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# SUSTAINABLE GROWTH IN CROP NATURAL DISASTER INSURANCE: EXPERIENCES OF JAPAN

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# Outline

## 0. INTRODUCTION

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2. Current Agricultural Insurance Market

3. Costs and Benefits of Insurance

4. Scheme for reducing costs of agricultural insurance and Farmers'  
Participating in it

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6. Implication for family farming under developing countries

## 7. CONCLUSION

# 0. INTRODUCTION

Table 0-1. The component of agricultural production risk for natural disaster, bad weather and the like

Source of risk		Consequence of risk	
Hazard	Peril	Damage (direct loss)	Loss (indirect or consequential loss)
<p><b>An circumstance or condition that increases the frequency or severity of damage and loss arising from some perils;</b> global warming, climate change, monsoon zone, earthquake-prone zone, vulnerability to disaster, smallholder farmers</p>	<p><b>An event causing damage and loss to the agriculture sector;</b> drought, storms, floods, tsunamis, earthquakes, pests, animal infectious diseases</p>	<p><b>The total or partial destruction of physical assets and infrastructure in disaster-affected areas, expressed as replacement or repair costs;</b> standing crops, farm tools and equipment, irrigation systems, livestock shelters and veterinary services (FAO 2015)</p>	<p><b>The changes in economic flows arising from the disaster;</b> a decline in crops and livestock, increased cost of production, lower revenues and higher operational costs for services (FAO 2015)</p>
<h2>Risk exposure</h2>			
<p>a value subject to loss; assets, income, agricultural land, agricultural production</p>			

# 0. INTRODUCTION

Damage and losses to agriculture sector caused by major disasters (FAO 2015)

- 78 major disasters caused some USD 1.5 trillion economic damage and losses in the decade from 2003 to 2013 worldwide.
- The agriculture sector suffered
  - 22% of total damage and losses from these disasters.
  - 25% of them caused by climate-related disasters.
  - 84% of them caused by drought, 18% by storms, 15% by floods, 14% by tsunamis and 4% by earthquakes.
- There has been rising trend both in the occurrence and economic impact of disasters around the world.
- The agriculture sector in Asia suffered USD 48 billion in crop and livestock losses, which reached 2% of the projected value production.

# 0. INTRODUCTION

Table 0-2. Some data on agricultural production in member countries participating in the seminar

	Countries								
2014	IDN	THA	VNM	MYS	PHL	JPN	KOR	TWN	World
A: production value (in USD billion)	118.9	42.4	33.7	29.6	32.2	54.6	30.1	9.6	3,302.2
Ranking	4	12	17	23	19	10	22	44	
B: rate of production value to GDP (in %)	13.72	10.48	18.11	9.16	11.30	1.22	2.34	1.80	4.23
Ranking	72	83	55	95	78	186	159	169	
C: export of agriculture products and food articles (in USD billion)	35.4	30.8	24.0	26.0	6.3	4.7	6.5	3.4	1,502.7
Ranking	13	16	21	18	45	53	43	62	
D: export dependence(C/A) (in %)	29.8	42.4	71.2	87.8	19.6	8.6	21.6	35.4	45.5
E: total premium in 2008 (in USD million)	1	0.04	0.1	1	3	1,200	116	-	23,511 <sup>a</sup>
F: penetration of insurance (E/A in 2008) (in %)	0.001	>0.000	>0.000	0.004	0.013	2.176	0.512	-	0.791 <sup>a</sup>

<sup>a</sup> 2011

Source: UN, World Bank 2012 (premium), SwissRe 2013 (premium estimate in 2011)

# 0. INTRODUCTION

- Research Question:

How should we address the sustainable growth of crop insurance market for agricultural countries?

- Main purpose of my research is to explain the experiences of Japan and examine a few suggestions for sustainable growth in crop insurance market.

- Approach and method used in the research:

Review and analysis of some existing study and statistical data

# 1. Recent Agricultural Damages in Japan

Table 1-1. Agricultural damage<sup>a</sup> caused by major disasters<sup>b</sup> (in dollars in millions) [Table. 1 in the paper]

Year	Disasters					total
	Typhoon	Rain	Snow	Earthquake	Others	
2008	21	97	0	311	258	688
2009	337	201	0	0	102	640
2010	20	402	87	0	132	641
2011	NA	NA	NA	11,997	NA	11,997
2012	216	813	136	0	122	1,287
2013	389	519	1,452	0	297	2,657
2014	104	457	0	21	0	582

<sup>a</sup> The figure is the sum of damaged crops, agricultural lands and facilities.

<sup>b</sup> The disasters which causes damages exceeding JPY 1 billion converted to USD 9.0 million in 2014.

Source: Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF)

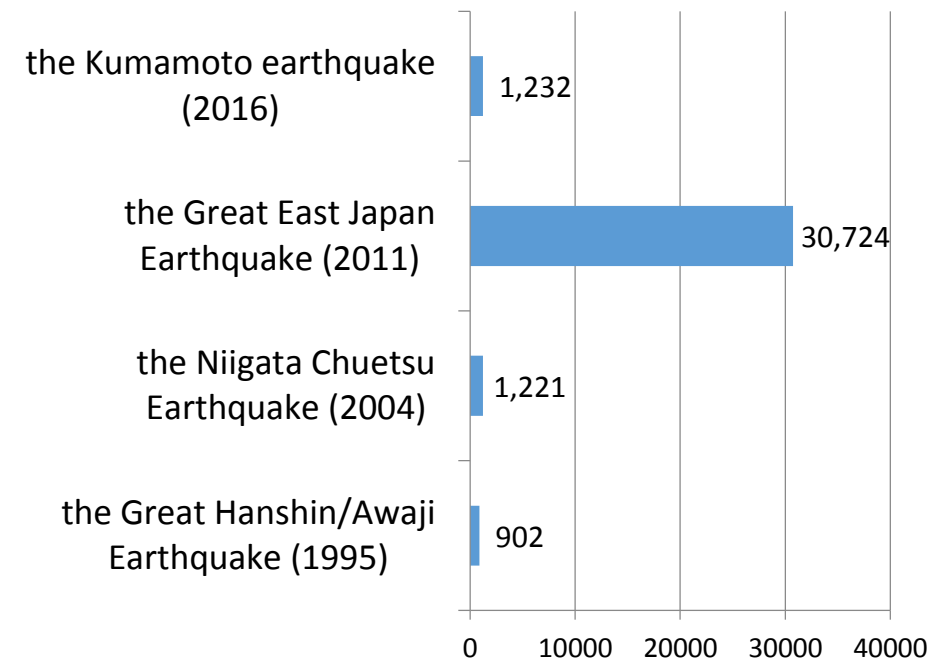
# 1. Recent Agricultural Damages in Japan

Table 1-2. Agricultural damages caused by the Great East Japan Earthquake in 2011 (as of March 5, 2012)

Main damage	Total number of damage	Amount of damage (in dollars in million)	Ratio (in %)
Agricultural land	18,174 areas	5,072	42.3
Agriculture facility, etc.	17,502 points	6,121	51.0
subtotal	35,676 points	11,193	93.3
Agricultural crops, livestock, etc.		180	1.5
Agricultural livestock facilities, etc.		624	5.2
subtotal		804	6.7
Total		11,997	100.0

Source: MAFF 2012

Table 1-3. Damage to the agriculture-forestry-fisheries sector caused by major earthquakes (in dollars in million)



Source: MAFF

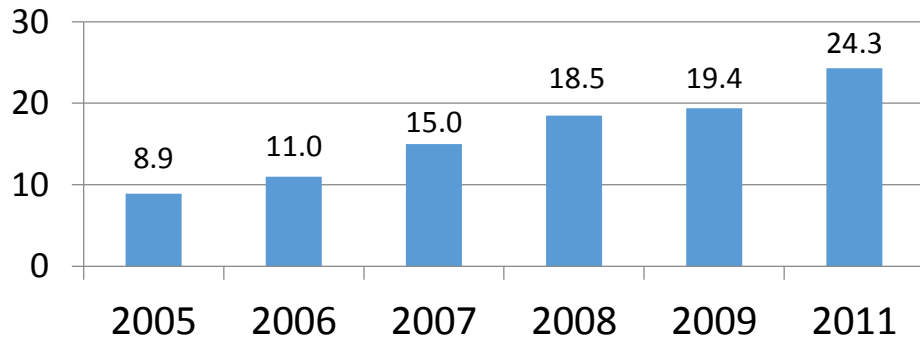
The amount of agricultural insurance payment (livestock and greenhouse) was about USD 16.9 million (NAIA 2011). The contract excludes damage of paddy rice from insurance payment because policy term did not start before rice planting. It also does not cover damages caused by a nuclear accident and reputational damage (MAFF 2012).



# 2. Current Agricultural Insurance Market

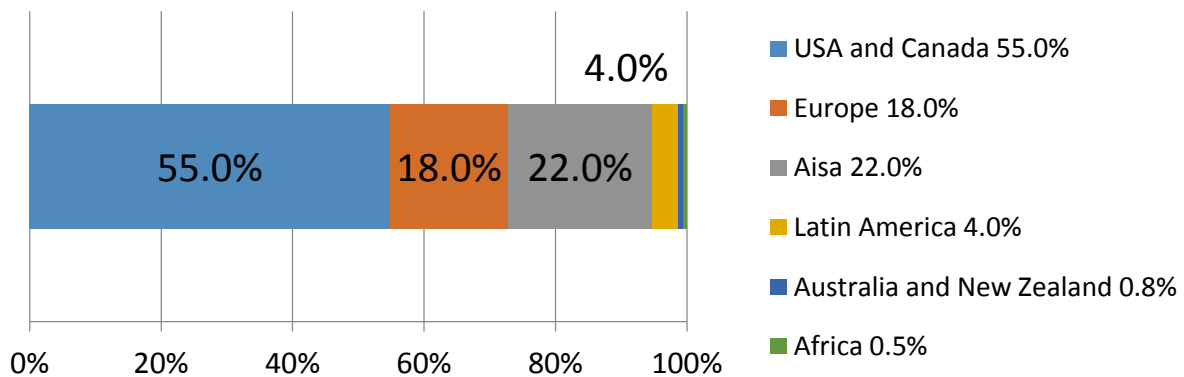
The current agricultural insurance market around the world

Figure 2-1. Agricultural insurance premium worldwide during 2005-2011



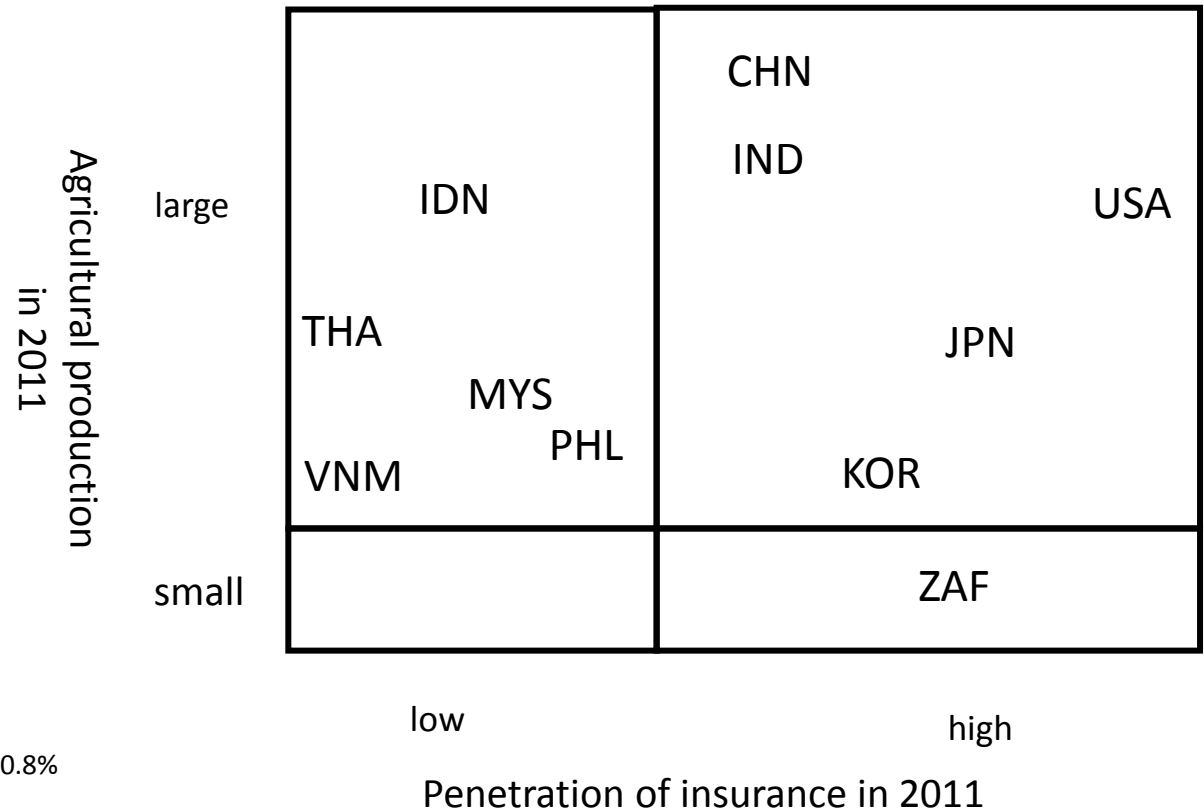
Source: Kida 2014

Figure 2-2. Estimated agricultural insurance premium by region in 2011



Source: SwissRe 2013

Figure 2-3. Agricultural production and insurance market in selected countries



Source: UN, SwissRe 2013, MAFF

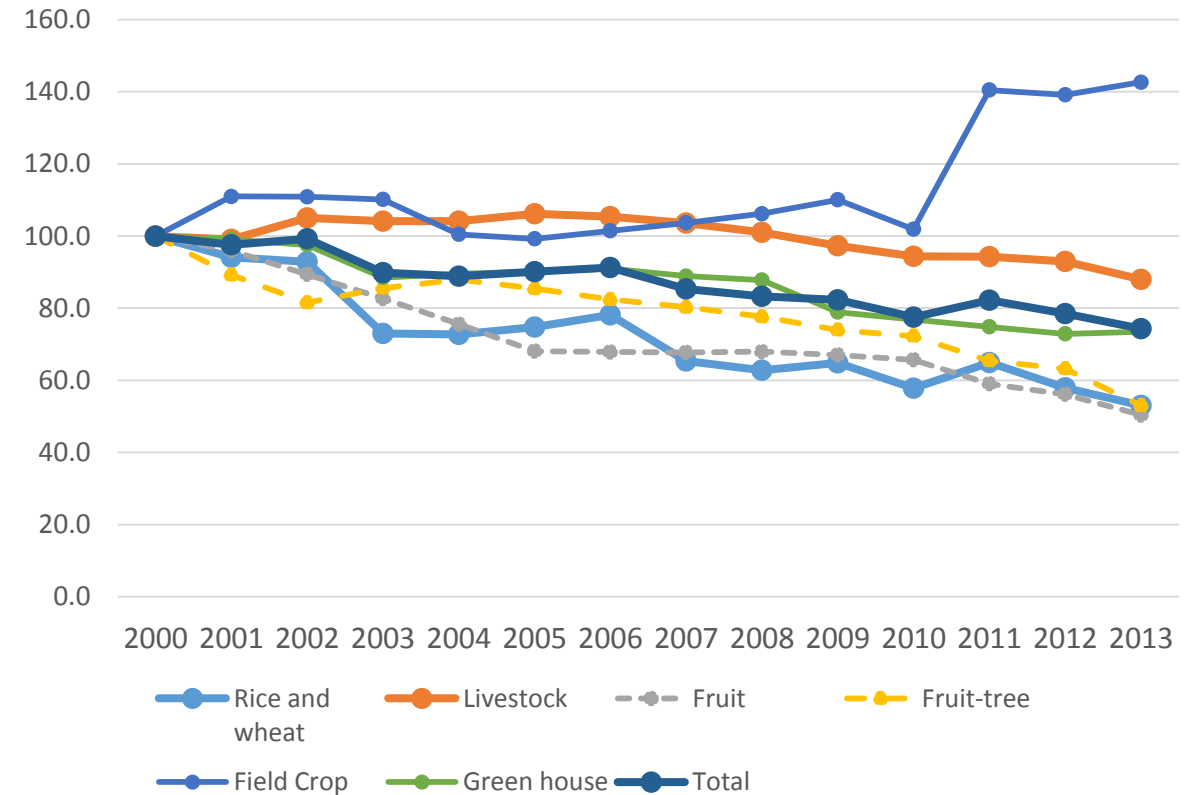
# 2. Current Agricultural Insurance Market

Table 2-1. Agricultural insurance premium in Japan  
[Table. 2 in the paper]

premium by items (in millions of USD)							
Year	Rice and wheat	Live stock	Fruit	Fruit-tree	Field Crop	Green house	total
2000	533	563	73	0.8	79	60	1,312
2013	314	550	40	0.5	126	49	1,081
Change (in %)	-41.2	-2.4	-44.1	-41.2	58.2	-18.5	-17.6
Change (in % of local currency)	(-47.0)	(-12.0)	(-49.6)	(-47.0)	(42.7)	(-26.5)	(-25.7)
Avg. 2000-13	411	607	56	0.7	98	56	1,231
Share in 2013 (in %)	29.0	50.9	3.8	0.0	11.7	4.6	100.0

Source: MAFF

Figure 2-1. Agricultural insurance premium in Japan



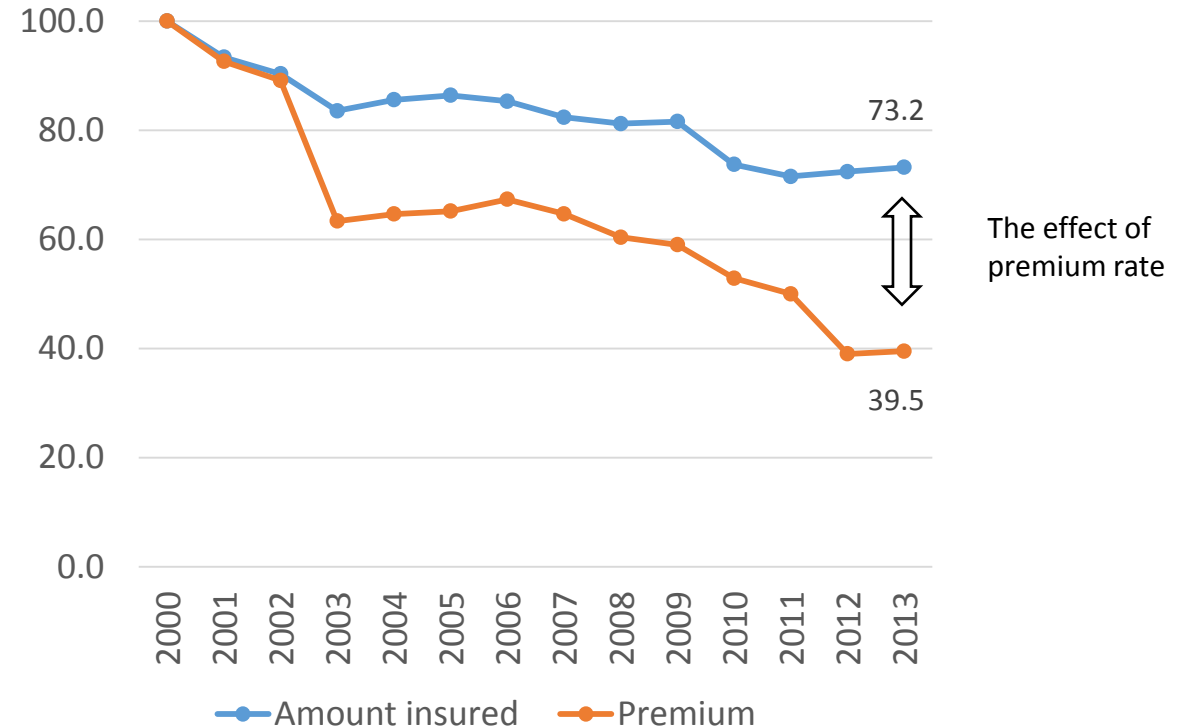
Premium in 2000 (local currency)=100

Source: MAFF

# 2. Current Agricultural Insurance Market

- The premium of paddy rice continues to be decreasing.
- Main reason is
  - (a) decreasing rice production because of a reduction in demand for it and policy of trimming rice production,
  - (b) trend toward lowering price of rice,
  - (c) declining premium rate.

Figure 2-2. Changes in paddy rice premium



## 2. Current Agricultural Insurance Market

Table 2-2. The rate of insured items based on area or livestock numbers [Table. 3 in the paper]

Year	The rate of insured (in %)				
	Rice	Wheat	Dairy cattle	Beef cattle	Horse
2000	90.1	81.6	100.0	64.1	89.5
2012	92.7	97.2	91.0	68.9	61.6
Avg. 2000-12	91.1	89.4	93.2	67.6	70.3

Year	Swine		Fruit	Field Crop	Green house
	breeding pig	fattening pig			
2000	15.4	14.4	25.5	50.5	48.2 <sup>a</sup>
2012	25.6	21.6	24.4	67.6	46.6 <sup>b</sup>
Avg. 2000-12	22.6	18.6	25.0	58.3	47.3 <sup>c</sup>

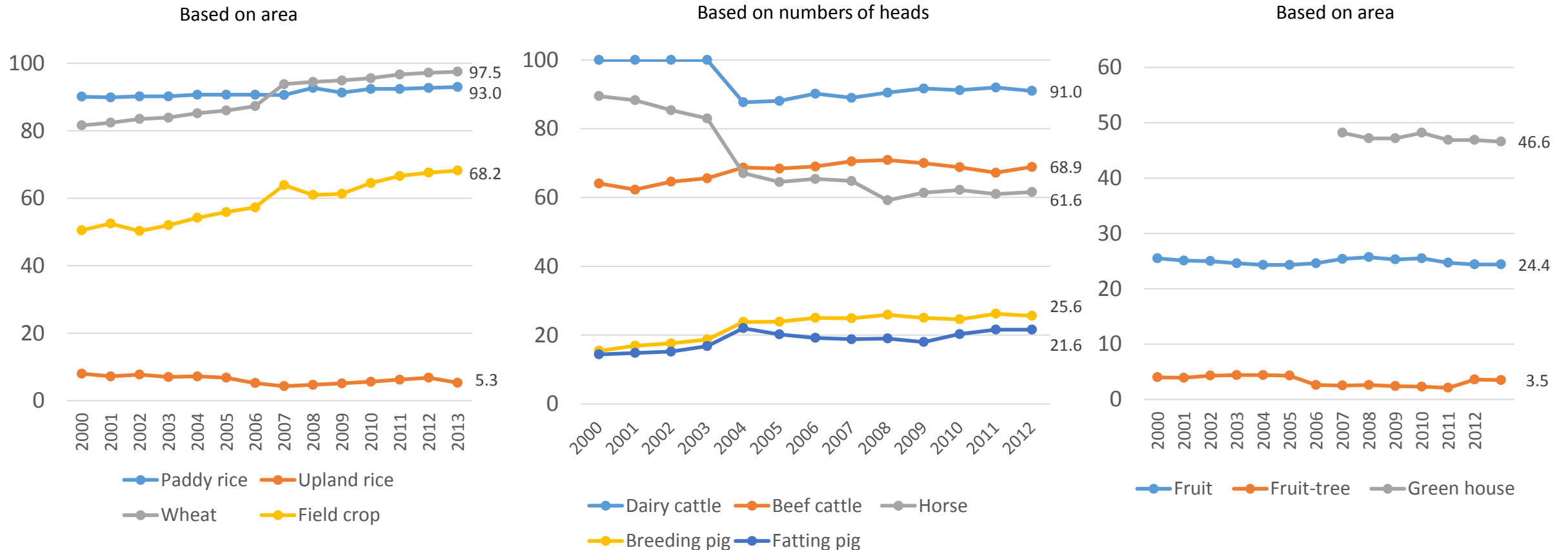
a2007, b2013, c2007-2013

Source: MAFF

The rate of insured, coverage ratio or underwriting ratio is classified into three types: (i) area or numbers of heads in livestock ;(ii) numbers of houses; (iii) production

# 2. Current Agricultural Insurance Market

Figure 2-3. The rate of insured by items (in %)



Source: MAFF

# 3. Costs and Benefits of Insurance

- Generally, insurance benefits society in two ways.
  - (i) insurance is the most popular tool for financing accidental loss by shifting the financial burden of it from an insured to an insurer. The separation of an insured who prefers not to have risk of an accident and an insurer who is willing and able to bear it results in high productivity in society, just like division of labor as Adam Smith pointed out.
  - (ii) insurance is mechanism for spreading loss among insureds. All insureds bear a heavy loss one insured suffered, just as you know “One for all, all for one.” Therefore, pooling risk is useful for saving resources needed by society if an accident happens.
- However, insurance involves considerable transactions costs such as operating costs, costs of adverse selection, moral hazards and bearings of risk. These costs influence availability and affordability for insurance coverage.

# 3. Costs and Benefits of Insurance

Table 3-1. The payment rate of agricultural insurance claim [Table. 4 in the paper]

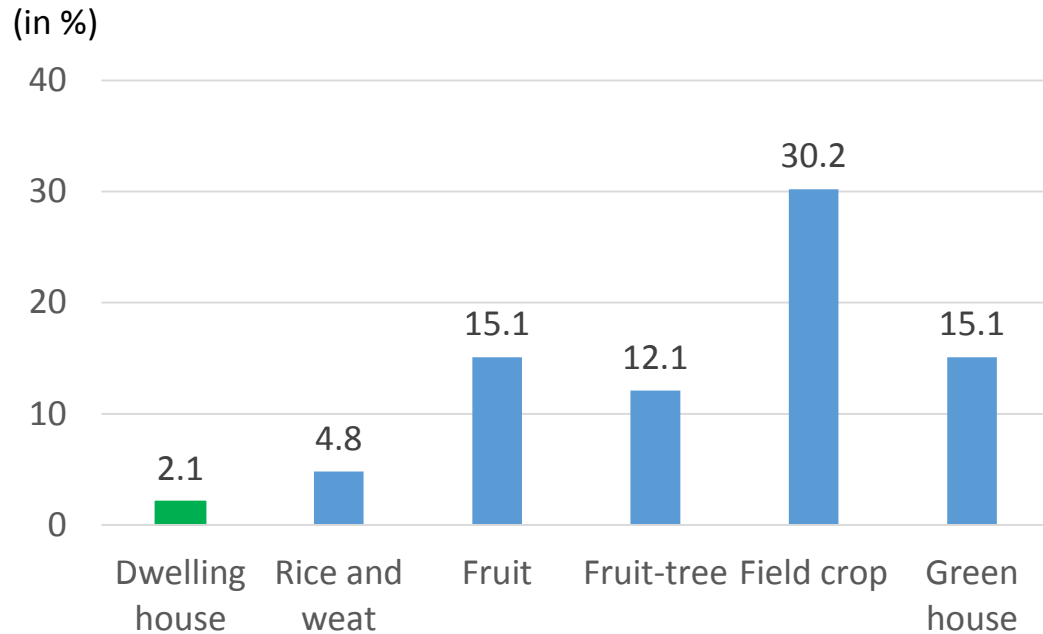
The ratio of farmers received insurance payment to those purchased insurance (in %)					
Year	Rice and wheat	Fruit	Fruit-tree	Field Crop	Green house
2000	3.6	17.1	10.0	25.1	18.6
2012	3.9	13.7	16.7	30.7	22.7
Avg. 2000-12	6.8	17.6	11.6	29.1	18.7
SD <sup>a</sup>	4.50	5.90	3.19	8.28	9.58
CV <sup>b</sup>	65.8	33.5	27.6	28.5	50.5
The ratio of insurance payment to policy amount (in %)					
Year	Rice and wheat	Fruit	Fruit-tree	Field Crop	Green house
2000	0.6	4.7	0.8	5.2	0.9
2012	1.0	3.3	1.4	4.3	1.1
Avg. 2000-12	1.9	4.6	1.0	5.4	1.1
SD <sup>a</sup>	1.88	4.58	0.99	0.99	0.81
CV <sup>b</sup>	99.3	35.6	35.5	47.1	73.4

<sup>a</sup> standard deviation, <sup>b</sup> coefficient of variance

SOURCE: MAFF

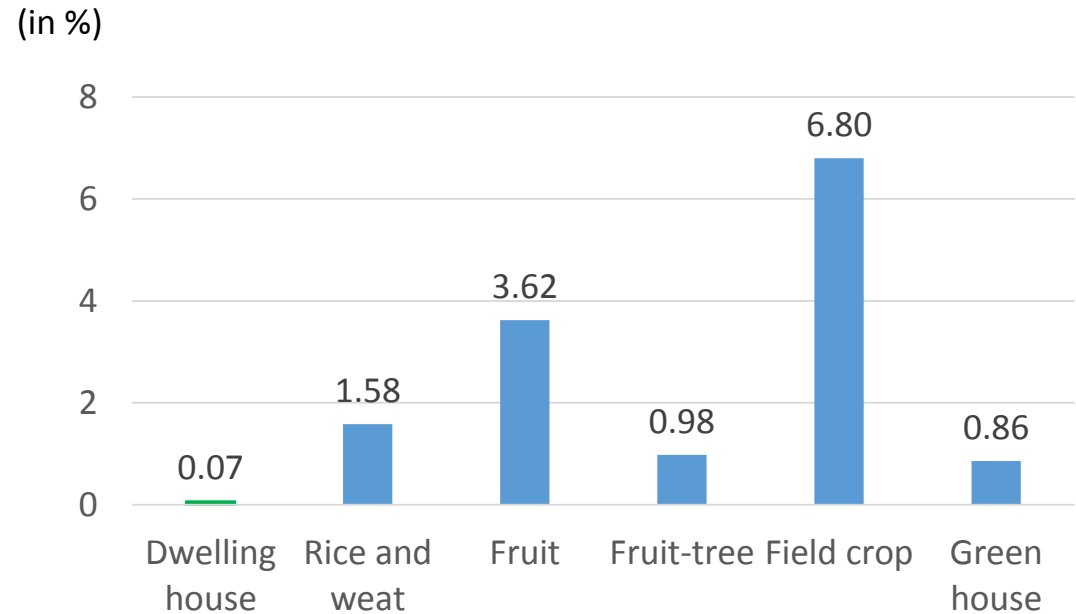
# 3. Costs and Benefits of Insurance

Figure 3-1. Comparison of agricultural insurance with non-life insurance in the payment rate of claim numbers by items



SOURCE: MAFF and GIROJ

Figure 3-2. Comparison of agricultural insurance with non-life insurance in the payment rate of claim amounts by items



SOURCE: MAFF and GIROJ

The average rate of agricultural insurance is as high as 4.5 percent compared to 0.042 to 0.088 percent in fire insurance and 0.062 percent in compulsory automobile liability insurance (Cabinet Office 2006)



# 3. Costs and Benefits of Insurance

Table 3-2. The payment rate of agricultural insurance claim [Table. 5 in the paper]

Year	The ratio of claim payment to premium (exclude subsidy) (in %)			
	Rice	Wheat	Livestock	Fruit
2000	12.1	128.0	196.2	149.6
2013	58.8	151.6	189.5	142.1 <sup>c</sup>
Avg. 2000-13	100.3	178.8	189.7	165.5 <sup>d</sup>
SD <sup>a</sup>	160.4	149.8	3.9	51.8 <sup>d</sup>
CV <sup>b</sup>	159.9	83.8	2.0	31.3 <sup>d</sup>

Year	Fruit-tree	Field Crop	Green house	Total
2000	136.8	168.7	99.8	166.9
2013	293.2 <sup>c</sup>	189.1	368.8	188.9
Avg. 2000-13	190.6 <sup>d</sup>	180.6	154.7	180.4
SD <sup>a</sup>	66.3 <sup>d</sup>	89.2	112.9	88.3
CV <sup>b</sup>	34.8 <sup>d</sup>	49.4	72.9	48.9

<sup>a</sup> standard deviation, <sup>b</sup> coefficient of variance, <sup>c</sup> 2012, <sup>d</sup>2000-2012

SOURCE: MAFF

# 3. Costs and Benefits of Insurance

- Governments provide underwriting capacity with insurers through a reinsurance contract and they can reduce the cost of risk bearing when extraordinary accidents happen.
- Adverse selection and moral hazards impair insurance function.
- Adverse selection means that as a person with higher risk is willing to buy insurance, a person with a lower risk is reluctant to do so.
  - Farmers also may seek to purchase coverage primarily for a crop growing in risky arable field.
  - Compulsory insurance, Risk classification
- Moral hazard shows failure to make an effort for preventing a loss after an insurance contract.
  - Some farmers may claim more payment without reducing damage post-disaster.
  - Deductible clause, No claim return or rebate

## 4. Scheme for reducing costs of agricultural insurance and Farmers' Participating in it

“Insurance is the first choice and the last choice.”

- The first part of phrase explains the importance of choosing insurance because we cannot get any protection without buying insurance.
- The latter part of it explains the meaning of loss control because its cost is so high that we have to engage loss control to reduce the total cost of risk management.
- In short, the axiom would mean that a right strategy is purchasing insurance first and reducing the cost next.
- Loss control reduces cost of potential loss on the other hand, while it involves implementation cost. Therefore, the optimum level of loss control is at the level where it minimizes the total costs of them.

## 4. Scheme for reducing costs of agricultural insurance and Farmers' Participating in it

Table 4-1. Examples for loss control in agricultural insurance by AMRAs [Table. 6 in the paper]

Item	Loss control
Crop	investigation in growing and disease forecasting, chemical spray using unmanned helicopters, prevention for animal damages such as boar, rental equipment such as trench excavator, seed planter and others
Livestock	disinfection in cattle house, protective vaccination, distribution of medicine
Green house	soil diagnostics, soil investigation, rental equipment safety training program, a free-of-charge check for small farm equipment

Source: NAIA

There is relatively strong correlation among risk exposures. It is necessary to reduce the cost of insurance for sustainable growth in the market. Recently, farmers and those involved have focused on loss control, while AMRAs support them in Japan.

#### 4. Scheme for reducing costs of agricultural insurance and Farmers' Participating in it

- Insurance operating process roughly consists of marketing, loss controlling and claim adjusting.
- A unique feature of Japanese agricultural insurance is farmers' participating in these operational activities within farming community. Distinctive activities based on the spirit of mutual aid would result in saving transaction costs.
  - A leader in a farming community, NOSAI Buchyo, who puts a strong faith in farmers, plays a role in marketing activities.
  - Claim adjusting is an important service because the AMRA pays suffered farmer insurance claim and contributes his recovery from loss with promptness, accuracy, courtesy and fairness.
  - AMRA is an autonomous and not-for-profit membership organization similar to cooperatives.

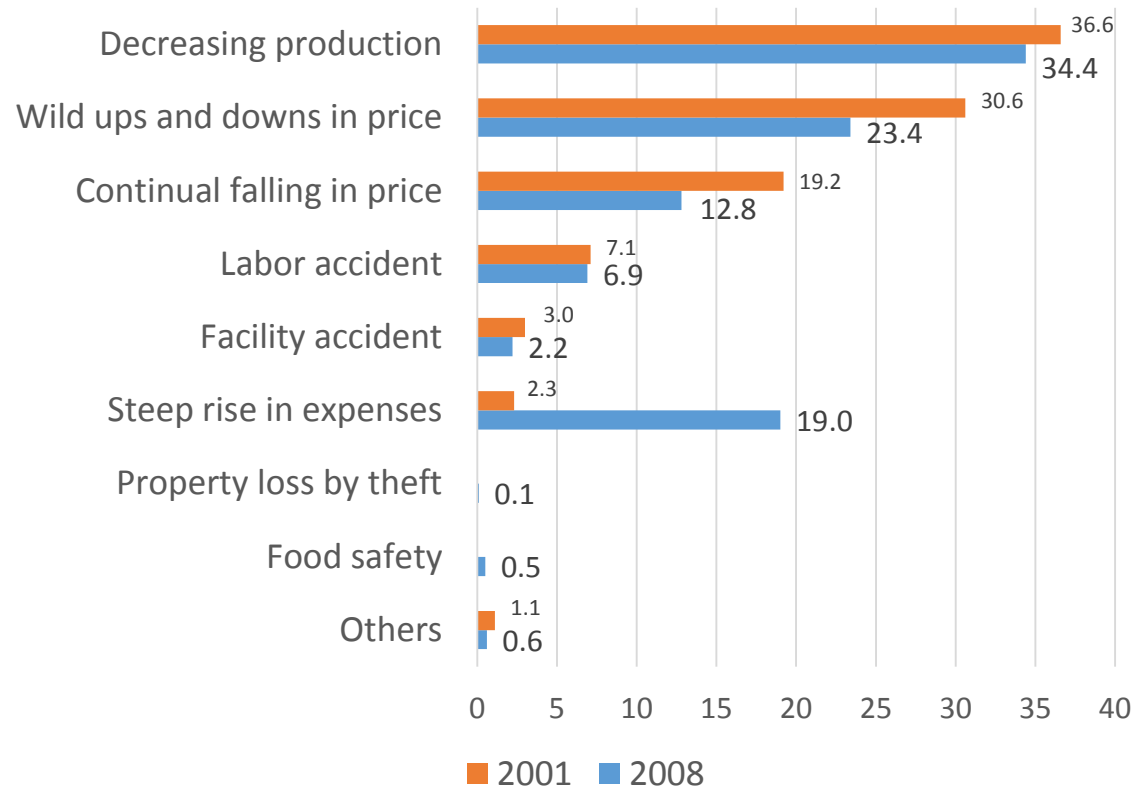
Source: MAFF

# 5. Challenges of Japanese agricultural Insurance

- The Japanese government has worked to make a series of improvements to the program in order to meet the diverse needs of agricultural insurance since the start of existing agricultural disaster compensation program in 1947.
- Of course, there are some challenges of the current system.
  - The first, area-yield crop insurance does not cover risk of lower price and limits the range of object insured for the reason that yield decrease needs to be recognized.
  - The second, AMRAs promoted the large-scale merger of them several times since 1970.
  - The third, farmers and AMRAs employees are aging.
  - Finally, IT utilization is increasingly important.

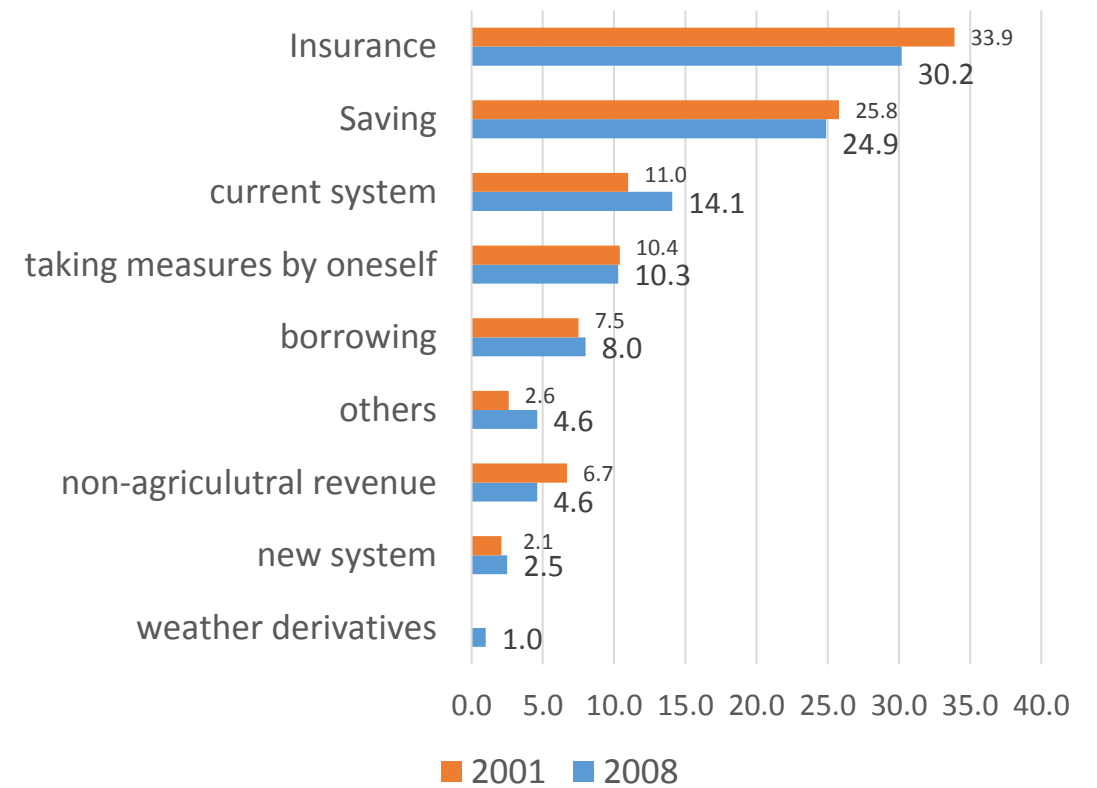
# 5. Challenges of Japanese agricultural Insurance

Figure 5-1. Risk that farmers consider the most anxious (in%)



NAIA 2008

Figure 5-2. Risk management tools that farmers consider the most desirable (in%)



NAIA 2008

## 6. Implication for family farming under developing countries

- Family-run farmers occupy more than 90 percent of the total and depend on family labor around the world (FAO 2014). Most of smallholder farmers are limited access to agricultural insurance market in an underdeveloped phase.
- A government should give the highest priority to a design of the insurance program for facilitating the purchase by small farmers. Subsidy for premium, blanket contracts, group contracts or even compulsory insurance is examples.
- It is also important to provide farmers with an incentive to prevent or reduce loss in order to deter an ex-ante and ex-post moral hazard. Typical cases are deductibles, no accident return or rebate, risk classification and the premium rate based on loss experience.
- In addition, it is desirable to add value to crop insurance, setting with related service such as loss control or information service or consulting service for smallholder farmers. From the perspective of relationship marketing, a trusted community organizer or leader may qualify for soliciting for crop insurance.



## 6. Implication for family farming under developing countries

- claim adjusting is a bottleneck in a less-developed stage of insurance market because there are few experts with skills and experience required to adjust a claim for traditional indemnity insurance such as named peril or multi-peril crop insurance (MPCI).
- Recently, public and private enterprise run pilot project from 2011-2015 in order to reduce the vulnerability of rice smallholder farmers in Asian countries. RIICE project
- Index-based crop insurance saves transaction cost, too. It is a general term for an insurance contract under which claim payment depends on objective parameter such as measurement of rainfall or temperature at defined weather station during a certain period rather than actual crop damage.

## 6. Implication for family farming under developing countries

Table 6-1. A comparison between traditional indemnity and index-based crop insurance  
[Table. 7 in the paper]

	Indemnity insurance	Index-based crop insurance
On-farm loss adjustment	Necessary	Unnecessary
Claim payment	Less rapid	Rapid
Adverse selection	Occurrence	Non occurrence
Moral hazard	Occurrence	Non occurrence
Feature of insured risk	Idiosyncratic (diversifiable)	Correlated (less diversifiable)
Perils	named, multi, all	limited
Basis risk	zero	substantial

Source: WFP 2011

The essence of it is its transparency. An insurer offers the same contract within the same area. Therefore, it avoids adverse selection because a policyholder pays the same rate of premium despite of the extent of risk. It also eliminates moral hazard because he cannot claim excessive insurance payment after a loss by manipulating index. The costs of claim adjusting are reduced significantly. Index-based insurance is appropriate in dealing with correlated risk, while indemnity insurance is suited for idiosyncratic risk. However, basis risk may be substantial in index-based insurance. Consequently, the biggest challenge for gaining popularity is minimizing it to acceptable level.

## 6. Implication for family farming under developing countries

Table 6-1. A summary of PPP in agriculture insurance [Table. 8 in the paper]

Government	establishment and implementation of regulation and supervision framework, reinsurance premium subsidy
Reinsurer	product development, offering capacity
Insurer	product development, underwriting, claim payment
Distribution channel	sales, acceptance for insurance claim, collection of premiums and distribution of insurance payment
Coordinator	coordination and support of a product development among parties concerned (brokers, NGO, <i>etc</i> )
Support Organization	support data and service needed to develop and implement agricultural insurance program (weather observation organization, agricultural input goods wholesalers, insurance trade association, agribusiness firms, NGO and research institution, <i>etc</i> )
Donor	development and implementation of agricultural insurance program loan of money (international development assistance organization and government in the developed world, <i>etc</i> )

Source: Kida 2014

Governments play a primary role in agriculture insurance in most of countries. The style of government involvement in it is classified broadly into two categories: public sector insurance and public-private partnership (PPP).

# 7. CONCLUSION

- The goal of the research is some presentation for sustainable growth in crop natural disaster insurance, considering the experience of Japan.
  - Based on a spirit of mutual aid among farmers rooted in farming community, the government supports AMRAs and farmers as well as establishes the system or scheme based on partnership. This unique system of farmers' participating in insurance successfully reduces transaction cost.
  - Insurance and loss control are like the two wheels of a cart, being twin-engine for sustainable growth in disaster crop insurance market. Additionally, loss control is not only a tool for saving insurance cost, but also for enforcing a cooperative relationship among farmers in some cases.
- Asian countries play a significant role in domestic and international food security, particularly for rice.
  - Technological innovation in agricultural insurance facilitates access to the insurance market for farmers.
  - Over the long term, how we should give and keep incentives for loss control to each farmer is key to sustainability growth.
  - Furthermore, it is important to establish a network of farmers and partnership with stakeholders for small-size farmers.
  - That is the way they cultivate a spirit of mutual aid and common value.
  - Governments also should focus on social capital in addressing improvements in the insurance system.

# Appendix

Table 8-1 Agricultural production in member countries participating in the seminar

	Countries								
	IDN	JPN	KOR	MYS	PHL	THA	TWN	VNM	World
<b>Production value</b>									
<b>2014</b>									
Production value (USD billion)	118.9	54.6	30.1	29.6	32.2	42.4	9.6	33.7	3,302.2
Share (%)	3.6	1.7	0.9	0.9	1.0	1.3	0.3	1.0	100.0
Ranking	4	10	22	23	19	12	44	17	-
<b>1990-2014</b>									
Average production (USD billion)	52.1	67.7	24.7	15.3	16.7	20.8	7.1	12.7	1,682.1
Standard deviation (USD billion)	36.0	12.1	3.5	8.3	7.2	12.4	1.2	9.5	761.2
<b>Index (1990=100)</b>									
<b>2014</b>									
Production	554.3	76.2	130.9	425.7	343.8	480.4	143.1	1,345.6	294.4
<b>1990-2014</b>									
Average production	242.8	94.5	107.2	219.3	178.2	235.5	106.9	505.4	150.0
Standard deviation	168.0	17.0	15.3	118.7	76.8	139.9	18.3	377.2	67.9
Coefficient of variation (%)	69.17	17.95	14.23	54.11	43.08	59.41	17.11	74.63	45.25

Source: UN

# Appendix

Table 8-2 Rice production in member countries

	Countries								
	IDN	JPN	KOR	MYS	PHL	THA	TWN	VNM	World
<b>Amount</b>									
Rice Production in 2013 (MT)	71.3	10.8	5.6	2.6	18.4	36.1	1.6	44.0	740.9
Share (%)	9.6	1.5	0.8	0.4	2.5	4.9	0.2	5.9	100.0
Ranking	3	10	15	24	8	6	30	5	-
1990-2013									
Average production (MT)	54.4	11.5	6.7	2.2	13.2	27.2	1.8	32.1	612.1
Standard deviation (MT)	7.4	1.2	0.5	0.2	2.9	5.6	2.7	7.2	67.6
<b>Index (1990=100)</b>									
Rice production in 2013	157.8	82.0	72.9	139.4	186.5	209.7	69.8	229.1	142.9
1990-2013									
Average production	120.5	87.8	86.8	118.2	133.7	158.4	78.7	167.2	118.0
Standard deviation	16.4	9.2	6.9	10.9	29.1	32.7	12.0	37.7	13.0
Coefficient of variation (%)	13.57	10.51	7.92	9.18	21.75	20.67	15.27	22.53	11.04

Source: FAO

# Appendix

Table 8-3 Agricultural production value as a percentages of GDP in member countries

	Countries								
	IDN	JPN	KOR	MYS	PHL	THA	TWN	VNM	World
<b>Rate of production value to GDP</b>									
2014									
Rate (%)	13.72	1.22	2.34	9.16	11.30	10.48	1.80	18.11	4.23
Ranking	72	186	159	95	78	83	169	55	-
1990-2014									
Average rate (%)	14.10	1.52	4.40	10.75	14.69	9.65	2.25	24.70	3.76
Standard deviation (%)	1.05	0.36	1.99	2.04	2.75	0.94	0.80	5.79	0.44
<b>Index (1990=100)</b>									
2014									
Rate	84.64	51.91	25.83	61.39	59.10	104.80	45.00	46.76	86.68
1990-2014									
Average rate	86.98	64.73	48.57	72.02	76.82	96.53	56.37	63.77	77.15
Standard deviation	6.46	15.32	21.95	13.64	14.41	9.39	19.95	14.94	8.97
Coefficient of variation (%)	7.42	23.66	45.19	18.94	18.76	9.72	35.39	24.43	11.62

Agricultural production are based on nominal GDP. In Philippine and Vietnam, figures are based on producer price.

Source: UN