An Investigation Into the Factors Inhibiting the Development of Date Crop Insurance: the Case of Saravan County

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An investigation into the factors inhibiting the development of date crop insurance: The case of Saravan County

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Abstract

The viability and efficiency of crop insurance policies depend on farmers' demand and willingness for crop insurance. The present paper analyzes the insurance demand of 441 date farmers in Saravan County. Data showed that 68.87% of the farmers did not agree with insurance. The results of the ordinal logit model at five different levels indicated that awareness of insurance benefits, insurance record, previous-year yield, educational level, the standard deviation of income, orchard area, and satisfaction with insurance services are the main variables influencing the demand for insurance. The coefficient of variation of the likelihood of insurance adoption was estimated at all five levels. A 1% increase in satisfaction with insurance services increases the likelihood of a person's shift from the 'strongly disagree' category to the 'disagree' category by 6.3%. Older date farmers abstain from insurance adoption, which needs reflection given the religious view in the region on interest rates on the one hand and the resistance of older people against modern risk management methods on the other.

Keywords: Date crop insurance, Ordinal Logit Model, Willingness To Accept.

Introduction

The instability of nature and the unpredictable nature of natural disasters have put the agricultural sector in a special situation so that the decisions and activities of agricultural users are influenced by different aspects of these unpredictabilities and are always exposed to some degrees of risk, making farmers unsure of their future revenue. So, reducing the risk factor of agricultural activities and increasing investment security are two of the most important goals of planners and policymakers of the agricultural sector. A mechanism to mitigate these risks is crop insurance, which provides farmers with a motivation for production, hope for the future, and an opportunity for saving with the role it plays in reducing the losses caused by disasters, creating a sense of security, and compensating for financial losses. Crop insurance is the most critical tool to secure investments in this

sector and cope with uncertainties and severe riskiness of the activities and investments; in other words, it is the best supporting tool to convert crisis management into risk management (Falco et al., 2005). Crop insurance is regarded as a financial mechanism in agricultural policy and aims at mitigating production and revenue instability arising from the losses by various adverse climatic factors and alleviating the related uncertainties and risks in the agricultural production process. Developed countries do not implement insurance plans only as an instrument of risk management, but they also use these plans to improve farmers' access to credits, motivate them to produce valuable and high-risk crops, and induce more sustainability to agriculture and related industries (Vandeveer, 2001). Crop insurance is a risk-sharing mechanism that in practice transfers risk from the insured to public or private-sector insurers (Nelson & Loehman, 1987). In a broader sense, crop insurance is a supportive cover for all crops against losses by natural disasters and acts of God (Williams et al., 1998).

The success and efficiency of crop insurance policies depend on the demand and farmers' willingness to use crop insurance. So, it is of crucial significance for the policymaking system of the agricultural sector to be provided with the results of analytical studies on the effects of various economic, social, and technical factors of farmers on their decision to use crop insurance. Since the goals of crop insurance development include enhancing production, mitigating risks caused by natural disasters, ensuring farmers' minimum revenue, and so on, the construct that should be taken into account in future planning is increasing the number of insurance adopters and satisfying the present insured. So, the prediction of the farmers who will keep using crop insurance and their difference from those who will not can be helpful to planners. Thereby, insurance adoption discontinuation can be reduced and failures of farmers caused by this discontinuation can be largely prevented.

Saravan County is one of the leading date producing regions in Sistan and Baluchestan province, Southeastern Iran. Out of the total area of this county, almost 13,000 ha is cultivated with date. Date is a strategic crop and an exporting commodity of this county to the international markets, but date farmers incur heavy losses by some natural disasters such as off-season rainfalls, droughts, the incidence of pests and diseases, and fires. Evidence shows that the process of crop insurance is not of an adequate pace in this county, and date crop insurance has not been institutionalized in the rural communities of the county owing to some socio-economic issues. Since the local farmers are traditionalists and resistant to innovation, it is crucial to promote and strengthen the culture of insurance among them. The efficiency of crop insurance policy strongly depends on farmers' willingness to use it for their production. Therefore, it is unavoidable to analyze farmers' decision process in terms of their willingness to use insurance. As well, since farmers of various crops in different regions respond to the adoption of crop insurance differently, understanding the extent of date insurance adoption and the reasons for its non-adoption seems necessary for designing incentive policies and proposes approaches to tackling insurance adoption barriers among date farmers. Accordingly, the present study aims to identify and explore the factors underpinning crop insurance

adoption by date farmers in Saravan County. The results can contribute to enhancing the efficiency of the crop insurance system in this region.

Literature Review

Identifying and understanding the parameters that influence the demand for crop insurance can contribute to improving the processes of policymaking for this sector. Various parameters can affect crop insurance demand and adoption. Research has already addressed these parameters for different crops, some of which are reviewed below.

In Iran, Darijani and Qorbani (1998) surveyed the factors affecting wheat insurance adoption by wheat farmers in Sari. According to them, the model estimation showed that the variables of credits, farm size, land ownership, farming type, participation in core projects, and risk history were the factors affecting insurance adoption by them. In a study in Fars province, Mohammadi et al. (2008) investigated the factors affecting the purchase of crop insurance for three crops, including wheat, barley, and cotton. The results showed that the variables of farming revenue, farmer's age, and awareness of insurance goals with a positive coefficient and ownership type with a negative coefficient were significant for all three crops. Torkamani and Qorbani (1999) revealed that farm size and farmer's part-time activity influenced the demand for insurance negatively. Karbasi (2000) explored farmers' attitudes and the factors affecting crop insurance adoption across Khorasan province and concluded that annual farming revenue was the most inhibiting factor and the cultivated area was the most motivating factor of farmers' willingness to adopt wheat insurance.

Barnet et al. (1990) estimated the demand function for crop insurance and expressed that the expected return rate of the insurance was the most important factor in determining insurance demand. They estimated the demand elasticity for insurance at -0.2. According to Smith and Goodwin (2001), the insurance premium is the key factor underpinning the adoption of crop insurance. In a study in Northern Vietnam, Vandeveer (2001) investigated local farmers' demand for insurance and figured out that farmers tended more towards crop insurance and lower prices. The econometric analysis revealed that farmers with higher revenue were more willing to participate. The paper concludes that crop insurance perspective and characteristics, demographic characteristics, farm and farming revenue, and farmer educational level are the key factors influencing the demand for crop insurance. Innes (2003) expresses that the higher the income and educational level of farmers are, the more likely the adoption of insurance schemes will be. In a study on the role of crop insurance in agriculture development in Nigeria, Ali (2004) found that the development of crop insurance over 1990-2000 had effectively contributed to mitigating the risk of agricultural activities in this country. Although insurance development was initially struggling with various problems including financial shortages, the government has helped it significantly by providing the necessary supports. In an attempt to list the factors influencing the adoption of livestock insurance in Eritrea, Mohammed and Ortmann (2005) considered such variables as educational level, farm size, the dummy variable of having a second job,

debt to asset ratio, a dummy variable to show activity diversity in the production unit, and years of farming experience. They concluded that the farmers' educational level had a direct impact on insurance adoption and the descriptive variables of the diversity of activities and experience had an indirect effect on it. Romun (2008) argues that crop insurance enhances farmers' capability of agricultural risk management and allows them to increase investment in the agricultural sector. Governments also contribute to increasing crop production by subsidizing crop insurance. This policy has been extensively used by the Chinese government in the last decade.

Tang (2009) reports that insurance development in China is faced with many problems. According to him, crop insurance has had a trivial impact on marketing patterns. Also, the government should pave the way for the development of crop insurance by providing state subsidies. Informing farmers about insurance can play a key role in extending crop insurance. Olubiyo and Webster (2009) found that the development of crop insurance for selected crops changed crop production composition, influencing farming profitability for some products and improving agricultural sustainability. In a study on the analysis of crop insurance services in some parts of Zimbabwe, Tsikirayi et al. (2010) revealed that farmers' awareness of the significance of insurance marketing, training, insurance premium's being economicality, fair methods of insurance distribution, and government's intervention in insurance affairs can be useful for insurance development. Sidra et al. (2015) state that measures like enhancing farmers' awareness, providing credits, holding training courses, providing infrastructure for the farmers to use media, and holding group discussion groups with farmers are effective in insurance development. In a study on the economic, social, and cultural factors affecting demand for crop insurance in American and European countries, Ezdini Sihem (2019) concluded that demand for crop insurance is a multi-facet function that depends on premium, insurance subsidy, crop quantity, the farmer's educational level, production risk, and the farmer's view on insurance.

Methodology

This section models date farmers' behavior as to date crop insurance to find out the main variables that account for this behavior. Therefore, we first express the concept of willingness to adopt or purchase insurance. A consumer firstly decides whether or not he/she wants to use a commodity or what commodity he/she should use. Then, it is decided how much money he/she will want to spend on the commodity. The main contribution of determining the willingness for adoption is that if the date farmers lack the willingness, then infrastructure (the descriptive variables of the model) should be examined and modified. The other application of the model is its capability of categorizing the utility of different date farmer groups in insurance use. If the utility derived from insurance use, denoted by D_i, is assumed to be formed under various socioeconomic variables, the function of D_i will be as below assuming a linear relationship between these variables and the constructed utility (Johnson and Albert, 1999; O'Connell, 2006).

$$D_i = \beta_0 + \sum_{k=1}^{m} \beta_k X_{ik} + \varepsilon_i = \beta_0 + Z_i + \varepsilon_i \tag{1}$$

in which D_i is the utility obtained by the ith individual from the use of crop insurance, X is a descriptive variable, β_0 is the y-intercept, β_k is the descriptive parameters, $i = 1,2,\ldots,n$ is the number of date farmers, $k = 1,2,\ldots,m$ is the descriptive variables, and ε_i is the random noise term. Since an individual's utility is a latent variable, the dependent variable, i.e., the likelihood of purchasing crop insurance, can be express at different levels as follows:

$$\begin{aligned}
&WTA_i = 1 \quad if \quad D_i \le 0 \\
&WTA_i = 2 \quad if \quad 0 \le D_i \le \mu_1 \\
&. \\
&. \\
&. \\
&WTA_i = n \quad if \quad \mu_{n-1} \le D_i \le \mu_n
\end{aligned} \tag{2}$$

in which μ represents the boundary points that show the utility of using crop insurance. The date farmers are categorized into different groups based on the likelihood of their willingness to accept (WTA) crop insurance and the utility created for them, which is defined as below:

$$\Pr(WTA_i = n) = \Pr(-\beta_0 - Z_i + \mu_{n-1} \le \varepsilon_i \le \mu_n - \beta_0 - Z_i) \tag{3}$$

This ordinal model has been formed on the premise that the utility of using date insurance (D_i) is a latent continuous variable and the ordinal variable provides a diagnostic approximation of this latent continuous variable. When the distribution of the error term ε_i is known, the above likelihoods can be calculated precisely. For simplicity, it is assumed that ε_i has a logistic distribution. In other words, its cumulative distribution is as follows:

$$F(\varepsilon) = \frac{\exp(\varepsilon)}{1 + \exp(\varepsilon)} \tag{4}$$

With this assumption, the likelihoods in Eq. (3) can be calculated. For example, the likelihood of given answer n is calculated as below:

$$\begin{aligned}
&\Pr(WTA_i = n) = \Pr(-\beta_0 - Z_i + \mu_{n-1} \le \varepsilon_i \le \mu_n - \beta_0 - Z_i) \\
&= \Pr(\varepsilon_i \le \mu_3 - \beta_0 - Z_i) - \Pr(-\beta_0 - Z_i + \mu_{n-1}) \\
&= \frac{e^{\mu_{n-1} - \beta_0 - Z_i}}{1 + e^{\mu_{n-1} - \beta_0 - Z_i}} - \frac{e^{\mu_n - \beta_0 - Z_i}}{1 + e^{\mu_n - \beta_0 - Z_i}}
\end{aligned} \tag{5}$$

Accordingly, the following model determines the likelihood of adopting the ordinal choice j by the ith consumer to the likelihood of its non-adoption:

$$\ln\left(\frac{P_{ij}}{1-P_{ij}}\right) = \mu_j + \beta_k X_{ik} + \mu_i \quad (6)$$

in which the subscript i represents various values of the ordinal variable and μ_i is the random noise term. The logit model presented by Eq. (6) is called the ordinal logit model because the dependent variable in this regression is expressed in an ordinal and scaled form (Greene, 2010; Agresti, 2010). In the present research, the dependent variable has been categorized at five levels of strongly disagree, disagree, neutral, agree, and strongly agree. The observation of the utility obtained by date farmers provides policymakers with useful information as to, for instance, how much utility the date farmers should gain from the adoption of crop insurance in order to move from 'strongly disagree' conditions to 'strongly agree' conditions. The described modeling helps us calculate the likelihood of utility obtained by each respondent. Then, we can state the variables influencing the improvement of insurance adoption.

Ethics committee approval

All applicable international, national, and institutional guidelines for the care and use of Human were followed. all methods were carried out in accordance with relevant guidelines and regulations. informed consent was obtained from all subjects in each questionnaire.

All authors of this manuscript confirm that experimental protocols were approved by the Higher Educational Complex of Saravan and by Research Council of this institutional.

Results

To conduct the research in 2020, after a review of the literature and collecting expert opinions from the Office of Agriculture-Jahad and Crop Insurance Fund, a questionnaire was developed and was distributed among date farmers taken by simple randomization. The willingness of the date farmers to adopt crop insurance was categorized into five levels. So, the dependent variable (willingness to adopt) was in the ordinal form representing the likelihood of the use of crop insurance by date farmers. Tables 1 and 2 present a statistical description of the variables included in the model of the willingness to adopt insurance.

Table 1. The statistical description of willingness for insurance adoption

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Number	137	82	85	57	80	441
Percentage	31	18.6	19.27	12.92	18.14	100

Table 2. The statistical description of the model's descriptive variables

Variable	Mean	Variance
Orchard age (years)	23	63
Orchard area (ha)	4.8	5.6

Awareness of insurance benefits	1.2	2.6
Record in having a risk (%)	60	609
Satisfaction with insurance	1.8	1.5
Record of insurance (years)	3.4	8.9
Previous-year yield of orchard (t)	6.2	1.3
Age (years)	46.79	90.78
Educational level (years)	7	15.19

Source: Research findings.

Since the variable studied here was of an ordinal nature, the ordinal logit model was used to estimate the impact of different factors on the willingness to adopt crop insurance. The results are shown in Table 3.

Table 3. The results of estimating the ordinal logit model for the willingness for crop insurance adoption

Variable	Estimated coefficient	Z-statistic	Sig. level
Orchard age (years)	-0.498	-1.62	0.09
Orchard area (ha)	0.312	2.47	0.01
Awareness of insurance benefits	0.210	2.68	0.00
Record in having a risk (%)	0.436	4.06	0.00
Satisfaction with insurance	0.389	1.74	0.03
Record of insurance (years)	0.204	2.1	0.00
Previous-year yield of orchard (t)	0.432	3.02	0.00
Age (years)	-0.048	-1.88	0.06
Educational level (years)	0.156	2.20	0.00
Standard deviation of income (5-year)	0.400	2.47	0.00
μ_1	-1.281		
μ_2	0.515		
μ_{31}	0.261		
μ_4	1.591		
McFadden's R^2 = 19.52%	Log Likelihood = 452.630		
χ^2 = 182.52	Sig. level = 0.00		

Source: Research findings.

Given the parameters estimated by the ordinal logit model, if the value of the dependent variable is smaller than the first threshold parameter, i.e., -1.281, the person is placed in the 'complete disagree' group, if it is between -1.281 and 0.515, the person is placed in the 'disagree' group, if it is between 0.515 and 0.261, the person is placed in the 'neutral' group, if it is between 0.261 and 1.591, the person is placed in the 'agree' group, and if it is greater than 1.591, the person is placed in the 'complete agree' group with the adoption of crop insurance. Based on the results as to the positive and negative effects of factors influencing the willingness to adopt date insurance in Table 3, the variable of revenue standard deviation is significant at the $P < 0.01$ level so that with an increase in this variable, farmers show more willingness to adopt crop insurance. The variables of the farmer's age and the date orchard's age have negative signs, implying that older date farmers show a weaker tendency towards purchasing insurance whereas younger farmers exhibit a stronger tendency. The date farmers whose orchards are older are less willing to purchase insurance for their orchards. This unwillingness was significant at the $P < 0.05$ level.

To infer further results from the estimated model, the marginal effects should be calculated for each level of willingness to adopt crop insurance. The marginal effects are shown in Table 4. According to Table 4, when the yield of the previous year is increased by 1%, it will be 4.5% less likely for the date farmer to strongly disagree with insurance adoption and it will be 1.9% more likely for him to shift from the 'agree' category to the 'strongly agree' category. When awareness of insurance benefits is enhanced by 1%, the farmer is 1.6% less likely to strongly disagree with insurance and if he/she is in the 'agree' category, a 1% increase in the awareness will make it 1.5% more likely for him/her to be placed in the 'strongly agree' level. The other variables of the model can be interpreted similarly.

Table 4. The marginal effects estimated for different levels of willingness for insurance adoption

Variable	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Orchard age (years)	0.029	0.025	0.005	-0.021	-0.035
Orchard area (ha)	-0.036	-0.017	0.009	0.002	0.022
Awareness of insurance benefits	-0.016	-0.012	0.006	0.010	0.015
Record in having a risk (%)	-0.025	-0.018	-0.008	0.018	0.032
Satisfaction with insurance	-0.063	-0.034	0.014	0.041	0.055
Record of insurance (years)	-0.019	-0.018	0.003	0.015	0.020
Previous-year yield of orchard (t)	-0.045	-0.022	0.009	0.022	0.019
Age (years)	0.003	0.001	-0.001	-0.002	-0.002
Educational level (years)	-0.009	-0.008	0.001	0.007	0.009
Standard deviation of income (5-year)	-4.5×10^{-8}	-4.1×10^{-8}	5.33×10^{-8}	3.5×10^{-8}	2.7×10^{-8}

Source: Research findings.

Discussion and Recommendations

The results of estimating the model of willingness for insurance adoption reveal that the willingness is higher among date farmers with a record of suffering from a hazard and those who are more informed about the benefits of insurance. So, to motivate date farmers, it is necessary to hold training courses on insurance where farmers can be taught about risk patterns and the effects of insurance on their management. As the results showed, date farmers who have older orchards or who are older avoid the adoption of insurance. This needs reflection given the religious view in the region on interest rates on the one hand and the resistance of older people against modern risk management methods on the other. The analysis indicates that an insurance record is a factor that enhances the likelihood of insurance adoption. The yield of the previous year and the standard deviation of the past five-year revenue of the orchard are among the main variables that significantly ($P < 0.01$) influence the likelihood of insurance adoption by date farmers. So, it is recommended to define insurance premium in accordance with different revenue levels, or the low-income farmers are provided with the option of paying the premium in an installment plan. The policymakers of the agricultural sector can also consider granting insurance loans for farmers or undertaking their insurance premium in

exchange for subtracting it from the farmers' monthly social assistance. This will contribute to further developing date orchard insurance across Saravan County.

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Ethics committee approval

All applicable international, national, and institutional guidelines for the care and use of Human and animals were followed. all methods were carried out in accordance with relevant guidelines and regulations. informed consent was obtained from all subjects in each questionnaire.

Data availability

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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