

Empirical Analysis on Farmers' Agriculture Insurance Purchasing Intention of Hebei Province^①

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Abstract: In order to study the restricting factors affecting agriculture insurance coverage, we carried out on-site visit and questionnaire survey on the farmers' agriculture insurance purchase intention of Hebei Province. On this basis, we used Logistic regression analysis method to extract the main factors influencing the farmers' purchase intentions, and put forward the policy recommendations to improve the farmers' insurance purchase intention according to the empirical results.

Key words: agriculture insurance; insurance purchasing intention; Logistic regression

1. Introduction

Hebei is a large agricultural province, one of the most important major grain-producing provinces, responding the great task of “vegetable basket” in Beijing and Tianjin area. At the same time, Hebei, however, is a province that seriously suffers agricultural disaster. Since the pilots of policy-oriented agriculture insurance, the agriculture insurance in Hebei province has had a flourishing development, with the premium income growth year after year, insurance subsidies expanding steadily, and agriculture insurance business operated stably. By the time of December 31st 2012, agriculture insurance of Hebei province has had a premium income of 1.286 billion Yuan, increased by 69.11%, making itself to be the second largest category of property insurance market, and it also has had a claim payment of 587 million Yuan, increased by 169.29%, which provide a money guarantee on post-disaster recovery and reconstruction of agricultural production. However, like most other provinces, agriculture insurance coverage in Hebei province is not quite ideal at present, and the crop insurance participation rates are rather low except the corn and wheat insurance rates. So, on the basis of questionnaire survey, this paper used a Logistic regression model to extract the main factors of influencing farmers' insurance purchase intention, and put forward some policy recommendations to improve the farmers' insurance purchase intention

[Fund Project] 2012 National Social Science Fund (Project Number: 12BJY166)

[Author Introduction]

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The authors thank the help from the 2010 level students of the Banking School of Hebei University of Economics and Business.

according to the empirical analysis.

2.Data Sources and Statistical Description

2.1 Data Sources

The survey was carried out in July 2012 and the interviewees are the farmers in Hebei province. In order to improve the authenticity of this investigation and get a more comprehensive understanding of farmers purchase intention in Hebei Province, this survey is carried out throughout all the 11 prefecture-level cities, totally 41 administrative villages in Hebei. During the survey, a total of 210 questionnaires were distributed randomly, recycling 193 valid questionnaires, reaching 92% effective percentage. All the investigators are students studying in Banking School of Hebei University of Economics and Business. Before the investigation, the investigators had been trained about the knowledge of agriculture insurance. All the questionnaires are finished independently in the guide of investigators, which can not only ensure the questionnaire can be recycled in time, but also improve the effectiveness of the questionnaire content.

2.2 Statistical Description on Factors Influencing Farmers' Insurance Purchase Intention

This research investigates the farmers' insurance purchase intention from the following eight aspects: gender, age, family's permanent population, education degree, income sources and income level, disasters that farmers worry most, the cognition of agriculture insurance, insure and claim experiences, and insurance type expectations.

2.2.1 Gender, age and family's permanent population

(1) Gender. Generally speaking, people with different gender have different appetite for risk. But from the result of the survey, this characteristic is not obvious on the question of whether the farmers would insure agriculture insurance: there are 15.0% of the male farmers and 15.15% of the female farmers having bought the agriculture insurance purchase intention. Perhaps the reason is that family members jointly make the decision on agriculture insurance. So gender is not the significant factor of influencing farmers' insurance purchase intention.

(2) Age. The survey shows that farmers under the age of 30 and of 51 to 60 years old have a much higher agriculture insurance purchasing rate, up to 25.9% and 27.3% respectively; that farmers of 31 to 40 years old and of 41 to 50 years old have a much lower agriculture insurance purchasing rate, down to 14.7% and 11.8% respectively; and that farmers over 61 years old have a zero agriculture insurance purchasing rate (shown in table 1). The probable reason is that farmers under the age of 30 are easy to accept the new thing such as the agriculture insurance; farmers of 51 to 60 are older and have a lower risk appetite, expect to receive stable agricultural produce income and tend to buy agriculture insurance; most of the farmers of 31 to 40 and 41 to 50 years old are migrant workers and have lower insurance willingness; farmers over 61 years old have weak insurance consciousness, and most of them are no longer engaged in agricultural production, so they have the lowest insurance desiring rate.

Table 1 Agriculture insurance intention of different ages

	Under30	31to40	41to50	51to60	Over61
Number of interviewee	27	34	68	33	11
Number of insured	7	5	8	9	0
Insurance purchasing rate	25.9%	14.7%	11.8%	27.3%	0.00%

(3) Family's permanent population. From the survey result, the more permanent members

family have, the less insurance willingness farmers have: families under 3 members have an agriculture insurance purchasing rate of 28%, families of 3 to 5 members have an agriculture insurance purchasing rate of 13.5%, and families of over 5 members have an agriculture insurance purchasing rate of 12.2%. The probable reason is that the more permanent members family have, the more powerful ability of resisting risk the farmers have, and the more reluctant to buy agriculture insurance.

2.2.2 Education degree

It is generally believed that the higher education degree is, the easier to understand and accept the insurance. The survey data confirms this point. In the numbers of interviewee, farmers of primary education have the lowest insurance purchasing rate—only 9.4%; more than half of the interviewees are farmers of junior education, but the insurance purchasing rate is only 12.8%; farmers of above high school education have the insurance purchasing rate of around 20%, significantly higher than which of the junior and below junior education farmers' (shown in table 2). In general, farmers' education degree in Hebei province is not high, which, to a certain extent, affects the agriculture insurance purchasing rates.

Table 2 Agriculture insurance intention of different education degree

	Below primary	Junior	Senior	Junior college	Undergraduate college
Number of interviewee	32	109	27	4	21
Number of insured	3	14	7	1	4
Insurance purchasing rate	9.4%	12.8%	25.9%	25.0%	19.0%

2.2.3 Income sources and income level

(1) Income sources. Farmers' income sources in Hebei province are tending to be diversification at present. Apart from agricultural production, a quite number of farmers go out to work or engage in self-employed businesses to earn money. In order to facilitate the analysis, we divide the income sources into three category options: agricultural income, non-agricultural income and mixed income. As table 3 shows, farmers whose income source is agricultural income have the highest insurance purchasing rate of 25%; farmers whose income source is non-agricultural income have the lowest insurance purchasing rate of only 6.5%; farmers whose income source is mixed income have a insurance purchasing rate of 15.3%.

Table 3 Agriculture insurance intention of different income sources

	agricultural income	mixed income	non-agricultural income
Number of interviewee	48	99	46
Number of insured	12	15	3
Insurance purchasing rate	25%	15.2%	6.5%

Note: crops, forestry, animal husbandry and aquaculture are attributed to "agriculture income"; going out for work, government subsidies, self-employed and others are attributed to "non-agricultural income"; having both the agricultural income and non-agricultural income are treated as "mixed income".

(2) Income level. Generally speaking, the higher income farmers have, the more likely to buy insurance. However, the survey data shows the opposite result, namely, farmers with lower

income have a higher insurance purchasing rate, while farmers with higher income have a lower insurance purchasing rate: Farmers with annual income of less than 6000 Yuan have an insurance purchasing rate of 27.8%; Farmers with annual income of 6000 to 15000 Yuan have an insurance purchasing rate of 21.8%; Farmers with annual income of more than 15000 Yuan only have an insurance purchasing rate of 9.17%. This is probably because high income farmers have a stronger ability to resist risk, and coverage level of policy agriculture insurance is too low to attract them to purchase.

2.2.4 Disasters that farmers worry most

Through the survey data, we can find out what farmers worry most are crop pests and diseases (57%), hailstorm (38.3%), drought (36.8%) and flood (35.8%)(Shown in table 4). At present, the insurance liability of the subsidized crop insurance in Hebei province is described as "the insured crop planting cost losses caused by human irresistible natural disasters, including the windstorm, hail, rainstorm, flood, water logging and freeze". But crop pests, diseases and drought that farmers worry most are not included in the insurance liabilities, which leads to the low enthusiasm of farmers' purchasing agriculture insurance.

Table 4 Disasters that the farmers worry most

	Number	ratio
drought	71	36.80%
Flood	34	17.60%
windstorm	55	28.50%
hailstorm	74	38.30%
water logging	69	35.80%
freeze	25	13.00%
diseases	94	48.70%
pests	110	57.00%
fire	20	10.40%
livestock and poultry disease	49	25.40%
others	12	6.20%

2.2.5 The cognition of agriculture insurance

Four questions in the survey form can reflect the cognition of agriculture insurance: "whether hearing about the agriculture insurance or not, ways to hear about agriculture insurance, post-disaster assist channel, and the importance of agriculture insurance".

(1) Whether hearing about the agriculture insurance or not. The survey shows, there are 114 farmers who have heard about agriculture insurance before this investigation, accounting for 59.1% of the interviewees. Among them, those who have bought agriculture insurance accounts for 25.4%. The number of not heard about agriculture insurance is 79, and surely they never take out an insurance.

(2) Ways to hear about agriculture insurance. Among the ones who have heard about agriculture insurance, "by radio and television", "by relatives and friends" and "by government propaganda" respectively accounts for 59.6%, 51.8% and 33.3%. In addition, 29 farmers say that one of the ways to hear about agriculture insurance is "insurance company's promotion", and 6 farmers treat "insurance company's promotion" as the only way to hear about agriculture insurance. What is notable is that none of these 6 farmers are insured, and only 5 of the other 23 farmers have

purchased the agriculture insurance (Shown in table 5). What amazing us is that, as the demand side of agriculture insurance, farmers get agriculture insurance information not through the agriculture insurance supply side—the insurance companies, which integrates that the insurance companies do not make enough publicity of agriculture insurance, or the propaganda effect is not obvious.

Table 5 Ways to hear about agriculture insurance

	Number	Ratio
radio and television	68	59.60%
relatives and friends	59	51.80%
government propaganda	38	33.30%
out to work	11	9.60%
education	5	4.40%
insurance company's promotion	29	25.40%
others	2	1.80%

(3) Post-disaster assist channel. When asked about the question " the main economic assistant channel when facing natural disasters and man-made misfortunes", 73.1% of the farmers choose "their own", 64.2% choose "friends", 30.6% choose "government", and 13% choose "insurance companies", in which only 4 farmers treat insurance company as the only channel to obtain financial aid, accounted for 2.1% of the total number of interviewees. It shows that the interviewed farmers have a low acceptant of insurance, and they do not regard insurance as an important means to manage agricultural risk.

(4) The importance of agriculture insurance. According to the survey results, the number of farmers who think agriculture insurance is "very important", "important" and "general" respectively accounts for 24.4%, 38.9% and 32.7%, and the number of farmers who think that agriculture insurance is "not important" only accounts for 4%. This shows that most farmers have realized the importance of agriculture insurance, but yet have not purchased. So what are the reasons to prevent those who consider agriculture insurance important from insuring? And that is exactly the focus of this paper.

2.2.6 Insure experiences

Farmers' insure experiences can be reflected by the following three questions: "agriculture insurance purchase patterns", "reasons for purchase" and "reasons for not purchase".

(1) Purchase patterns. The survey data shows the number of farmers who buy insurance though "the village unified purchase" accounts for 72.4% of the total, though "the insurance company promotion" accounts for 17.2%, though "friends and relatives" accounts for 13.8%, though "insurance company site publicity" accounts for 10.3%, and though "going to the insurance company" accounts for 3.4%. Obviously, the main way to purchase the agriculture insurance is though the village unified purchase, which has some relationship with the insurance company principle of "whole village insurance". In practical, in order to reduce moral risk and costs, insurance companies often regard the whole village as an insured unit, and do not insure only one or a few households alone. For insurance companies, this type of insurance purchase pattern is not only better for expanding the business sales, preventing moral risks and reducing operating costs, but also lowers insurance rates. However, this type of insurance purchase pattern excludes the farmers who are willing to buy insurance but the village doesn't organize the unified purchase.

(2) Reasons for purchase. Among the insured farmers, the number of choosing "to understand the agriculture insurance is an effective compensation method" and "to provide farmers with the national premium subsidy" as "purchase reason" respectively accounts for 55.2% and 41.4% (Shown in table 6). Obviously, it is more and more rational for farmers to take out agriculture insurance, and the government providing premium subsidies is not the most important and the only reason for farmers to buy agriculture insurance.

Table 6 Reasons for purchase agriculture insurance

	insure number	ratio
village cadre's mobilization	4	13.80%
government provides scrapping subsidies	12	41.40%
insurance salesman's mobilization	2	6.90%
purchase when others buy	6	20.70%
see others getting benefit from insurance	5	17.20%
agriculture insurance can effectively compensate the losses	16	55.20%

(3) Reasons for not purchase. Among the uninsured households, farmers mostly choose "people around do not buy" as the reason for not purchase agriculture insurance, occupied 47%. Obviously, in the face of whether to insure, farmers shows "herding behavior". To a certain extent, farmers' blindly follow psychology reduces the insurance rate. There are 40.2% and 40.9% farmers attribute the reason for not purchase to "disbelieve insurance companies" and "complex claim settlement procedures", which indicates that farmers have a low recognition on insurance companies. In addition, there are 29.3% of the farmers who never insure for the reason of "less likely to gain loss", which indicates that these farmers have a poor awareness of encountering risk, and to some extent this also affects the insurance purchasing rate (Shown in table 7).

Table 7 Reasons for not purchase agriculture insurance

Option statements	ratio
not afford the premium	12.20%
low compensation	37.80%
complex claim settlement procedures	40.90%
disbelieve insurance companies	40.20%
Insurance is unlucky	4.30%
people around do not buy	47%
Do not know where to buy	17.70%
less likely to gain loss	29.30%
state's relief	3.00%
others	9.10%

2.2.7 Insurance type expectations

Just as Table 8 shows, the interviewed farmers' insurance demands are concentrated in the corn (73.6%), fattening pigs (25.4%), reproducing sows (21.2%) and others (32.1%). Among them, farmers have the most demand of corn insurance. It is because that corn accounts for a large proportion of agricultural structure in Hebei province. And perhaps it is also because of corn's greater probability of suffering agricultural risks and its weaker ability to resist agricultural

disasters. From our research, we find that farmers have a larger demand of fresh fruit insurance and aquaculture insurance, which have not been included in the scope of policy agriculture insurance premium subsidies^②.

Table 8 Demands of agriculture insurance type

Options	Rice	Corn	Fattening pigs	Reproducing sows	Cow	Others
Ratio	9.8%	73.6%	25.4%	21.2%	6.7%	32.1%

2.2.8 Claim experiences

The survey data shows that there are 26 farmers of the 193 interviewees having been compensated by the insurer. In these 26 households, 14 farmers have made renewal insurance, accounting for 53.8%. The insurance purchasing rate of those who have not obtained any agriculture insurance indemnity is only 9%. Through the survey analysis, we can find that farmers who have received the indemnity are more willing to make renewal, which indicates that they have already realized the important role of agriculture insurance. But it is worthwhile to note that nearly half of the farmers who have already received the indemnity do not make a renewal.

Table 9 The insure situation of farmers who have received indemnity

	Number of receiving indemnity	Number of not receiving indemnity
Number of interviewee	26	167
Number of insured	14	15
Insurance rate	53.8%	9.0%

3. Logistic Regression Analysis on Farmers' Insurance Purchase Intention

3.1 Model Establishment

In the practical economic life, lots of phenomena can be divided into two possibilities or come down to two choices, namely binary selection. Usually Probit and Logistic regression model are the two methods to analyze the binary selection. Since the Logistic regression model not only depends on hypothesis of the sample's multivariate normal distribution and covariance matrix equality, but also makes regression on metric or non-metric variables, we choose Logistic regression as the method of empirical analysis in this paper.

In this model, we describe that whether farmers insure or not as the explained variable, in terms of y . $y=1$ says that farmers buy agriculture insurance, and $y=0$ says farmers buy no agriculture insurance. Name the probability of farmers insure as P , and the Logistic regression between P and variables x_1, x_2, \dots, x_n is:

$$P = \frac{\exp(\beta_0 + \sum_{i=1}^n \beta_i X_i)}{1 + \exp(\beta_0 + \sum_{i=1}^n \beta_i X_i)}$$

Obviously, the probability of no insure is:

^② The questionnaire is carried out in June 2012, when fattening pig has not yet been included in the Hebei policy-oriented agriculture insurance.

$$1 - P = \frac{1}{1 + \exp(\beta_0 + \sum_{i=1}^n \beta_i X_i)}$$

by mathematical transform:

$$\ln[P / (1 - P)] = \beta_0 + \sum_{i=1}^n \beta_i X_i$$

That is the general equation of the Logistic regression model.

3.2 Variable Declaration

Agriculture insurance intention is influenced by many factors. Combined with the above statistical description, the following variables are used in Logistic regression model: farmer's age, annual family income, income sources, permanent family population, education degree, the importance degree of agriculture insurance, premium willing to pay for 1000 insurance amount, and having received indemnity or not. In order to improve the model accuracy, when setting variables, the classification variables are transformed into dummy variables so that each dummy variable only represents the difference between categories, but not the value of variable. See table 10 for the specific assignment of above variables.

Table 10 Variable characteristics

Variables	The name of variables	Variables value		Mean value
dependent variables	Whether to buy agriculture insurance (Y)	No	0	0.15
		Yes	1	
independent variable	Age (x ₁)	Under 30	1	1.98
		30 to 50	2	
		Above 50	3	
	annual family income (x ₂)	Under 6000 Yuan	1	2.53
		6000to15000 Yuan	2	
		Above 15000 Yuan	3	
	income sources (x ₃)	non-agricultural income and	1	2.01
		mixed income	2	
		agricultural income	3	
	permanent family population (x ₄)	Less than 3	1	2.08
		3 to 5	2	
		More than 5	3	
	education degree(x ₅)	Below primary	1	2.34
		Junior	2	
		Senior	3	
Junior college		4		
Undergraduate college		5		
the importance degree of agriculture insurance (x ₆)	Not important	1	2.83	
	General	2		
	Important	3		
	Very important	4		

premium willing to pay for 1000 insurance amount (x ₇)	About 10yuan	1	3.05
	About 20yuan	2	
	About 40yuan	3	
	About 60yuan	4	
	About 80yuan	5	
	About 100yuan	6	
having received indemnity or not (x ₈)	No	0	0.13
	Yes	1	

3.3 Results Analysis

In this paper, we use software SPSS17.0, and adopt maximum likelihood estimation (condition) sieve method, that is, put above eight variables into the regression model equations, test the significant of variables, eliminate the minimum F value of the insignificant variables, re-fitting regression equation, and test until all variables in the equation are basically significant. select criteria $\alpha = 0.05$ and eliminate criteria $\alpha = 0.10$ exclusion. the results are shown in table 11: age (x₁), income sources(x₃), education degree(x₅) and whether received indemnity (x₈) have a significant effect on farmers' participation intention.^③

(1) Age. Analysis shows that the intention of 30 to 50 years old farmers is 3.432 times as that of under 30 farmers, and the intention of over 50 years old farmers is 16.498 times of that of under 30 farmers. This illustrates that the older farmers are, the more strong intention of agriculture insurance farmers have. This corresponds with the general understanding that "the older, the higher degree of risk aversion".

(2) Income sources. Analysis shows that farmers whose income source is agricultural income have the highest insurance rate, 6.240 times than that of non-agricultural income, and farmers whose income source is mixed income have a 3.072 times insurance rate bigger than that of non-agricultural income. This illustrates that the higher proportion agricultural income accounts for in total income, the more insurance willingness farmers have.

(3) Education degree. Analysis shows that the intention of farmers in junior education degree is 2.980 times as that of primary, the intention of farmers in senior education degree is 16.657 times as that of primary, the intention of farmers in Junior college education degree is 13.272 times as that of primary, and the intention of farmers in Undergraduate college education degree is 15.278 times as that of primary. Apparently, the willingness to insure of farmers who have a senior or above senior education degree is much higher than that of farmers who have a junior or below junior education degree.

(4) Whether received indemnity. This factor is the most significant factor affecting farmers' agriculture insurance purchasing intention. The intention of farmers who have received the agriculture insurance indemnity is 21.517 times than that of farmers who have not received any indemnity. This illustrates that farmers who have received the agriculture insurance indemnity have a more profound understanding of the agriculture insurance, and they trust more in insurance companies. So they have a greater probability to insure.

^③ Some variables' P value is more than 0.05, but not removed from the equation, because the likelihood ratio test results make a conflict with the above Walds test. The likelihood ratio test shall prevail here, because it is an overall test while Walds test itself is not so accurate.

(5) Others. annual family income (x_2), permanent family population (x_4), the importance degree of agriculture insurance(x_6) and premium willing to pay for 1000 insurance amount (x_7) are not included in the final results, which illustrates that the effects of these four factors on farmers' insurance purchasing intention are not significant.

Table 11 Binary Logistic regression analysis results of the factors affecting farmers' agriculture insurance intention

factors	B	S.E.	Wals	df	Sig.	Exp (B)	95% C.I. of EXP(B)	
							Lower limit	Upper limit
X ₁			8.776	2	.012			
X ₁ (1)	1.233	.810	2.315	1	.128	3.432	.701	16.799
X ₁ (2)	2.803	.995	7.936	1	.005	16.498	2.346	115.992
X ₃			4.739	2	.094			
X ₃ (1)	1.122	.832	1.820	1	.177	3.072	.601	15.696
X ₃ (2)	1.831	.870	4.432	1	.035	6.240	1.135	34.313
X ₅			9.897	4	.042			
X ₅ (1)	1.092	.859	1.616	1	.204	2.980	.554	16.037
X ₅ (2)	2.813	1.019	7.622	1	.006	16.657	2.261	122.710
X ₅ (3)	2.586	1.632	2.509	1	.113	13.272	.541	325.433
X ₅ (4)	2.726	1.283	4.513	1	.034	15.278	1.235	189.008
X ₈ (1)	3.069	.595	26.572	1	.000	21.517	6.699	69.109
constant	-6.482	1.416	20.970	1	.000	.002		

4. Policy Recommendations

Synthesizing the results of statistical and empirical analysis, combining with the reality of the development of agriculture insurance in Hebei province, this paper puts forward the following policy recommendations to improve farmers' intention to insure:

(1) Rich Categories and Increase the Variety of Insurable Risks

According to research, farmers have stronger intentions to insure corn, fattening pigs and reproducing sows, besides, they also have stronger demands on fruits and aquaculture, at the same time, they are afraid of drought and pest disasters. Therefore, on the basis of existing insure categories, some crops of wide acreage and livestock of high breeding ratio which have greater impact on farmers' income and national economic should be brought in the scope of agriculture insurance subsidy. And drought, fires and crop pests and diseases that farmers concern about most should gradually be brought into insurable risks, so as to improve the attractiveness and insure rate of policy-oriented agriculture insurance.

(2) Strengthen the Publicity of Agriculture Insurance

According to the result that 40.9% of the farmers have not heard of agriculture insurance, and the empirical result that farmers of more than 30 years old and above senior education degree have stronger intention to insure, we can draw the conclusion that the publicity of agriculture insurance should be strengthened to improve agriculture insurance rate. It is necessary to bring the government, insurance companies, universities and media into full play, make full use of the Internet, television, radio, newspapers, wall newspaper, mobile phone, publications and other

information carriers, and build an agriculture insurance propaganda system of multi-level, multi-form, multi-channel and multi-agent, with the help of the market, venue and other various information transmission places, by many ways of organization propaganda, typical cases and demonstration. Get the farmers a deeper understanding and acknowledge of policy-oriented agriculture insurance, cultivate farmers' consciousness of modern risk prevention, improve the initiative, enthusiasm and continuity to insure. Explore to establish agriculture insurance demonstration counties, towns and villages, perfectly playing the leading role. Strengthen the publicity of typical examples to let more farmers deeply realize the risk protection of the policy agriculture insurance, and enjoy its benefits.

(3) Improve the Claims Quality of Insurance Companies

The empirical analysis results show that "have received the agriculture insurance indemnity or not" is the most significant factors to affect the intention of agriculture insurance. In this regard, the insurance company should put an end to the phenomenon of unwilling to compensate. Strive to solve the problems generally reflected by the farmers, such as "difficulty to damage assessment and slow settlement of claim". Simplify claims procedures, shorten claims time and fully enhance claims quality. When disasters happen, insurance companies should provide full and timely compensation for the affected farmers, strictly in accordance with the contract of insurance. The experience of receiving indemnity can produce positive reinforcement effect in insured farmers and encourage them to make renewal insurances. At the same time, word-of-mouth publicity among farmers can affect the uninsured farmers to insure actively, and thus increase the insurance purchasing rate.

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