From Agriculture to Rural Protection against Natural Disasters in China

Risk Perception, Management and Policy

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Institute of Integrated Risk Management
Beijing Normal University
Overview of China’s Natural Disasters and Risk
Distribution of Major Disasters (1900-2000)

Location of Major Natural Disasters in China (1900~2000)
Regionalization of Natural Disaster in China
Regionalization of Agriculture Natural Disaster in China
Integrated Risk Index of Natural Disasters in China
Occurrence of Disasters - Flood

Number of Counties Affected by Flood (1901-2005)

Data Source: ADREM, BNU, China
Drawn by ADREM, BNU, China
Occurrence of Disasters - Earthquake

Earthquake (Ms ≥ 6.0, 1901–2008)

Data Source: ADREM, BNU, China
Drawn by ADREM, BNU, China
Occurrence of Disasters - Typhoon

Frequency of Typhoon in the NorthWest Pacific Ocean (1949-2006)

Year

Frequency


Typhoon
Landfall Typhoon
Extreme Events are Increasing
Occurrence of extreme events is increasing
Improved capacity filtered out small hazardous events
With rapid urbanization and increased exposure, extreme events exceeding current capacity result in large-scale disasters
An Example of Large-scale Disaster
Dramatic Temperature Decrease from Jan.10 to Feb.2

Temperature decreased 10-20°C in the middle and downstream of Yangtze River.
2008 South China Snow Storm and Freezing Rain

10-12 days longer than mean annual snowing days
The annual continuous freezing days along the middle stream and downstream of Yangtze River (including Hunan, Hubei, Jiangxi, Anhui, Shanghai, Jiangsu provinces) and Guizhou

Note: data for year 2007-2008 is from Dec, 1 2007 to Feb, 2, 2008
Severe Impact to Infrastructure
Interaction of multi factors in the disaster system

Extreme weather
Low-Temperature, Sleet, Snow;
Inversion layer and quasi-stationary front;

Hazard
Complex Topology
Mountain and Plateau;
Low wind speed and high humidity

Exposure
CAT
Less Developed Economy
Low urbanization ratio;
High proportion of agriculture;
Infrastructure Vulnerable

Environment
Integrated Disaster Reduction Strategy of China
Integrated Disaster Reduction Strategy

Capacity Building
National Development and Reform Commission (1,000 Billion Yuan RMB)

Disaster Relief
Office of Emergency Response, State Council (40 Billion Yuan RMB)

Integrated Disaster Reduction Strategy

Emergency Management
National Commission for Disaster Reduction

Risk Transfer
China Insurance Regulatory Commission
Ministry of Finance (10 Billion Yuan RMB)

Ministry of Civil Affairs (100 Billion Yuan RMB)
New Agriculture Insurance Program
Experimentation of government-supported disaster insurance – Agriculture Insurance

Step(1): Farmers’ payment
Step(2): Local government subsidy
Step(3): Central government subsidy
Step(4): Provincial government subsidy
Step(5): Reserve 25% of premium
Good Practice of Implementation: Changde Mode

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Old Mode</th>
<th>New Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government at county level</td>
<td>Providing subsidy</td>
<td>Assigning officials for insurance</td>
</tr>
<tr>
<td>Insurer at county branch</td>
<td>Focus on business development</td>
<td>Focus on loss adjustment and claim settlement</td>
</tr>
<tr>
<td>Farmers</td>
<td>Less trust on insurance</td>
<td>More trust on local insurance assistant</td>
</tr>
<tr>
<td></td>
<td>professionals</td>
<td></td>
</tr>
</tbody>
</table>
Implication of 2009-2010 China Drought Disasters
The spatial pattern of drought disasters in China

Drought centers
Spatial patterns of the drought hazards

Snapshots of the spatial patterns of meteorological droughts

Jan 31, 2009

Aug 15, 2009

Mar 15, 2010

Source: CMA website (http://bcc.cma.gov.cn/en/)
Three consecutive severe droughts in 2009~2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
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<tr>
<td>2008</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
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<tr>
<td>2010</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

### Features

<table>
<thead>
<tr>
<th>Features</th>
<th>2009 Spring Drought</th>
<th>2009 Summer Drought</th>
<th>2010 Spring Drought</th>
</tr>
</thead>
<tbody>
<tr>
<td>The date for the most severe drought</td>
<td>Feb 7th, 2009</td>
<td>Aug 16th, 2009</td>
<td>--</td>
</tr>
<tr>
<td>Meteorological trigger</td>
<td>Higher temperature &amp; smaller precipitation</td>
<td>Smaller precipitation</td>
<td>Higher temperature &amp; Smaller precipitation</td>
</tr>
<tr>
<td>Intensity</td>
<td>1/30a~1/50a</td>
<td>1/50a~1/100a</td>
<td>1/50a~1/100a</td>
</tr>
</tbody>
</table>
Issues to be addressed

- Sustainability and insurability in face of large-scale disasters
- Subsidy
- Reserved catastrophe fund
- Rational premium reflecting regional difference

Does the program meet people’s actual need?
Risk Premium
Paddy Rice

**Premium Rate** (%)

**Province ID**

- **Premium Rate in Use**
- **Calculated Premium Rate**
Risk Perception
Survey Itinerary and Sample Coverage
Disaster Experience

Disaster Experiences of Respondents

- Drought: 37.8%
- Rainstorm: 34.0%
- Flood: 28.8%
- Sandstorm: 18.7%
- Hail: 17.6%
- Construction fire: 15.1%
- Earthquake: 14.6%
- Typhoon: 9.9%
- Wild fire: 9.8%
- Landslide: 8.5%
- Heavy snow/ice rain: 6.9%
- Debris flow: 4.6%
- Storm tide: 1.8%
<table>
<thead>
<tr>
<th>Earthquake Frequency by Respondents</th>
<th>Rainstorm Frequency by Respondents</th>
<th>Frequency of Flood by Respondents</th>
<th>Frequency of Typhoon by Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epicenter Distribution in China</td>
<td>Mean Annual Precipitation in China</td>
<td>Frequency of Flood in China</td>
<td>Number of Severe Typhoon Landing in Eastern China</td>
</tr>
</tbody>
</table>
84% have insurance experience
16% have no insurance experience
Regional development and preference on Government disaster reduction measures

Class 1: Poverty stricken counties in need of annual fiscal support from the central government
Class 2: Average counties other than poverty stricken counties
Class 3: County-level cities
Class 4: Average cities other than 36 large cities
Class 5: 36 large cities such as Beijing, Tianjin and Shijiazhuang
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Class 3: County-level cities
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Class 5: 36 large cities such as Beijing, Tianjin, and Shijiazhuang
# Intercorrelation Among the Eight Factors

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.26</td>
<td>-0.132</td>
<td><strong>-0.487</strong></td>
<td>0.280</td>
<td><strong>-0.732</strong></td>
<td><strong>0.468</strong></td>
<td><strong>-0.573</strong></td>
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</tr>
<tr>
<td>2.</td>
<td>0</td>
<td><strong>-0.660</strong></td>
<td>-0.106</td>
<td>0.194</td>
<td>-0.180</td>
<td>0.165</td>
<td>-0.139</td>
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</tr>
<tr>
<td>3.</td>
<td>0</td>
<td>1</td>
<td><strong>0.406</strong></td>
<td>-0.159</td>
<td>-0.137</td>
<td>-0.241</td>
<td>0.190</td>
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</tr>
<tr>
<td>4.</td>
<td>0</td>
<td>1</td>
<td>0.080</td>
<td>0.302</td>
<td>-0.308</td>
<td><strong>0.549</strong></td>
<td></td>
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<tr>
<td>5.</td>
<td>0</td>
<td>1</td>
<td>-0.287</td>
<td>0.297</td>
<td>0.111</td>
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<tr>
<td>6.</td>
<td>0</td>
<td>1</td>
<td><strong>-0.468</strong></td>
<td><strong>0.624</strong></td>
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<tr>
<td>7.</td>
<td>0</td>
<td>1</td>
<td><strong>-0.530</strong></td>
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</tr>
<tr>
<td>8.</td>
<td>1</td>
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<td></td>
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</table>

* Correlation is significant at the 0.05 level (1-tailed). ** Correlation is significant at the 0.01 level (1-tailed).
Focal Groups Survey on 31 Types of Risks

31 types of risks

<table>
<thead>
<tr>
<th>Civil Unrest</th>
<th>Economic Crisis</th>
<th>Population Fluctuation</th>
<th>Inferior products</th>
<th>Infectious disease</th>
<th>Shortage of Medical Facilities</th>
<th>Family Breakdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure of Reform</td>
<td>Corruption</td>
<td>Energy Crisis</td>
<td>Degradation of Social Values</td>
<td>Sandstorm</td>
<td>Earthquake</td>
<td>Snowstorm and Freezing Rain</td>
</tr>
<tr>
<td>Food Safety</td>
<td>Flood</td>
<td>Rainstorm</td>
<td>Drought</td>
<td>Environmental Pollution</td>
<td>Traffic Accident</td>
<td>Traffic Congestion</td>
</tr>
<tr>
<td>Unemployment</td>
<td>Hospital Congestion</td>
<td>No money to see a doctor</td>
<td>High Real Estate Price</td>
<td>Smoking</td>
<td>Global Climate Change</td>
<td>International Conflict</td>
</tr>
<tr>
<td>Taiwan Strait Crisis</td>
<td>Terrorism Thread</td>
<td>Ethnic Conflict</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 focal groups by occupations

| Farmers | Government Employees |
| Small Business Owners | Industry Workers |
| College Students | Migrant Construction Workers |
Comparison by Occupations

Farmers

Perceived Probability of Occurrence

Degree of Concerns

Government Employees

Degree of Concerns
# Cluster Analysis by Degree of Concerns

<table>
<thead>
<tr>
<th>1&lt;sup&gt;st&lt;/sup&gt; cluster</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; cluster</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; cluster</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; cluster</th>
</tr>
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<td>Flood</td>
<td>Civil unrest</td>
<td>Smoking</td>
</tr>
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<td>Rainstorm</td>
<td>Economic crisis</td>
<td>Global Climate Change</td>
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<td>Sandstorm</td>
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</tr>
<tr>
<td>High Real Estate Price</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Factor Analysis of Demographic Characteristics

<table>
<thead>
<tr>
<th>Component</th>
<th>FACT 1</th>
<th>FACT 2</th>
<th>FACT 3</th>
<th>FACT 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee time</td>
<td>0.829</td>
<td>-0.316</td>
<td>0.127</td>
<td>-0.081</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.039</td>
<td>-0.087</td>
<td>0.065</td>
<td>0.981</td>
</tr>
<tr>
<td>Age</td>
<td>0.871</td>
<td>-0.166</td>
<td>0.140</td>
<td>-0.097</td>
</tr>
<tr>
<td>Educational background</td>
<td>-0.515</td>
<td>0.658</td>
<td>-0.204</td>
<td>0.084</td>
</tr>
<tr>
<td>Monthly income</td>
<td>0.248</td>
<td>0.819</td>
<td>-0.016</td>
<td>-0.201</td>
</tr>
<tr>
<td>Resident time</td>
<td>0.811</td>
<td>-0.130</td>
<td>-0.153</td>
<td>0.010</td>
</tr>
<tr>
<td>Building property right</td>
<td>0.809</td>
<td>0.238</td>
<td>0.098</td>
<td>0.030</td>
</tr>
<tr>
<td>Location of residence</td>
<td>-0.358</td>
<td>0.766</td>
<td>-0.127</td>
<td>0.018</td>
</tr>
<tr>
<td>Number of the family members</td>
<td>0.070</td>
<td>-0.146</td>
<td>0.966</td>
<td>0.069</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FACT 1</th>
<th>Degree of Concerns for 1\textsuperscript{st} cluster</th>
<th>Degree of Concerns for 2\textsuperscript{nd} cluster</th>
<th>Degree of Concerns for 3\textsuperscript{rd} cluster</th>
<th>Degree of Concerns for 4\textsuperscript{th} cluster</th>
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</thead>
<tbody>
<tr>
<td>FACT 2</td>
<td>0.141\textsuperscript{*}</td>
<td>0.271\textsuperscript{**}</td>
<td>-0.061</td>
<td>-0.216\textsuperscript{**}</td>
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<td>FACT 3</td>
<td>0.097</td>
<td>-0.072</td>
<td>-0.007</td>
<td>0.012</td>
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<tr>
<td>FACT 4</td>
<td>-0.022</td>
<td>-0.025</td>
<td>-0.011</td>
<td>-0.037</td>
</tr>
</tbody>
</table>
Quick Summary of Risk Perception Survey

- Farmers (strong FACT1 characteristics) have much higher degree of concerns on natural hazard risks
- People who live in cities with higher education and income have much lower degree of concerns on natural hazard risks
- Farmers have higher percentage of accepting catastrophe insurance, although their affordability is lower
- The acceptance of catastrophe insurance is highly correlated with people’s past insurance experience and their opinions on government responsibility
Needed of Integrated Management and Policy

1976 TangShan 7.8 EQ, 240,000 dead, >10 billion Yuan RMB economic loss

2008 WenChuan 8.0 EQ, >70,000 dead, >800 billion Yuan RMB economic loss
The Reinforcement and Rehabilitation Program
Integrated Disaster Reduction Strategy

- Capacity Building
- Disaster Relief
- Emergency Management
- Risk Transfer
Conclusions

- Government investment in rural areas to increase coping capacity is still the top priority, especially for the less developed areas.
- In general, farmers are still very vulnerable to disasters, and their highly perceived risk determines their highly acceptance of catastrophe insurance. “Farmers generally lack of risk/insurance awareness” is not true.
- Farmers’ participation of insurance should be encouraged by government subsidy.
- Policy implementation at county-level is critical. County-level subsidy should be removed and the focus of county-level government should shift to personnel and technical support. Using existing rural network is the key, at least, for the early stage.
- People’s past insurance experience is strongly correlated with their acceptance of catastrophe insurance. Performance of existing rural insurance such as farmers’ medical, accidental & injury insurance highly affect the acceptance of new rural insurance programs.
- Premium should be studied carefully and reflects regional difference.
Next Steps for Better Governance

Integrated Risk Governance Project

SCIENCE PLAN
Thank you!

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