



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Small Holders' Demand for Alternative Types of Crop Insurances: The case of corn in China

Holly Wang, Purdue University

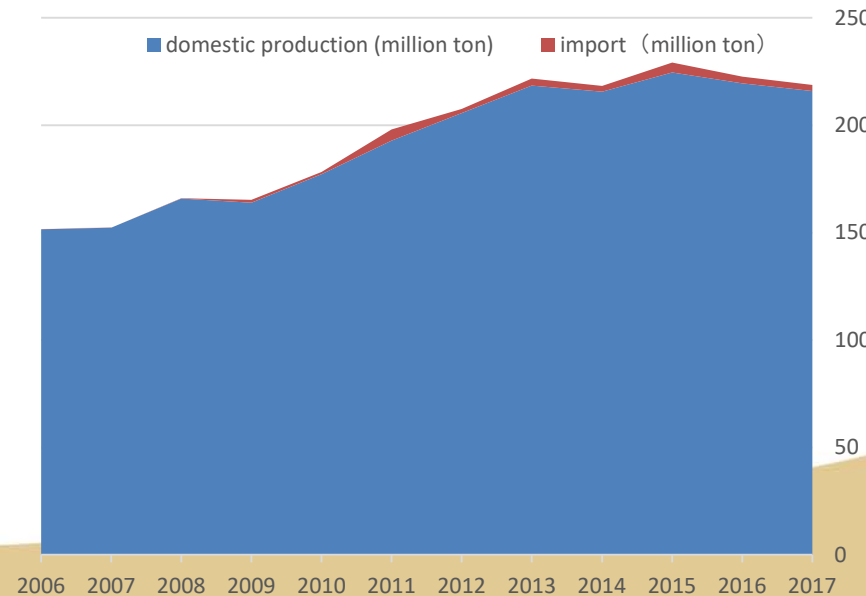
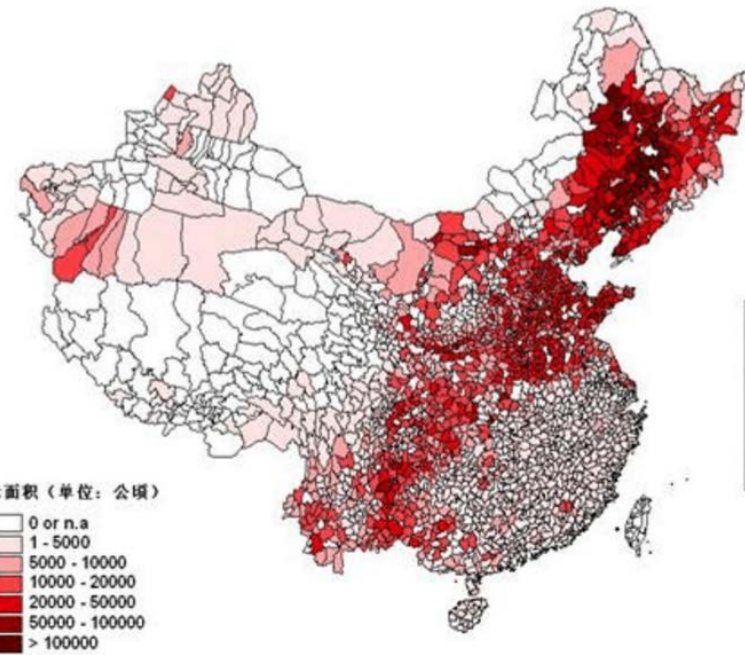
Liu Lu, Chinese Academy of Agricultural Science

SCC76, Kansas City, MO

April 7, 2018

Introduction

- Corn production and market
 - Production distribution
 - Small scale family farm
 - Production trend and import
- Risks
 - World market price risks
 - “stock up” policy
 - Rain fed production risks



Crop Insurance in China

- Chinese Crop insurance
 - Started in 2007, covering most major crops in major areas
 - Heavily subsidized, farmers pay 20%-50% of premium
 - Private companies try to design different products
 - Four Insurance types: yield, price, revenue, weather index
- Multi Peril Yield Insurance is the primary type
 - Coverage is at the level of material cost (seed, fertilizer, etc.)
 - Premium is set 2~10% of the coverage
 - Indemnity = Time adjusted coverage X Loss ratio X Acreage insured

When disaster occurs, report

Assessment is made

Sign up at the beginning

Issues and Objectives

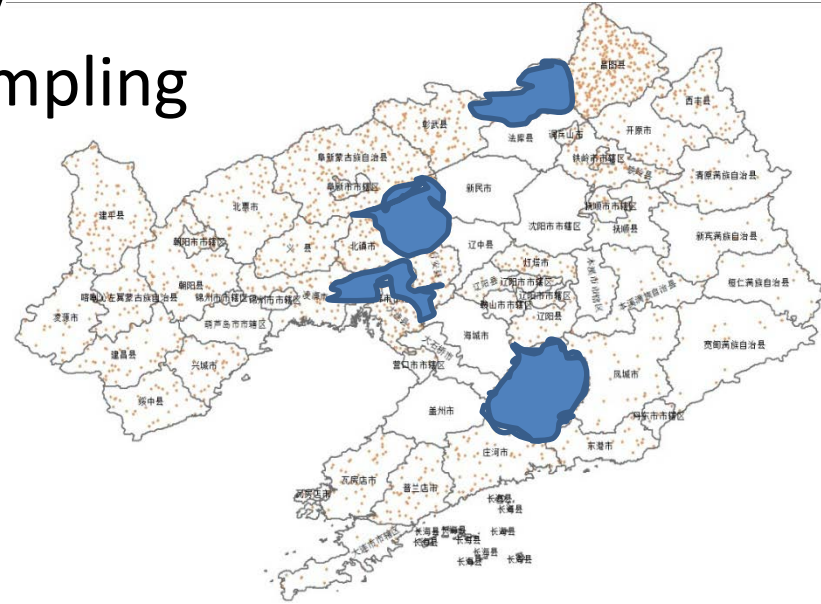
- Issues
 - Village approximate loss assessment
 - Farmers' purchasing motivation
 - Small household farms
 - Specialized farms with land rented
 - Current insurance participation rate
- Objective
 - To explore Chinese corn growers' demand or stated preference for alternative types of insurance
 - Preference for alternative types
 - WTP for different contract parameters

Literature

- Actuarially fair premium level based on risk assessment
 - Yield, revenue, weather types
 - Risk distribution and expected loss (Goodwin & Ker, 1998; Goodwin 1994;Zheng et al, 2014)
 - US, EU, China
- Farmers' willingness to pay (WTP) premium
 - Expected utility based welfare gain (Fraser, 1992; Wang et al, 1998)
 - Assumption on risk preferences, no financial constraint
- Survey based farmers demand for insurance
 - WTB (Boyd et al, 2011)
 - WTP Contingent Valuation(Hill et al. 2013; Akter et al 2009; Ning et al, 2006; Peng et al, 2012)
- Choice experiment WTP methods applied in non-insurance
 - (Lusk et al,2003; Ortega et al, 2014)

Survey

- Liaoning province, stratified sampling
 - Four cities
 - Shenyang, Jinzhou, Panjin, Anshan
 - Four counties, one in each city
 - Ten villages, 2-3 in each county
 - ~20 farmers in each village
- In person interview in November 2017
- 198 valid surveys from 220 rural households
- Choice experiment

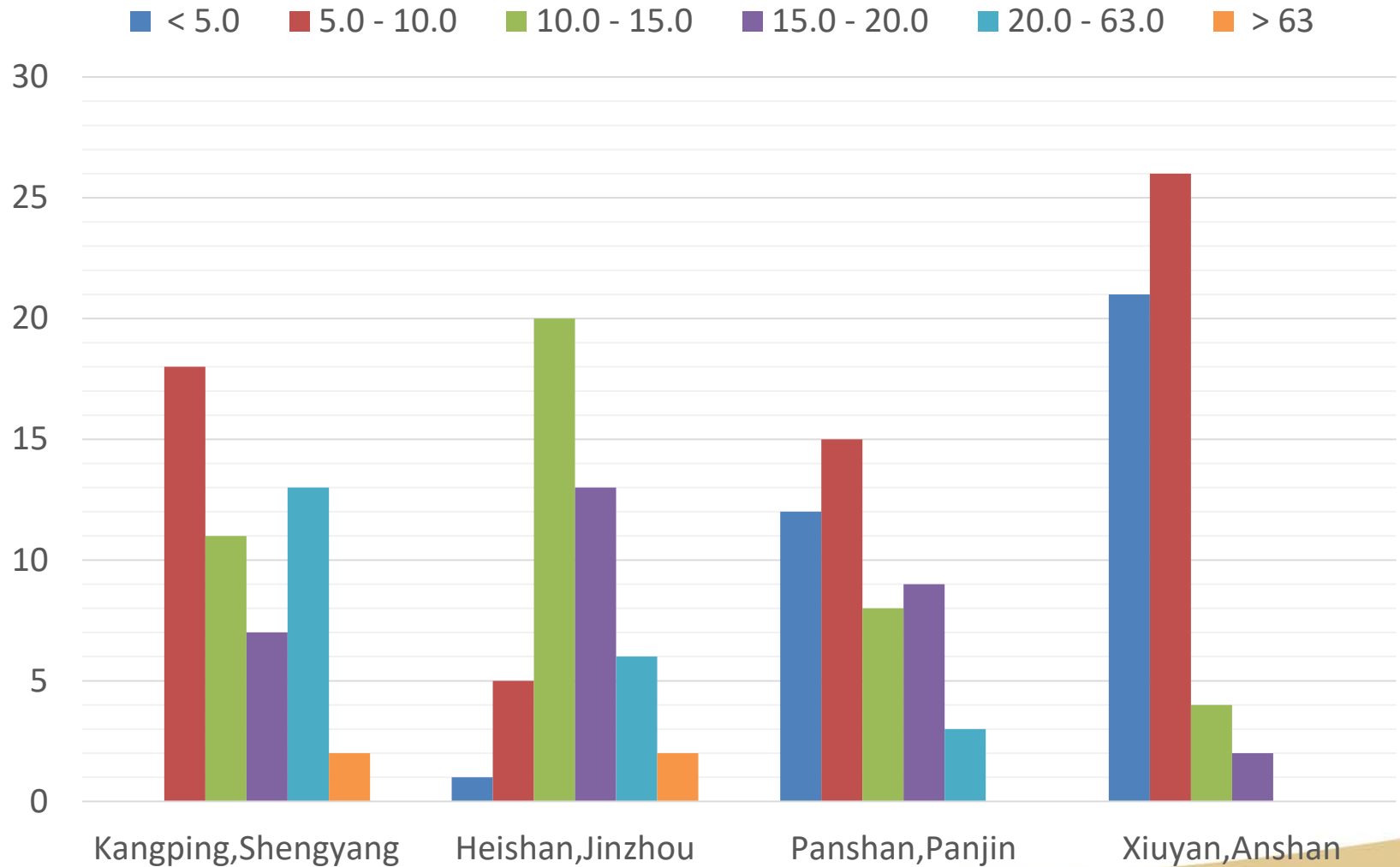


Data

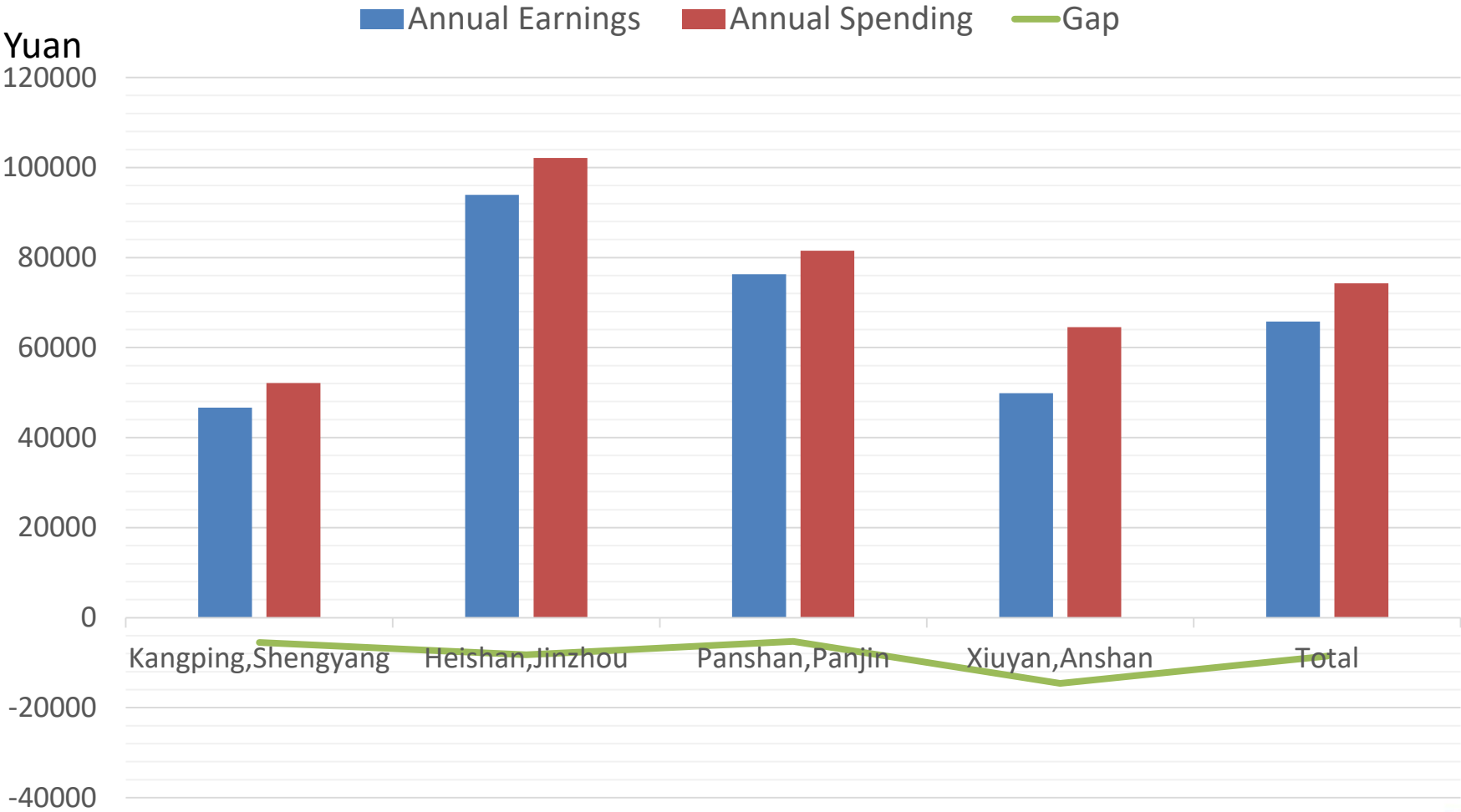
- Farmers
 - Demographics: gender, age, education, family size, having children
 - Economics: family income and expenses
 - Production: Corn planting area and cost, other crops
 - Risk attitude: risk preference, evaluation of crop insurance, contingent valuation of crop insurance

Demographics	Average
Female	37.9%
Age	54.27
College and up education	6.6%
Tech school	11.6%
High School	53.0%
Primary School	28.8%
Family Size	4.3
Number of children	0.6

Corn Planting Acreage (Mu, 1 acre=6.1 Mu)



Annual Family Income and Expenditure



The Attributes for Crop insurance

Attributes	Levels
Insurance Products	Yield Insurance, Revenue Insurance, Price Insurance, Index Insurance
Coverage	¥300, 650, 1000
Self Paid Premium (1~2%)	¥3, 4.5, 6, 6.5, 9.75, 13, 15, 20
Time to receive indemnity payment	Short or long
Government or private	State-owned insurance company or private insurance company

- A combination of alternative levels of the attributes form one option. Five options, one for each product plus an optout, are provided for survey subjects to make a choice.
- Each farmer is doing 8 different experiments, called situations

Labeled Choice Experiment Example

Attribute	Yield	Revenue	Price	Index	Option C
Coverage (¥)	300	650	1000	300	Not to buy any insurance
Premium	3	13	20	4.5	
Time	long	long	short	long	
Govt. or private	private	private	govt.	private	
Check one only	_____	_____	_____	_____	

- $4 \times 3 \times 9 \times 2 \times 2 = 432$ different combinations
- Random sample design in SAS, D-Efficiency, 48 situations
- Blocked into 6 groups of 8, so each farmer did 8.

Theoretical Framework

- Lancasterian approach to utility (1966)
 - Individuals derive their utilities from a product through each of its attributes (price, normal attributes, credence attributes)
 - Attributes can be discrete or continuous, price gives disutility

$$U_i(p, A_1, A_2, A_3, \dots), \partial U / \partial p < 0$$

- To keep the consumer just as well off, a trade off between increasing one discrete attribute from 0 to 1 and increasing the price, gives the Willingness to pay for that attribute.

$$\partial U / \partial p dp + \partial U / \partial A_i dA_i = 0$$

$$WTP \equiv dA_i / dp = - \frac{\partial U / \partial A_i}{\partial U / \partial p}$$

- For a continuous attribute, this is the WTP for its marginal increase

Theoretical Framework

- Random Utility Model
 - $U_{nit} = V_{nit} + \varepsilon_{nit}$, n for individual 1~198, i for alternative 1 ~5, and t for situation 1 ~ 8
 - $V_{nit} = \beta' x_{nit}$ is the deterministic part, and ε is the random part
 - X represents the vector of attributes
- An individual choose the bundle of attributes that maximizes the utility
- $P_{nit} = Prob(V_{nit} + \varepsilon_{nit} > V_{njt} + \varepsilon_{njt}; \forall j \neq i, \forall j \in C)$ is the probability that s/he choses alternative i over all j's

Econometric Modeling

$$V_i = \beta_{1i}Prem_i + \beta_{2i}Cov_i + \beta_{3i}Sho_i + \beta_{4i}Gov_i + \beta_{5i}$$

- Random parameters (mixed) logit
 - The coefficients, β 's, are random to allow heterogeneity
 - Continuous heterogeneity

$$P_{nit} = \int \frac{\exp(V_{nit})}{\sum_j \exp(V_{njt})} f(\beta) d\beta$$

- Willingness-to-pay

$WTP_{ki} = -2 \beta_{ki} / \beta_{1i}$, $k=2,\dots,4$, the 2 is a result of effect coding

$WTP_{5i} = -\beta_{5i} / \beta_{1i}$, the loss of not having this insurance

Results

- Standard deviations of all coefficients are significant, indicating the necessity of parameter randomness for heterogeneity

Price Insurance	Coefficient	Standard Deviation	WTP (¥/Mu)
Premium	-0.07427 (0.0372)**	0.16026 (0.0589)***	
Coverage	0.00156 (0.0007)**	0.0026 (0.0012)**	0.042
Short	0.58430 (0.1371)***	0.63936 (0.1660)***	15.73
Government	0.99540 (0.1698)***	0.73238 (0.2154)***	26.80
Rasc	-1.19709 (0.3565)***	1.60864 (0.4532)***	-16.12

Results

- Relatively, farmers prefer yield insurance, index insurance, price insurance over revenue insurance

WTP (¥/Mu)	Yield	Index	Price	Revenue
Coverage	0.18	0.03	0.04	0.05
Time	28.92	3.15	15.73	6.44
Government	126.38	29.50	26.80	14.74
Casc	-59.77	-21.31	-16.12	-8.57

- Yield insurance is the primary insurance available and farmers know it well
- The government provides the floor price
- Weather index insurance also protects yield risks only

Results

- Farmers trust the government owned insurance firms over the private
- Shorter time to receive the indemnity payment is preferred

WTP (¥/Mu)	Yield	Index	Price	Revenue
Coverage	0.18	0.03	0.04	0.05
Time	28.92	3.15	15.73	6.44
Government	126.38	29.50	26.80	14.74
Casc	-59.77	-21.31	-16.12	-8.57

- The government ownership is a more important attribute than the fast payment
- For each Yuan increase in the coverage level, the WTP is increased by 3 to 18 cents.
 - This is consistent to the current situation that a large share of subsidy is required.

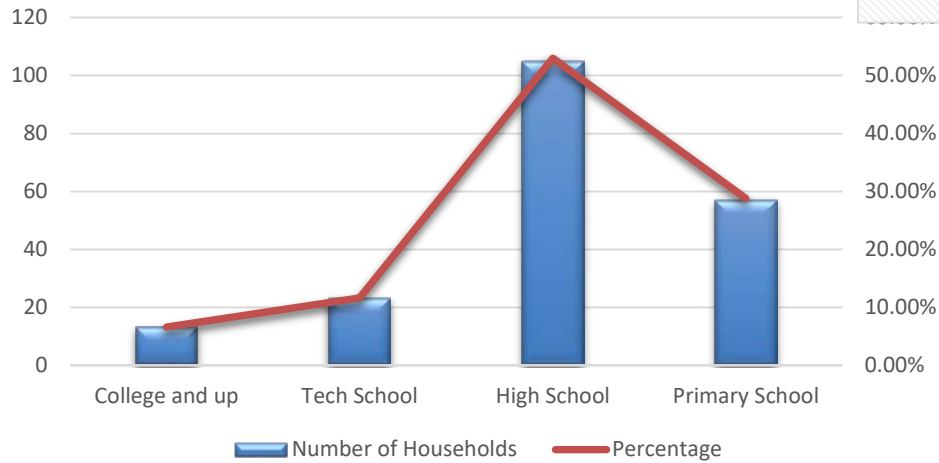
Conclusion

- Yield insurance has been widely available and farmers understand it
- Farmers are satisfied with the great subsidy
- Farmers are willing to buy higher coverage if available, 3~18%
- Farmers trust the government better than private firms

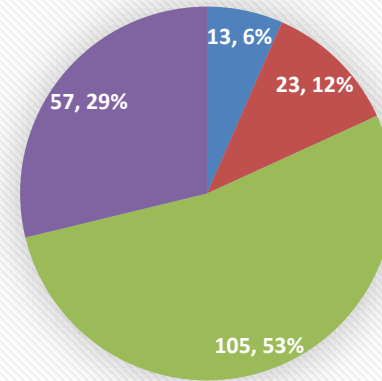
Further Research

- Impact of farmers' risk preferences to WTPs
- Impact of production factors to WTPs
 - A small number of larger farms emerge as land is allowed to be rented with the new policy
 - The material cost coverage is very low for the larger “commercial” farms
- Impact of economic factors to WTPs
 - Affordability issues

Education Background



Education Background



■ College and up
 ■ Tech School
 ■ High School
 ■ Primary School

WTP Soliciting Methods

- **Contingent valuation:** asking consumers directly what they are willing to pay for a specific attribute, can be a hypothetical attribute.
- **Auction:** bring a group together, provide a limited number of products, the interested attributes are included, ask them to bid.
- **Experimental methods:** give shoppers real money and real products labeled with the interested attributes with reasonable prices, observe their purchasing decisions.
- **Choice experience:** survey based, give a few options on paper, each has a product with specific attributes and price, they can choose.

Results

Revenue Insurance	Coefficient Estimates	Standard Deviation Estimates	Willingness to Pay (¥/contract)
Premium	-0.13286 (0.02945)***	0.11386 (0.05909)*	
Coverage	0.00311 (0.00051)***	0.00114 (0.00077)	0.047
Time	0.42753 (0.09079)***	0.16359 (0.15380)	6.44
PP	0.97936 (0.14519)***	0.97106 (0.83427)	14.74
Casc	-1.13848 (0.30127)***	1.77626 (0.45253)***	-17.14

Results

Yield Insurance	Coefficient Estimates	Standard Deviation Estimates	Willingness to Pay (¥)	
Premium	-0.02548 (0.03)	0.11771 (0.05685)**		
Coverage	0.00235 (0.00053)***	0.00055 (0.00104)	0.18	
Short Time	0.36852 (0.1052)***	0.52275 (0.22366)**	28.92	
Public	1.61009 (0.20197)***	1.4101 (0.33438)***	126.38	
Yasc	-1.52335 (0.38446)***	3.25748 (0.48221)***	-59.77	

Results

index	Coefficient Estimates	Standard Deviation Estimates	Willingness to Pay (¥/contract)
Insurance			
Premium	-0.11320 (0.04538)**	0.17274 (0.06268)***	
Coverage	0.00194 (0.00078)**	0.00264 (0.00113)**	0.034
Time	0.17853 (0.11967)	0.17120 (0.28891)	3.15
Public	1.66949 (0.33027)***	1.32006 (0.39693)***	29.50
Dasc	-2.41218 (0.51780)***	2.08719 (0.62612)***	-21.31

Results

optout	Coefficient Estimates
Cdum	-3.92402 (0.58212)***

References

- Fraser, R. W. An Analysis of Willingness-To-Pay For Crop Insurance. *Australian Journal of Agricultural and Resource Economics* 36(1992): 83-95.
- Hill, R. V., Hoddinott, J., and Kumar, N. Adoption of weather-index insurance: learning from willingness to pay among a panel of households in rural Ethiopia. *Agricultural Economics* 44(2013): 385-398.
- Boyd, M., Pai, J., Zhang, Q., Wang, H. H. and Wang, K. Factors affecting crop insurance purchases in China: the Inner Mongolia region. *China Agricultural Economic Review* 3(2011): 441-450.
- Wang, H. H., Hanson, S. D., Myers, R. J. and Black, J. R. The effects of crop yield insurance designs on farmer participation and welfare. *American Journal of Agricultural Economics* 80(1998): 806-820.
- Goodwin, B. K., and Ker, A. P. Nonparametric estimation of crop yield distributions: implications for rating group-risk crop insurance contracts. *American Journal of Agricultural Economics* 80(1998): 139-153.
- Goodwin, B. K. Premium rate determination in the federal crop insurance program: what do averages have to say about risk?. *Journal of Agricultural and Resource Economics* 19(1994): 382-395.

References

- Akter, S., Brouwer, R., Choudhury, S. and Aziz, S. Is there a commercially viable market for crop insurance in rural Bangladesh?. *Mitigation and adaptation strategies for global change* 14(2009): 215-229.
- Lusk, J. L. Effects of cheap talk on consumer willingness-to-pay for golden rice. *American Journal of Agricultural Economics* 85(2003):840-856.
- Ortega, D. L., Wang, H. H., and Olynk Widmar, N. J. Aquaculture Imports from Asia: An Analysis of U.S. Consumer Demand for Select Food Quality Attributes. *Agricultural Economics*, 45 (2014): 625-634.
- Peng, K., Xi, L., and Peng, K. An empirical study of factors impacting farm households' willingness to pay for rice insurance: 1772 household dat from 34 locations in Guangdong. *Insurance Studies*, 2012(4):33-43.
- Ning, M., Miao, Q., Xing, L., and Zhong, F. An empirical study on farm households' willingness to pay for insurance: the case of Manas River Watershed in Xingjing. *China Rural Economy*, 2006(6):43-51.
- Zheng, Q., Wang, H. H., and Shi, Q. H. Estimating bivariate yield distributions and crop insurance premiums using nonparametric methods. *Applied Economics*, 46(2014):2108-2118.