approximately 1 million acres of cultivated land were devastated (NDMA, 2014; Abid et al., 2015). Pakistan has faced different scales of floods throughout the country, of which 20 were extremely severe. The unprecedented flood of 2010 was the most severe in the country's history, affecting 24 million people, damaging more than 2 million hectares of standing crops, and causing economic loss for more than 10 billion US dollars (Shah et al., 2017).

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Pakistan is an agro-based economy in which agriculture contributes 22% to overall gross domestic product and employs 45% of the country's total workforce, including almost 60% of the rural population; thus, any negative aftermath of climate events might affect the livelihoods of millions of people (GOP, 2013). Despite the significant share in the overall economy, the agricultural sector has experienced serious challenges from catastrophic flood impacts (Nomman and Schmitz, 2011). Hence, adaptation of the agricultural sector to flood impacts is an effective measure and necessary to protect the livelihoods of farmers. For a clear understanding of farmers, it is important to design policies that support successful adaptation and necessary to advance existing adaptation setups.

Crop insurance has become an important adaptation tool for managing economic and environmental risk in the agricultural sector. Many developing countries, including Pakistan, often face agricultural disasters (Ahsan, 1985; Goodwin and Smith, 1995; Boyd et al., 2011), which are often costly and might result in reduced agricultural growth. Crop insurance is the most useful and essential risk tool to cope with flood disasters (Goodwin and Smith 1995; Goodwin and Mahul, 2004) and has been recommended as the best emerging tool for adaptation to climate change (Falco et al., 2014).

In Pakistan, the most availed insurance program is a crop loan insurance scheme (CLIS) which is mandatory for all borrowers who take agricultural credit from banks. There is a need for an ex-ante risk mitigating strategy, such as crop insurance and the Federal Flood Commission of Pakistan has already evinced ex-post financing options and showed its desire to have such a risk mitigating tool as the Mutual-Support Insurance System (FFC, 2012). Shaw et al. (2013) reported that non-structural measures, such as crop insurance, are found to be more effective disaster strategies than structural measures. A well-defined market-based crop insurance scheme could be a better risk management instrument for rural farmers in Pakistan.

Various literature has used crop insurance as a risk-management tool for a number of purposes and attained differing results over the years (Vandever, 2001). The existing literature measures insurance demand against natural calamities across different countries (Akter et al., 2009; Botzen et al., 2009; Kwadzo et al., 2013), but no scientific study has been carried out to explore the acceptability and potential of crop insurance among rural flood victim households. Thus, the acceptability of crop insurance as a risk-mitigation instrument is still unknown in many developing countries, including Pakistan.

Surprisingly, studies concerning the crop insurance market associated with extreme climatic events have not been conducted in Khyber Pakhtunkhwa (KP) province of Pakistan, which is one of the most flood-affected regions of the country. To fill the literature gap discussed above, this study is expected to provide valuable evidence regarding the willingness of farmers to purchase crop insurance and the determining factors that could support pertinent strategies by public and private organizations aiming to initiate crop insurance programs as a risk-mitigating tool in flood-prone areas of KP province of Pakistan, which is extremely vulnerable to flooding events. Therefore, the study seeks to examine the main factors influencing farmers' willingness to purchase (WTP) crop insurance as a risk management strategy.

The remainder of this paper is structured as follows: The methodology used is defined in the following section (Section 2). Section 3 presents the survey design and data collection. The results are discussed in Section 4, while Section 5 concludes the study.

2. Materials and methods

2.1. Study area

The data were collected from four districts, namely, Charsadda, Mardan, Peshawar, and Nowshera of KP province, Pakistan. KP province is located in the northwestern region of the country and is bounded by Afghanistan to the west and north. These districts are most

Table 1

Surveyed areas.

District	Tehsils	Sampled Villages	No of interviewed farmers
Peshawar	Peshawar	33	100
Mardan	Takht e Bhai	19	34
	Katlang	8	33
	Mardan	11	33
Charsadda	Shabqadar	12	33
	Charsadda	14	34
	Tangi	7	33
Nowshera	Pabbi	7	33
	Jahangira	12	33
	Nowshera	18	34
Total			400

Source: Field Survey, 2017.

vulnerable to extreme weather events, such as floods, and are located in the area most affected by the floods in 2010, 2011, and 2014.

2.2. Sampling and data collection

The authors' main focus was on rural farm households in the four districts of KP province of Pakistan. In the first stage, these four districts were purposely selected owing to their vulnerability, flooding history, agricultural importance, and severity of flood damage. Second, three tehsils (Pakistan's second-lowest tier of local government) were selected from each district. Third, different flood-affected villages were randomly selected and a list of flood-affected counties was obtained from the District Disaster-Management Authority of each district (shown in Table 1). A face-to-face interview was conducted, as it suited the socio-economic characteristics of rural households in Pakistan and it was impossible to conduct a web-based or postal survey. Primary data of 400 subsistence farm households were collected using a structured questionnaire survey. A multi-stage sampling technique was used to select the sampled households in order to evaluate the factors influencing farmers' willingness to purchase crop insurance against floods in the rural areas of KP province, Pakistan. The actual data were collected during January 2017–March 2017 by six trained researchers. Fig. 1 is a map showing the location of the study area (districts).

In addition, secondary data were collected for this study from the Provincial Disaster-Management Authority (PDMA). Rural areas and vulnerable households were identified by the National Disaster-Management Authority and PDMA. Pakistan's agricultural activities tend to be conducted by people with low skills (Deen, 2015). The authors selected a sample size of 400 subsistence farmers in four vulnerable districts of KP province of Pakistan using a confidence level of 95% and a margin of error of about 7% (Yamane, 1967). Some previous studies, such as (Hussain and Thapa, 2012), used about a 7% margin of error while other studies (Ullah et al., 2015a) used about a 13% margin of error.

$$n = \frac{N}{(1 + Ne^2)} \quad (1)$$

n = Sample size

N = Total number of farming households in an area

e = Precision value, set as $\pm 7\%$ (0.07)

2.3. Socio-economic factors

Farmers adopt various risk-coping strategies to manage their farms. Below et al. (2010) demonstrated that crop insurance, crop diversification, irrigation, water preservation techniques, different timing of crops, new plant varieties, adoption of new technologies, and agricultural credit are strategies that farmers adopt to cope with natural disasters. Ullah et al. (2015a) stated that the most common strategy of coping with flood risk is the use of precautionary savings and

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