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RESEARCH ARTICLE

The impact of risk perception and information acquisition on meteorological adaptive behavior of large grain farmers

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ABSTRACT

Based on the survey data of 414 large grain farmers in 11 counties and cities in Poyang Lake District of Jiangxi Province, this paper used structural equation modelling (SEM) and hierarchical regression method to explore the relationship between risk perception, information acquisition, human capital and meteorological disaster adaptive behaviour of large grain farmers. This paper focuses on the mediating role of information acquisition in risk perception and adaptive behaviour and the moderating role of human capital in information acquisition and adaptive behaviour. The results show that the risk perception of large grain farmers has a significant positive effect on their information acquisition and adaptive behaviour. Information acquisition ability of large grain farmers has a significant positive effect on their adaptive behaviour, and there exists a mediating effect between risk perception and adaptive behaviour; the human capital of large grain farmers does not play a moderating role in the impact of risk perception on information acquisition, yet has a significant positive moderating effect on the impact of information acquisition on adaptive behaviour. The results reveal the mechanism of meteorological disaster adaptive behaviour of large grain farmers and its influencing factors, which can be used as a reference for the government to make relevant policies.

Keywords: Meteorological disasters; Risk perception; Adaptive behaviour; Information acquisition; Human capital

INTRODUCTION

The IPCC Fifth Assessment Report (AR5) points out that global warming has become a consensus, and global climate change is expected to continue in the future (IPCC,2013). The trend of climate change in China is the same as that of global climate change (Shen and Wang, 2013), and the harm of agro-meteorological disasters continues to intensify, which has a great impact on China's agricultural and food production (Li et al., 2010). With the further deepening of agricultural modernization, land transfer, and large-scale development of agricultural land, the group of large grain farmers has gradually grown, and its role in China's agricultural industry chain has become increasingly prominent. As a carrier of agglomeration of resources and a representative of new productivity, large grain farmers have shown great sensitivity to new agricultural technologies, and are advanced in terms of new agricultural technology project demand and investment willingness. However, their single income structure causes them to be greatly affected by meteorological disasters, and much larger than small farmers (Jiang et al., 2016). In the current situation, large grain farmers deserve to be a model force for adaptive behaviour to meteorological disasters. Since the risks arising from climate change are uncertain events (Altmann and Burns, 2005), adaptive policies are the best choice to deal with climate change (Solomon et al., 2007). Therefore, understanding the adaptation mechanisms and processes of large grain farmers for meteorological disasters is the basis for formulating effective adaptation policies.

Meteorological disaster adaptive behaviour of farmers refers to the behaviour or measures that farmers use the favorable conditions provided by climate resources and environment to resist the potential risks of climate change and reduce the vulnerability of agriculture to climate change (Ian et al., 2002). In this paper, we consider the

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adaptive behaviour of meteorological disasters as the measures taken subjectively by large grain farmers to cope with various meteorological disasters, and these measures are generally the traditional adaptive behaviours preferred by large grain farmers. Farmers generally need to go through three stages when responding to climate change, namely observation, perception, and action, and the latter stage must be based on the former stage (Bohensky et al., 2012). Recent studies have shown that climate awareness is a key factor affecting farmers' adaptive decision-making (Below et al., 2012), while other studies believe that even if farmers have the motivation to adapt, they do not take action because of their own lack of adaptive capacity on the one hand, and their perception of risk from weather disasters on the other hand, which is influenced by past experiences and social communication and will lead to cognitive bias. Due to the differences in research objects and regions, the results of the research on the factors affecting the adaptive behaviour of farmers are different, but it is generally agreed that the adaptive behaviour of farmers is the result of the perception of climate change (Song and Shi, 2020; Zhao, 2014). Risk perception is one of the main influencing factors for individuals to make decisions under uncertainty (Arrow et al., 1971) and is an important factor affecting farmers' adaptation to meteorological disasters. It has been confirmed that the higher the level of risk perception, the greater the demand for relevant information acquisition (Zhao et al., 2012). Extensive access to meteorological information can help farmers to better select adaptation measures and thus enhance their ability to adapt to climate change (Wu et al., 2015) and the probability of taking adaptive decisions increases when the demand for information acquisition increases. Through the analysis of the influence path of risk perception on information acquisition and the influence path of information acquisition on adaptive behaviour, this paper argues that risk perception may also affect the adaptive behaviour of large grain farmers through the influence of information acquisition, that is, information acquisition may have a mediating role between risk cognition and adaptive behaviour.

In addition, human capital is particularly important for new business entities such as large grain farmers. On the one hand, the existing research suggests that individual characteristic variables have an impact on public risk perception and information cognition (Sun et al., 2013), and the risk perception and information acquisition of farmers may differ to some extent due to differences in individual characteristics, in other words, farmers' educational level, health status, skill training, experience, and other human capital indicators may affect farmers' risk perception and information acquisition to some extent; On the other hand, human capital as the internal factors of the large grain farmers' own conditions, when these internal factors are more excellent, the ability to use information is stronger (Hou et al., 2019). Human capital inevitably plays an important role in the information use of large grain farmers, and the better the human capital is, the better the efficiency of information use is, which is mapped to behaviour that is conducive to promoting large grain farmers to adopt meteorological disaster adaptive behaviour. In this paper, the structural equation model and a hierarchical regression model are used to quantitatively analyze the survey data to explore the influence mechanism of risk cognition, information acquisition, and adaptive behaviour of large grain farmers, as well as the moderating effect of human capital. From the perspective of large grain farmers, we consider how to effectively improve their adaptability to meteorological disasters and reduce the adverse impact of meteorological disaster risks on grain production, so as to provide scientific references for the government to formulate relevant policies.

THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

Risk perception and meteorological disaster adaptation behaviour of large grain farmers

Risk perception has undergone continuous evolution since Bauer introduced risk perception into consumer behaviour in 1960, which is the individual's attitude and intuitive judgment of risk, including the cognition and judgment of risk, subjective evaluation, and preference, attitude and behaviour of risk response, etc (Xie and Xu, 1995). In this paper, risk perception is defined as the cognitive status and acceptance level of large grain farmers regarding losses caused by meteorological disasters, which is a psychological element of subjective judgment. There are few existing studies on the impact of risk perception on adaptation behaviour and focused on the residents of a specific city regarding climate change (Yan, 2010; Song, 2014). However, perception is a prerequisite for behaviour, and it has been widely recognized that risk perception is a key factor in adaptive decision-making, and the concept of risk perception includes the perception of risk, and for climate change risks with uncertain conditions, one of the two major factors influencing the decision making of large grain farmers is risk perception, and the awareness of adaptation behaviour increases with the degree of perception, so the following hypothesis is proposed:

H1. Risk perception has a positive impact on the adaptation behaviour of large grain farmers to meteorological disasters, that is, the high level of risk perception of large grain growers can enhance the awareness of adaptation behaviour, and vice versa, reduces this awareness.

The mediating role of information acquisition

Information acquisition refers to the activity or process of obtaining information and screening useful information through various channels within the reach of large grain farmers in response to meteorological disasters. The purpose of the information search is to obtain information, and there is abundant research on risk perception and information search behaviour. Many scholars have conducted relevant studies on the role of risk perception in information search behaviour. The earliest model proposed by Griffin (RISP model) is the risk information search and processing model, which can be applied to different risk situations (Lan, 2019), such as the information seeking of large grain farmers in the case of weather disasters. When the risk perception increases, their information search efforts will also increase (Zhou and Jiang, 2004; Ma et al., 2017). Therefore, this paper believes that with the increase of risk perception, large grain farmers will strengthen information search behaviour, thereby enhancing information acquisition ability, so the following hypothesis is proposed:

H2. Information acquisition plays a mediating role between risk perception and adaptive behaviour, that is, the degree of risk awareness will affect the information acquisition ability of large grain farmers, and then affect the awareness of meteorological disaster adaptation behaviour through information acquisition ability.

H2a. Risk perception has a significant positive impact on information acquisition, that is, a high degree of risk perception helps to improve information acquisition ability.

Secondly, the existing studies generally agree that whether before or after natural disasters, obtaining information on climate change can improve the enthusiasm of large grain growers to adopt adaptation behaviour. The adaptation behaviour adopted by farmers who obtain information before the disaster will choose to switch to other crops (Zhu et al., 2016), and the adaptation behaviour adopted by farmers who obtain information after the disaster is actually a passive adaptation, and farmers will generally take measures such as replanting to reduce their losses (Liu et al., 2013), so the following hypothesis is proposed:

H2b. Information acquisition has a significant positive impact on adaptive behaviour, that is, the stronger the ability to obtain information is, the more beneficial it is to improve the awareness of adaptive behaviour. Farmers' cognition of meteorological disaster risk is actually the premise of obtaining relevant information, and the scope, channel or level of information processing will affect the enthusiasm of farmers to take adaptation measures, which means that the higher the degree of farmers' risk cognition, the stronger the demand for information. When the information searching ability is improved, the information channels or information amount obtained will increase, and the probability of adaptive measures adopted will also increase (Wu et al., 2015), so the following hypothesis is proposed:

The moderating role of human capital

Human capital refers to the comprehensive quality of ability, knowledge, technology and health qualities that have economic value in the laborers, and reflects the quality of the laborer (Yang et al., 2006). In this paper, human capital is defined as the implicit individual characteristics that reflect the value-added and profit-generating qualities possessed by the large grain farmers themselves, mainly composed of farmers' education level, health status, skill training, experience and other indicators. As a labor-intensive industry, agriculture accounts for a large proportion of labor input in production costs. In terms of the heterogeneity of human capital, the degree of return on labor input varies among farmers, that is, the level of human capital varies among farmers, which leads to significant differences in the effects of adaptive behaviour. One is that high human capital tends to have stronger ability to obtain information, and the higher the level of education, the stronger the willingness to obtain information (Shi, 2019); the longer the number of years of farming, the more willing the large grain farmers are to communicate with others to obtain information (Zhou and Sun, 2010). The second is that high human capital tends to have a stronger ability to use information. For example, large grain farmers who attend rural technology training courses are better able to use the market information they obtain (Cai and Chen, 2012); due to technical reasons, the information utilization of low-educated grain growers lags behind that of high-educated grain farmers (Sun, 2013), so the following hypotheses are proposed:

H3a. Human capital positively moderates the positive impact of risk perception on information acquisition. Compared with lower human capital, the positive impact of risk perception on information acquisition is enhanced under higher human capital.

H3b**.** Human capital positively moderates the positive impact of information acquisition on adaptive behaviour. Compared with lower human capital, the positive impact of information acquisition on adaptive behaviour is enhanced under higher human capital.

Most of the research on the relationship between risk perception and information-seeking behaviour is based on the RISP model proposed by Griffin (1999) (Griffin et al., 1999) and the RPA model proposed by Rimal

and Real (2003) (Rimal and Real, 2003), but the RISP model is more extensive than the RPA model due to its applicability to different risk scenarios. The RISP model was first used to describe the cognitive processing of information by individuals in the face of risk due to their own psychological factors and other social factors, which in turn affect the seeking and processing of individual information (Liu and Wu, 2016).The key components of the RISP model include perceived risk characteristics, emotional response to risk, information subjective norms and information insufficiency, perceived information collection ability, and attitude to risk information(Yang et al., 2014). The characteristics of perceived risk are the individual's cognitive evaluation of risk, corresponding to this article is the ability of large grain farmers to collect risk perception information, which is the ability of individuals to collect risk, corresponding to this article is information acquisition; and the ultimate purpose of information acquisition is the adoption of optimal strategies to cope with meteorological disasters. In addition, the RISP model also believes that individual characteristics have an impact on risk information seeking and processing behaviour, including demographic variables, past experiences, and other socio-cultural factors, which correspond to the human capital of large grain farmers in this paper. The mediating effect of information acquisition between risk perception and adaptation behaviour may be moderated by different human capital, that is, the effect of risk perception on meteorological disaster adaptation behaviour can be described by a moderated mediation model. Thus, this paper constructs a theoretical framework diagram based on the RISP model (Fig. 1).

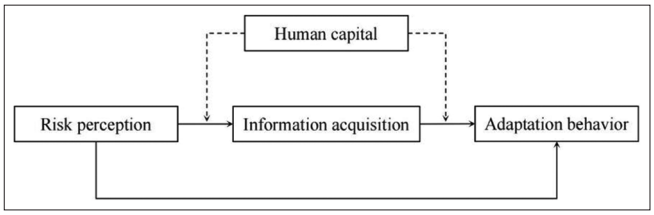

Fig 1. Theoretical framework diagram

RESEARCH DESIGN

Research sample

This study mainly relies on the questionnaire survey data, and the survey method is field survey. Several typical rice planting areas (around the Poyang Lake River region) in Jiangxi Province are selected, and household surveys are conducted in different villages in 11 cities (northern and central Jiangxi regions) in the survey area (Fig. 2). A total of 536 questionnaires are distributed, and 414 valid questionnaires are finally recovered, with effective rate of 77.23 %. The survey targets mainly the heads of large grain-growing households with more than 50 acres at home.

Variable setting

Independent variable

Based on the scale developed by Baruch Fischhoff (Baruch et al., 1978) to examine the public's perceptions of gains or losses caused by natural events, and combined with the context and characteristics of the subjects in

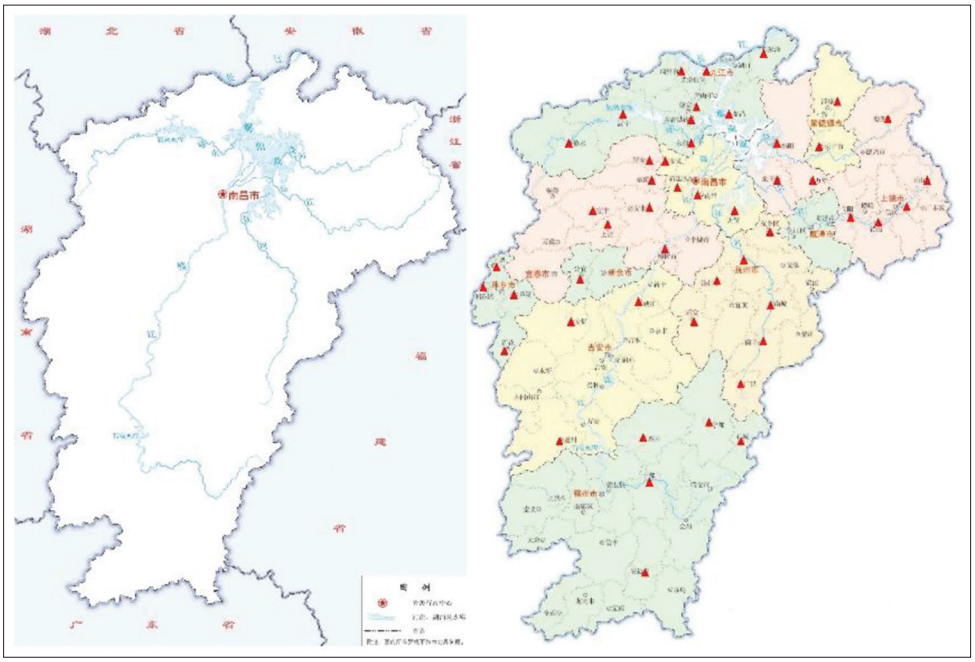

Fig 2. Distribution of rivers, lakes and samples in Jiangxi Province

this study, the following three questions were set in the questionnaire: "Do you agree that meteorological disasters will lead to a decrease in rice quality?"; "Do you agree that meteorological disasters can lead to a decrease in rice yield?"; "Do you agree that meteorological disasters will lead to an increase in input costs?" to reflect the level of risk perceptions of large grain farmers regarding meteorological disasters (the meaning and assignment of independent variables are shown in Table 1).

Dependent variable

Referring to the adaptive behaviour scale developed by Tong Qingmeng (Tong et al.,2018),the following three questions are set in the questionnaire: "In the face of meteorological disasters, you will adjust the farming time (planting earlier, harvesting, etc.)."; "In the face of meteorological disasters, you will adjust the frequency of irrigation and drainage." "In the face of weather disasters, you will increase the input of ordinary pesticides and chemical fertilizers." to reflect the adaptation level of large grain-growing households to meteorological disasters (the meaning and assignment of the dependent variable are shown in Table 1)

Mediating variable

Based on the RISP model and referring to the information-seeking behaviour and information processing ability scale developed by Ding Yi-Xia (Ding, 2019), the following three questions are set in the questionnaire: "I can screen out useful information from various climate change information"; "I will positively pay attention to the policies of government departments to deal with climate change"; "I will collect information through various methods as much as possible when encountering meteorological disasters" to reflect the information acquisition level of large grain farmers (the meaning and assignment of mediating variables are shown in Table 1).

Moderating variable

Based on the Sustainable Livelihood Analysis Framework (SLA) (DFID, 1999) proposed by the UK Agency for International Development (DFID), the sustainable livelihoods analysis framework believes that human capital refers to the skills, knowledge, and health status of farmers in order to maintain livelihoods and achieve sustainable livelihood goals. In this paper, drawing on existing research results, the human capital level of large grain farmers is set as "years of farming experience of large grain farmers"; "education level of large grain farmers"; "physical health status of large grain farmers." The human capital level of large grain farmers was set as "years of farming"; "education of large grain farmers"; "the physical health of large grain farmers"; "participation in agricultural technology training of large grain farmers" (the meaning and assignment of adjustment variables are shown in Table 1).

Among the valid questionnaires collected, the characteristics of large grain farmers in the sample are shown in Table 2.

Table 1: Variable Setting

Variable name	Variable meaning and assignment	Reference Source of Scale
Independent variable Risk Perception	RP1: Do you agree that meteorological disasters can lead to a decrease in the quality of rice?	Scale developed by Fischhoff etc., (Baruch et al.,1978)
	RP2: Do you agree that meteorological disasters can lead to a decline in rice yield?	
	RP3: Do you agree that meteorological disasters can lead to increased input costs?	
Dependent variable Adaptation Behaviour	AB1: In the face of meteorological disasters, you will adjust your farming time (planting earlier, harvesting, etc.).	Scale developed by Tong Qingmeng etc., (Tong et al.,2018)
	AB2: In the face of meteorological disasters, you would adjust the frequency of irrigation and drainage.	
	AB3: In the face of meteorological disasters, you would increase the input of ordinary pesticides and chemical fertilizers.	
Mediating variable Information Acquisition	IA1: I am able to filter out useful information from various climate change information.	Ding Yi-Xia developed the scale (Ding, 2019)
	IA2: I will positively pay attention to the policies of government departments to deal with climate change.	
	IA3: When encountering weather disasters, I will collect information through various methods as much as possible.	
Moderating variable Human capital	HC1: farming years of farmers. 1-10 = 1, 11-20 = 2, 21-30 = 3, 31-40 = 4, 41 and above = 5	SLA framework proposed by DFID (DFID,1999)
	HC2: Education level of farmers. Elementary school and below = 1, middle school = 2, high school = 3, junior college = 4, bachelor and above = 5	
	HC3: Health status of farmers. Very poor = 1, poor = 2, general = 3, good = 4, good = 5	
	HC4: Participation of farmers in agricultural technology training. Few = 1, less = 2, general = 3, more = 4, many = 5	

Strongly disagree = 1. Relatively disagree = 2. Generally = 3. Relatively agree = 4. Strongly agree = 5

The proportion of men is as high as 91.8 %, and the main labor force in the large grain-growing households is mainly men. The average age of the surveyed large grain-growing households is 48.69, and the age distribution is olive-shaped, with the majority of the villagers. In terms of educational level, 22.7 % of the large grain growers are primary school and below, 45.4 % of the large grain farmers are junior high school, 20.8 % of the large grain farmers are high school, 9.4 % of the large grain growers are junior college, and only 1.7 % of the large grain growers are undergraduate and above, indicating that the overall educational level of the large grain growers is low. In terms of farming years, more than half of the large grain growers have farming years of 20 years or more, indicating that large grain growers are more dependent on agricultural production. In terms of physical health, more than half of the large grain farmers believe that their health level is better.

HYPOTHESIS TESTING

Mediating effect test

SPSS22.0 software was used for factor analysis to test its reliability and validity. The results are shown in Table 3. The factor loading coefficients of latent variable risk perception, information acquisition, and adaptive behaviour are all greater than 0.7, and the CR values are 0.872, 0.842, and 0.812, respectively, which are all greater than the standard value of 0.8. The AVE values are 0.694, 0.641, and 0.59, respectively, which are all greater than the standard value of 0.5 and are acceptable. The Cronbach's α coefficients are 0.776, 0.719, and 0.649, respectively, which are all greater than 0.6, indicating that the scale has internal consistency reliability. KMO values are 0.669, 0.669, and 0.649, respectively, which are all greater than the standard value of 0.6. Since the years of farming in the potential variable human capital are non-scale items, the reliability and validity of the scale cannot be tested. However, the factor loading coefficients except H1 are all above 0.5, the CR value is 0.712, and the AVE value is 0.393, so the reliability and validity of the scale are good.

The results of the mediated model fit test for information acquisition are shown in Table 4, with a chi-squared freedom ratio of 1.687, within 1-3, fit index GFI=0.979, adjusted fit index AGFI=0.961, value-added fit index NFI=0.953, IFI=0.981, relative fit index RFI=0.930, non-canonical fit index TLI= 0.970, comparative fit index CFI=0.980, root mean square error of approximation

Table 2: Basic information of the sample

Characteristics	Category	Number of People	Proportion	Characteristics	Category	Number of People	Proportion
Gender	Male	380	91.8%	Whether the village	Yes	360	87.0%
	Female	34	8.2%		No	54	13.0%
Age	30 and below	11	2.7%	Education level	Primary school and below	188	22.7%
	31~40	61	14.7%		Junior high school	86	45.4%
	41~50	160	38.6%		High school	39	20.8%
	51~60	154	37.2%		Junior College	39	9.4%
	61 and above	28	6.8%		Bachelor's degree and above	7	1.7%
Years of farming	10 and below	141	34.1%	Health status	Very poor	4	1.0%
	11~20	116	28.0%		Poor	12	2.9%
	21~30	87	21.0%		Not bad	128	30.9%
	31~40	51	12.3%		Fine	163	39.4%
	41 and above	19	4.6%		Very good	107	25.8%

Table 3: Factor load and reliability and validity of test results of variables

Variable	Coding	M	SD	FL	Composition Reliability (CR)	Average Value Extraction (AVE)
Risk Perception (RP)	RP1	3.830	0.941	0.822	0.872	0.694
	RP2	3.980	0.960	0.882		
	RP3	3.770	1.037	0.793		
Information Acquisition (IA)	IA1	3.850	0.989	0.772	0.842	0.641
	IA2	3.480	1.151	0.834		
	IA3	3.820	0.996	0.794		
Adaptive Behaviour (AB)	AB1	3.670	0.961	0.732	0.812	0.590
	AB2	3.750	0.885	0.798		
	AB3	3.640	0.851	0.773		
Human Capital (HC)	HC1	3.746	1.181	0.441	0.712	0.393
	HC2	2.220	0.958	0.800		
	HC3	3.860	0.868	0.556		
	HC4	2.500	1.246	0.654		

RMSEA=0.041, and all fit tests passed the test, indicating that the model fit results of this paper are good.

Hypothesis testing

Mediating effect test

To test the mediating effect of information acquisition, a structural equation model was constructed using Amos 23.0 software based on the maximum likelihood (ML). As shown in Fig. 3, the unstandardized path coefficient c=0.17 (P=0.011<0.05) of the relationship between risk perception and weather hazard adaptation behaviour of large grain farmers passed the significance level test, indicating that risk perception has a significant positive effect on adaptation behaviour, therefore, hypothesis H1 is verified.

It can be seen from Fig. 4 that the path coefficient of "risk perception→information acquisition" is 0.23 (P<0.001), indicating that risk perception has a positive and significant impact on information acquisition, so the hypothesis **H2a** is verified. The path coefficient of "information acquisition→adaptive behaviour" is 0.38 (P<0.001), indicating that information acquisition has a positive and significant impact on adaptive behaviour, so the hypothesis **H2b** is verified. The non-standardized path coefficient c' = 0.09 of the relationship between risk perception and adaptation behaviour of major grain-growing households to meteorological disasters does not pass the significance level test, indicating that the direct effect of risk perception on adaptation behaviour is not significant under the effect of information acquisition. It is preliminarily verified that information acquisition has the mediating effect between risk perception and adaptive behaviour.

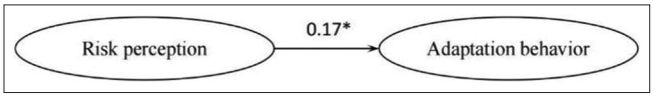

Fig 3. Direct effect (*P<0.05)

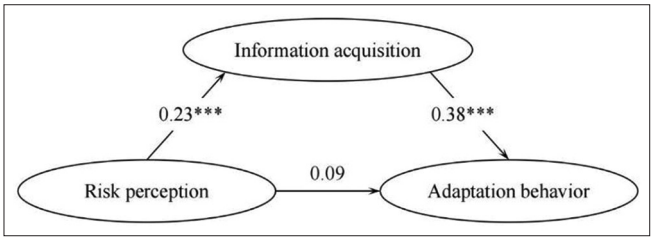

Fig 4. Mediation model for information acquisition (***P<0.001)

To further test the mediating effect of information acquisition and its type of effect, this study used the coefficient product test with the Bootstrap method in structural equation modeling to test the mediating effect of information acquisition, using Bootstrap ML estimation, setting Bootstrap = 2000 times to derive the point estimates of the total effect, indirect effect, and direct effect, standard error (SE) and respectively calculate their significance levels (Z values). Based on the corrected bias confidence interval (BC 95% CI), percentile confidence interval (PC 95% CI), and PRODCLIN 95% CI (Mackinnon et al., 2007), the total and direct effects of risk perception on the adaptation behaviour of large grain farmers to weather disasters were analyzed, and the indirect effect of information acquisition and the type of mediating role it played were tested. The results of the test for the mediating effect of information acquisition (see Table 5) showed that the total effect of "RP→AB" had a Z value = 2.169 > 1.96, indicating that the total effect reached a significant level, and the corresponding BC and PC 95% CIs were [0.010,0.279] and [0.006,0.271], respectively, which did not contain 0, so the total effect exists and is significant, and the indirect effect can be further tested; the Z value of the indirect effect of "RP→AB" = 2.267 > 1.96, indicating that the indirect effect reaches a significant level, and the corresponding BC and PC 95% CIs are [0.025,0.146] and [0.022, 0.140] do not contain 0, while PRODCLIN 95% CI is [0.023,0.129] does not contain 0. Therefore, the indirect effect exists and is significant, then the mediating effect of risk perception can be considered to exist. Therefore, hypothesis H2 was tested. The direct effect of "RP→AB" has a Z value = 1.091 < 1.96, and the direct effect does not reach a significant level, but the indirect effect (0.068) accounts for 48.23% of the total

Table 4: The results of fitting test of mediation model for information acquisition

Indicators	χ^2	χ^2/DF	GFI	AGFI	RMSEA	NFI	RFI	IFI	TLI	CFI
Result	40.480	1.687	0.979	0.961	0.041	0.953	0.930	0.981	0.970	0.980
Standard	—	1~3	>0.9	>0.9	<0.05	>0.9	>0.9	>0.9	>0.9	>0.9

Table 5: The results of fitting test of mediation model for information acquisition

RP→AB	Point Estimate	Product of coefficients		Bootstrapping		MacKinnon PRODCLIN 95% CI	Effect ratio
		SE	Z-value	Bias-Corrected (BC)95% CI	Percentile (PC)95% CI		
Total effect	0.141	0.065	2.169	[0.010,0.279]	[0.006,0.271]	—	—
Indirect effect	0.068	0.030	2.267	[0.025,0.146]	[0.022,0.140]	[0.023,0.129]	48.23%
Direct effect	0.072	0.066	1.091	[-0.054,0.204]	[-0.057,0.199]	—	51.06%

Table 6: Hierarchical regression model of human capital, risk perception on information acquisition

	Information Acquisition			
	Model	**Model 2**	**Model 3**	**Model 4**
Control variable				
Gender	0.046	0.062	0.016	0.019
Age	-0.011	-0.016	0.039	0.041
Education level	0.286***	0.258***	0.130*	0.128*
Independent variable				
Risk perception	—	0.139**	0.120*	-0.065
Moderating variable				
Human capital	—	—	0.301***	0.076
Interaction effect				
Risk perception × human capital	—	—	—	0.059
Indicator				
R^2	0.11***	0.127**	0.152***	0.153
ΔR^2	0.11***	0.017**	0.025***	0.001
F-value	16.828***	14.849***	14.570***	12.228***

*,**,*** represent 5%, 1%, and 0.1% significance levels, respectively, the data in this table are unstandardized coefficients. Same as below

Table 7: Hierarchical regression model of human capital and information acquisition on adaptation behaviour

	Adaptive behaviour			
	Model1	**Model 2**	**Model 3**	**Model 4**
Control variable				
Gender	0.091	0.081	0.071	0.104
Age	0.003	0.005	0.018	0.01
Education level	0.109**	0.047	0.019	0.016
Independent variable				
Information Acquisition	—	0.217***	0.210***	-0.258
Moderating variable				
Human capital	—	—	0.069	-0.498*
Interaction effect				
Information Acquisition × human capital	—	—	—	0.152*
Indicator				
R^2	0.024*	0.086***	0.088	0.103*
ΔR^2	0.024*	0.062***	0.003	0.015*
F-value	3.426*	9.65***	7.886***	7.770***

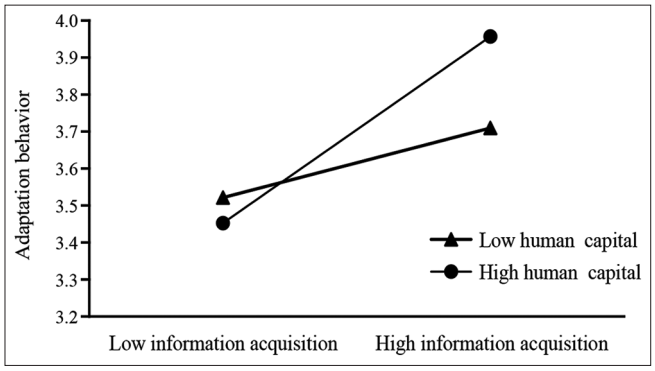

Fig 5. Moderating effect of human capital on information acquisition and adaptive behaviour

effect (0.141), and this percentage is significant before reachin g 70% of the total effect (Wen and Ye, 2014). In the case of small sample size and low total effect, the result of full mediation is easily obtained (Preacher and Kelley, 2011), so the type of mediation of information access cannot be simply determined as full mediation. Thus, this study tentatively concluded that information acquisition partially mediates the relationship between risk perception and adaptive behaviour of large grain farmers, and the exploration and verification of this mediating role and other mediating variables will be further explored in future studies.

Mediating effect test

In order to test the moderating effect of human capital between risk cognition and information acquisition, SPSS22.0 software was used for hierarchical regression analysis. The results are shown in Table 6.

As shown in Table 6, the unstandardized regression coefficient of the interaction term is 0.059 ($P > 0.05$), which means human capital does not play a moderating role between risk perception, information acquisition, and therefore hypothesis 3a is not valid. To test the moderating effect of human capital between information acquisition

and adaptive behaviour, SPSS22.0 software continued to be used for the cascade regression analysis, and the results of the analysis are shown in Table 7.

As shown in Table 7, the non-standardized regression coefficient of interaction items was 0.152 ($P<0.05$), representing that each additional unit of human capital, the regression coefficient of information acquisition on adaptive behaviour increased by 0.152, that is, human capital significantly positively regulates the relationship between information acquisition and adaptive behaviour, so hypothesis H3b is verified.

In order to show the moderating effect of human capital more intuitively, the effect of information acquisition on the adaptation behaviour of large grain growers under the condition of high human capital (M + 1SD) and low human capital (M-1SD) is tested respectively, and the moderating effect analysis chart is shown in Fig. 5. When human capital is at a low level, information acquisition has a significant positive predictive effect on adaptive behaviour ($B = 0.1122$, $P = 0.0477$, 95% CI = [0.0011,0.2233]), and this significant positive predictive effect will increase with the increase of human capital ($B = 0.3008$, $P < 0.001$, 95% CI = [0.1890,0.4127]). Therefore, human capital has a significant positive moderating effect on the relationship between information acquisition and adaptive behaviour, that is, the higher the level of human capital is, the stronger the impact of information acquisition on the adaptive behaviour of large grain growers is.

CONCLUSION AND POLICY IMPLICATIONS

Conclusion

Based on the survey data of large grain-growing households in 11 cities of Jiangxi Province, China, this paper used the structural equation model and the hierarchical regression model to empirically analyze their risk perception, information acquisition, human capital, and adaptation behaviour and drew the following conclusions. First, risk perception has a significant positive direct impact on the adaptation behaviour of large grain-growing households. Second, risk perception has a significant positive impact on the information acquisition of large grain farmers. Third, information acquisition has a significant positive impact on the adaptation behaviour of large grain farmers. Fourth, information acquisition plays a mediating role between risk perception and adaptive behaviour. Fifth, the human capital of large grain farmers does not play a moderating role between risk perception and information acquisition. Sixth, the human capital of large grain growers has a significant positive moderating effect on the impact of information acquisition on adaptation behaviour.

Policy implications

Based on the above conclusions, this paper gives the following policy implications: First, for large grain farmers who generally have a low level of risk perception at this stage, we should pay attention to their risk perception training and focus on strengthening the basic education of large grain farmers. The strengthening of basic education can be achieved by promoting rural community education, through training and education in line with local industrial characteristics of farmers, and improve the possibility of large grain farmers to participate in education and training. On the other hand, in order to avoid farmers' rejection of theoretical teaching, innovative training models should be used to combine theory and practice to enhance the interest of large grain farmers in learning and thus improve the educational effect. Second, in response to the uneven information access ability of large grain farmers, the development of rural informatization should be vigorously promoted to broaden the information access channels. First of all, it is necessary to ensure the most basic mobile communication network for large grain farmers. Secondly, relying on the cooperation of mobile communication networks and telecom operators to put cheap network equipment to grain growers, which improves the probability of using mobile communication networks. Finally, it is dedicated to build a network platform for large grain farmers, build a good social network, and regularly carry out climate change-related discussions on the platform, strengthen communication between large grain farmers, facilitate the flow of effective information and reduce the cost of information acquisition. Third, for large grain farmers with weak human capital, resources should be actively tilted, while agricultural technology training should be promoted. Due to the weakness of large grain-growing households with low human capital in information acquisition and utilization, certain resources can be allocated to large grain-growing households with low human capital in the implementation of rural informatization to avoid the waste of resources. At the same time, the agricultural technical training of large-scale farmers should be strengthened, and the ability of large-scale farmers to use information obtained should be enhanced under the guidance of grass-roots agricultural technicians, so as to improve their adaptation behaviour.

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Author's contributions

Zhu Lingjuan: data analysis and write the manuscript. Cai Yingshu: Collaboration in writing and manuscript translation. He Yulong: Supervision and manuscript review. Huang Jichao: Contribution in Research design and data analysis. Li Huijie: Research design, supervision and manuscript review.

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