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Factors affecting crop insurance purchases in China: the Inner Mongolia region

Milton Boyd, Jeffrey Pai, Qiao Zhang, H. Holly Wang and Ke Wang

(Affiliations appear at the end of the paper.)

Abstract

Purpose – The purpose of this paper is to explain the factors affecting crop insurance purchases by farmers in Inner Mongolia, China.

Design/methodology/approach – A survey of farmers in Inner Mongolia, China, is undertaken. Selected variables are used to explain crop insurance purchases, and a probit regression model is used for the analysis.

Findings – Results show that a number of variables explain crop insurance purchases by farmers in Inner Mongolia. Of the eight variables in the model, seven are statistically significant. The eight variables used to explain crop insurance purchases are: knowledge of crop insurance, previous purchases of crop insurance, trust of the crop insurance company, amount of risk taken on by the farmer, importance of low crop insurance premium, government as the main information source for crop insurance, role of head of village, and number of family members working in the city.

Research limitations/implications – A possible limitation of the study is that data includes only one geographic area, Inner Mongolia, China, and so results may not always fully generalize to all regions of China, for all situations.

Practical implications – Crop insurance has been recently expanded in China, and the information from this study should be useful for insurance companies and government policy makers that are attempting to increase the adoption rate of crop insurance in China.

Social implications – Crop insurance may be a useful approach for stabilizing the agricultural sector, and for increasing agricultural production and food security in China.

Originality/value – This is the first study to quantitatively model the factors affecting crop insurance purchases by farmers in Inner Mongolia, China.

Keywords China, Insurance, Crops, Agriculture, Crop Insurance, Purchasing behaviour, Farmers, Surveys, Regression, Probit model

Paper type Research paper

Introduction

This study attempts to explain the factors affecting crop insurance purchases by farmers in Inner Mongolia, China. Crop insurance in China has been recently viewed by government as a useful approach for stabilizing the agricultural sector in China, and for increasing crop production in the long term, which in turn provides more food security (Boyd et al., 2011). Also, on an individual farmer level, crop insurance is seen as a policy instrument for helping to reduce the poverty level of small-scale farmers in China.

As a result of the above approaches, crop insurance has been recently expanded in China, and much of this expansion has been as a result of favorable government crop

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insurance policy toward farmers, including government subsidies. As well, the government has provided more information to improve farmers’ knowledge of crop insurance, in order to increase the use of crop insurance, as farmers are believed to have relatively limited knowledge of crop insurance in China (Hou et al., 2011). In the past, the adoption rate of crop insurance in China has been relatively low, and so more attempts are now being made by government to increase the crop insurance adoption rate. Studies in other countries have also examined crop insurance purchasing behavior (Sherrick et al., 2004; Wang et al., 1988; Coble, 1996; Boyd et al., 2011) provides a review of agricultural risks, background, and development of crop insurance in China, which is also drawn upon in discussion below.

### Agricultural risks and crop insurance

Many countries, including China, often face instability or disasters in the agricultural sector (Ahsan, 1985; Goodwin and Smith, 1995; Tuo and Framingham, 1994; Boyd et al., 2011), and this can often be costly and may result in reduced growth for the agricultural sector. This instability in agriculture is because of risks such as crop disasters, often caused by adverse weather, and sometimes caused by pests and disease (Hueth and Furtan, 1994; Ray, 1980). When facing these risks without crop insurance, farmers may use fewer inputs such as fertilizer and invest less in crop production, resulting in lower yields and lower production. As well, banks may be hesitant to provide loans to farmers, if farmers do not have crop insurance. Crop insurance has been one of the most reliable and longest running programs for stabilization and risk management for farmers in many countries. This has been particularly true in parts of North America, where crop insurance became more common and commercially available around 1960. Multi-peril crop insurance, the most popular type of crop insurance, usually insures farmers against yield losses from natural causes such as weather (e.g. drought, excessive moisture, wind, snow, and frost), insects, and disease.

### Background regarding agricultural risk in Inner Mongolia and China

A number of areas in China sometimes face severe weather and agricultural disasters (Zhang et al., 2011; Boyd et al., 2011). One such area is Western China, where the possibility exists for severe cyclical droughts. This area includes the autonomous regions of Inner Mongolia and Xinjiang, which cover one-sixth of China’s land area. In year 2006, parts of Xinjiang had a rural net income of approximately 2,400 yuan (US$311) annually, less than $1 a day. In comparison, income was about 2,900 yuan (US$377) for parts of Inner Mongolia, about a dollar a day. However, Inner Mongolia can be very dry at times, with parts of Inner Mongolia being within the Gobi desert. Therefore, a significant challenge in Inner Mongolia is that during droughts, levels of income can fall to half the average levels, which can result in severe poverty. As well, frost, snow, wind, and hail can also be significant risks to crops in Inner Mongolia.

### Crop insurance development in China

In contrast to North America, there is currently no crop insurance in China that has a high participation rate throughout the whole country, as crop insurance is still mostly in the development stages for much of China (Boyd et al., 2011; Kong et al., 2011). Many farmers are unable to purchase suitable crop insurance to reduce yield risk related to natural disasters, and crop losses can cause high rates of poverty for subsistence farmers.
Crop insurance began to receive more attention and research in China in the late 1970s and early 1980s. In 1994, the first international crop insurance conference was held in China (Tuo and Framingham, 1994). As China became wealthier, especially in city areas, the government was able to eventually provide crop insurance subsidies which would assist farmers in rural areas. A renewed priority on crop insurance had begun, and by 2007, the Chinese Government State Council decided to “fund agricultural risk management mechanisms,” and “enlarge the extension of agricultural insurance pilot programs.” To carry out this initiative, the Central Government proposed to pay roughly 40 percent of the crop insurance premium cost, local governments would pay 40 percent, and the farmer would pay 20 percent of the cost. This is a relatively high subsidy, and sufficient in size to ensure adequate farmer participation. However, different geographic areas of China often have different provisions. For example, in Miyun County in 2008, near Beijing, the Beijing City Government paid 50 percent of the total 32 yuan per mu premium. Another 30 percent was paid by Miyun County, and 20 percent was paid by the farmer. The potential indemnity was 400 yuan per mu, but this insurance did not include coverage for drought (Hou et al., 2011).

Previously, crop insurance in China was often unsubsidized, and this is one of the reasons why it failed a number of times in the past. On January 19-20 in 2007, Premier Wen Jiabao proposed to develop agricultural insurance in order to reduce poverty and increase agricultural production in China, especially for poorer regions, and for a number of crops. Some major grain and oilseed crops grown in China include corn, wheat, rice, sorghum, and soybeans. These crops account for about three-quarters of the crop land, and many of these crops are now becoming insurable, depending on the particular region.

Therefore, given the goal to increase the adoption rate of crop insurance in higher risk areas and poorer areas such as Inner Mongolia, this study attempts to explain the factors affecting crop insurance purchases by farmers in Inner Mongolia, China. The information from this study should be helpful for crop insurance companies and government policy makers who are attempting to understand the factors related to crop insurance purchases in China, in order to expand the use of crop insurance. If crop insurance companies can better understand the factors related to crop insurance purchases by farmers, then the firms should be able to increase the adoption rate of crop insurance in China. Having established the background and rationale for this paper, it proceeds next with sections on data, methodology, results, and then a summary.

Data
The data is from a survey questionnaire given to farmers in Inner Mongolia, China, in 2007. It includes two county areas, with the first area covering the Dalate region, and the second area covering the Wushen region. The survey includes 220 farmers, and main groups of variables used for this study include knowledge and behavioral information, risk level, and crop insurance premium level, main information sources for crop insurance, role of farmer in the village, and off-farm income.

Methodology
The dependent variable that is used, purchase of crop insurance, is a binary variable that equals one if the farmer purchases crop insurance, and is zero otherwise. A probit regression model is used as it has a number of advantages compared to a linear
regression model (Aldrich and Nelson, 1984; Liao, 1994; Green, 2008). The probit model avoids heteroskedasticity in the error term when the dependent variable is binary. It also avoids inaccurate prediction of \( \hat{Y} \) greater than 1, or less than 0, and so ensures that probability is bounded by 0 and 1, consistent with theory. The model is estimated by a maximum likelihood estimator. The independent variable codes are shown in Table I, and the codes are from 1 to 5, or 0, 1 depending on the particular variable.

Results
The dependent variable is whether a farmer purchased crop insurance this year, with 1 – purchased crop insurance this year, and 0 – did not purchase crop insurance this year. Eight independent variables are categorized into five different groups, and the groups are knowledge and behavioral, risk level and premium level, main information source for crop insurance, role in village of farmer, and off-farm income. Data included 220 observations \((n = 220)\), and Table I shows the codes of independent variables.

Probit regression results
Table II shows the results of the probit regression model. The McFadden \( R^2 \), a goodness-of-fit measure, shows a value of 0.295. Seven of the eight variables showed statistical significance at the 10 percent level or better. As well, three of the variables are significant at the 1 percent level or better. Therefore, the goodness of fit measure of 0.295, combined with seven of the eight variables being statistically significant at the 10 percent level or better, indicates that the model has sufficient statistical explanatory power.

Knowledge and behavioral
The knowledge of crop insurance variable shows a positive coefficient (0.152) as expected. This positive coefficient may be interpreted that as farmers gain more knowledge of crop insurance, they are more likely to purchase crop insurance. However, this variable is not statistically significant at 10 percent or better, but rather only 17 percent, indicating that the relationship between knowledge and crop insurance is not

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Definition and codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge and behavioral</td>
<td></td>
</tr>
<tr>
<td>Knowledge of crop insurance</td>
<td>1 (very low), \ldots, 5 (very high)</td>
</tr>
<tr>
<td>Previously purchased crop insurance</td>
<td>1 (yes), 0 (no)</td>
</tr>
<tr>
<td>Trust of crop insurance company</td>
<td>1 (very low), \ldots, 5 (very high)</td>
</tr>
<tr>
<td>Risk level and premium level</td>
<td></td>
</tr>
<tr>
<td>Amount of risk taken on by the farmer</td>
<td>1 (very low), \ldots, 5 (very high)</td>
</tr>
<tr>
<td>Importance of low crop insurance premium</td>
<td>1 (very unimportant), \ldots, 5 (very important)</td>
</tr>
<tr>
<td>Main information source for crop insurance</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>1 (yes), 0 (no)</td>
</tr>
<tr>
<td>Role in village of farmer</td>
<td></td>
</tr>
<tr>
<td>Head of village</td>
<td>1 (yes), 0 (no)</td>
</tr>
<tr>
<td>Off-farm income</td>
<td></td>
</tr>
<tr>
<td>Number of family members working in city</td>
<td>1 (none), 2 (one person), 3 (two people), 4 (three people), 5 (more than three people)</td>
</tr>
</tbody>
</table>

Table I. Variable codes for the independent variables
particularly strong. The knowledge variable is potentially important, as both the Chinese Government and private crop insurance companies have recently attempted to provide farmers with more crop insurance information, in order to increase farmers’ knowledge of crop insurance, in hopes of increasing the crop insurance adoption rate. As well, in some cases, lack of knowledge has prevented farmers from understanding their crop insurance policy coverage and details (Hou et al., 2011).

For the variable, previous purchase of crop insurance, it shows a positive coefficient (1.737) as expected. The variable also shows high statistical significance, at the 1 percent level or better. These results imply that if farmers purchased crop insurance last year, they are likely to purchase it again this year. Repeat purchases of crop insurance would indicate that those farmers purchasing it repeatedly have a favorable view of it, and so are purchasing it again. Previous purchases may also reflect habit or tradition, as purchases may sometimes be made based partially on habit, in order to save search costs and search time (Smith et al., 1999). This is in contrast to a farmer spending costly amounts of time and money to comprehensively analyze all other new and existing risk management alternatives, relative to crop insurance.

The variable, trust of the crop insurance company, has results showing that the coefficient is positive (0.396) as expected. Results are statistically significant at the 1 percent level or better. These results indicate that farmers’ trust of a crop insurance company is associated with crop insurance purchases. Therefore, the more that farmers trust a crop insurance company, the more likely they are to purchase crop insurance. This trust variable is important for crop insurance policy, as there have been some defaults on crop insurance contracts by crop insurance companies in China in the past, where the crop insurance companies were either unable to pay or refused to pay (Tuo, 2010). These results indicate that farmers are more likely to purchase crop insurance if they trust the company, but less likely to purchase crop insurance if they do not trust the company.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficients</th>
<th>SE a</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge and behavioral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of crop insurance</td>
<td>0.152</td>
<td>0.111</td>
<td>0.171</td>
</tr>
<tr>
<td>Previously purchased crop insurance</td>
<td>1.737***</td>
<td>0.412</td>
<td>0.000</td>
</tr>
<tr>
<td>Trust of crop insurance company</td>
<td>0.396***</td>
<td>0.123</td>
<td>0.001</td>
</tr>
<tr>
<td>Risk level and premium level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of risk taken on by the farmer</td>
<td>0.186 *</td>
<td>0.113</td>
<td>0.100</td>
</tr>
<tr>
<td>Importance of low crop insurance premium</td>
<td>0.227 **</td>
<td>0.092</td>
<td>0.013</td>
</tr>
<tr>
<td>Main information source for crop insurance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>0.811 ***</td>
<td>0.218</td>
<td>0.000</td>
</tr>
<tr>
<td>Role in village of farmer</td>
<td>0.739 *</td>
<td>0.379</td>
<td>0.051</td>
</tr>
<tr>
<td>Off-farm income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of family members working in city</td>
<td>−0.251 *</td>
<td>0.136</td>
<td>0.064</td>
</tr>
</tbody>
</table>

Notes: Statistically significant at: *0.10 (10 percent), **0.05 (5 percent), and ***0.01 (1 percent) levels; Mcfadden $R^2 = 0.295$; dependent variable, 1 – purchased crop insurance this year, 0 – did not purchase crop insurance this year; aSE is standard error

Table II. Estimates of probit regression model: purchase of crop insurance in China
Risk level and insurance premium level
For the variable, amount of risk taken on by the farmer, results show a positive coefficient (0.186) as expected, and results are statistically significant at the 10 percent level or better. The positive coefficient shows that as farmers take on more risk, they are more likely to purchase crop insurance. This is as expected, since the risk reduction provided by crop insurance would help offset some of the other higher risk that is taken on by farmers. These results also imply that farmers who take on less risk would purchase less crop insurance, reflecting their reduced needs for crop insurance. The risk variable measures how much risk the farmer believes they are taking on in their general farming operations.

The variable, importance of low crop insurance premium, showed a positive coefficient (0.227), and statistical significance at the 5 percent level or better. The positive sign indicates that a lower crop insurance premium is associated with higher levels of crop insurance purchasing. In other words, results indicate that the demand for crop insurance is negatively sloping as expected, and that as the crop insurance premium decreases, farmers would purchase more crop insurance. This price sensitivity to premium cost also highlights the importance of the government crop insurance subsidy to farmers.

Main information source for crop insurance
The variable, government as a main information source for crop insurance, showed a positive coefficient (0.811), and statistical significance at the 1 percent level or better. This indicates that farmers who rely on government as their main source of crop insurance information, are more likely to purchase crop insurance. This may be because farmers may trust government crop insurance information more than information from private crop insurance companies. Farmers may view government crop insurance information as more unbiased, because private company crop insurance information may reflect advertising and sales biases, rather than strictly providing insurance information. As well, private crop insurance companies in China have been known to default on occasion without paying out full indemnities (Tuo, 2010), and this may be further reason that farmers may rely more on information from government, rather than private companies.

Role in village of farmer
In a number of cases, farmers play a role in their village, sometimes as village leader. The variable, head of village showed a positive coefficient (0.739), and statistical significance at the 10 percent level or better. This indicates that if a farmer is a village leader, s/he is more likely to purchase crop insurance. This may be because given the position of village leaders, they may have more of an understanding of crop insurance.

Also, the village leader may often have a role overseeing the operation of crop insurance in the village, and may have some involvement with the village crop insurance purchases, such as collecting premiums, and interaction with the crop insurance company. The village leader is sometimes compensated by the crop insurance company for their service. When farmers in a village wish to purchase crop insurance, often they will meet, and decide which company to deal with. Then they will often purchase the crop insurance collectively with one crop insurance company. Next, often the village leader would collect the crop insurance premiums on behalf of the village, and forward
them to the crop insurance company. This procedure makes the purchase and administration of the crop insurance more efficient, because farms are usually small and so premiums are relatively small.

**Off-farm income**
The variable, number of family members working in city showed a negative coefficient (−0.251), and with statistical significance of 10 percent or better. This negative sign indicates that as more family members work in the city, the farmer is less likely to purchase crop insurance. This would be expected, as those working in the city would provide off-income that is diversified away from farm income, and therefore lowering risk, and in turn reducing the need to purchase crop insurance to lower the overall farm risk. As well, the income from the family members working in the city would raise the family income, which would also lower the risk and reduce the need for crop insurance. Many family members in China earn off-farm income, and serve as temporary migrant workers in cities (Wang et al., 2010) for construction work, and then return to the farm for seasonal work during busy farm seasons such as planting and harvest. This makes family members working in the city an important variable for explaining crop insurance adoption.

**Other variables**
While a number of demographic and farm characteristic variables were contained in the broader data set, none were found to be statistically significant in the model. For a number of other agricultural insurance studies, some demographic variables (e.g. age, education) and some farm characteristic variables (e.g. farm size, farm debt level, farm income level) have often been found to be not significant, and this is not surprising. This may occur because there could be limited risk-related information in the particular demographic and farm characteristic variables. In China, for example, Kong et al. (2011) found no statistical significance between willingness to pay for farm weather insurance, and demographic and farm characteristic variables. As well, regarding crop insurance participation, Hou et al. (2011) found age to be the only statistically significant demographic variable, and found no farm characteristic variables to be statistically significant.

**Policy implications**
Crop insurance has been recently expanded in China, and much of this expansion has been as a result of government policy. This policy to expand crop insurance has been mostly carried out through government subsidization of crop insurance, and through improved information by government to improve farmers knowledge of crop insurance operation. The information from this study should be helpful for crop insurance companies and government policy makers who are attempting to understand the factors related to crop insurance purchases in China, and to expand the use of crop insurance. If crop insurance companies can better understand the factors related to crop insurance purchases by farmers (including the factors found in this study), then the firms should be able to increase the adoption rate of crop insurance in China. From a government policy perspective, government may be able to influence crop insurance purchases, through three potentially government influenced variables which were found to affect crop insurance purchases. For the first variable, trust of the crop insurance company, government could influence crop insurance purchases through improved regulation of the industry, to build more trust regarding crop
insurance companies. For the second variable, premium level, government could influence crop insurance purchases by controlling the amount of subsidy for the premiums. For the third variable, government as main crop insurance information source, government could influence crop insurance purchases by providing more crop insurance information to farmers.

Finally, crop insurance in China is often viewed by government as a useful approach for stabilizing the agricultural sector in China, and for increasing crop production in the long term. If more farmers are able to adopt crop insurance, they are likely to use more inputs such as fertilizer and chemicals, because at least part of their costs would be covered in the event of crop failure. Higher use of crop inputs would in turn result in higher crop yields and higher production. Also, on an individual farmer level, higher use of crop insurance may reduce the poverty level of small-scale farmers in China. Therefore, increased use of crop insurance should lead higher crop production and reduced poverty levels in China, and greater food security.

Summary
An explanatory model is developed using a number of factors to explain crop insurance purchases by farmers, in Inner Mongolia, China. The source of the data is a survey of 220 farmers in two counties. The model used is a regression probit model, and it is estimated with a maximum likelihood estimator. Results show that a number of independent variables explain crop insurance purchases by farmers in Inner Mongolia. Of the eight independent variables in the model, seven are significant at the ten percent level or better, indicating a reasonably good level of statistical fit for the model.

The eight variables that are used to explain crop insurance purchases are: knowledge of crop insurance, previous purchases of crop insurance, trust of crop insurance company, amount of risk taken on by the farmer, importance of low crop insurance premium, government as the main information source for crop insurance, head of village, and number of family members working in the city. All eight variables have the expected sign. As well, all variables are positively related to crop insurance purchases, except number of family members working in the city, as expected. This variable is negatively related to crop insurance purchases as expected, because as more family members work in the city, family income may become higher, and more diversified, providing lower risk, and therefore less need for crop insurance.

The information from this study should be helpful for government policy makers and crop insurance companies who are attempting to increase the use of crop insurance in China, because it will help to better understand what is driving crop insurance purchases. If government and crop insurance companies can better understand factors related to crop insurance purchases, then they should be able to increase the crop insurance adoption rate. This increased adoption rate of crop insurance should bring about a more stable agricultural sector, reduced poverty levels, and improved food security for China.

References


Goodwin, B.K. and Smith, V.H. (1995), The Economics of Crop Insurance and Disaster Aid, AEI Press, Washington, DC.


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