

Sustainable Growth in Crop Natural Disaster Insurance: Experiences of Japan

Futoshi Okada¹

¹ College of Commerce Nihon University, Tokyo, Japan
okada.futoshi@nihon-u.ac.jp

ABSTRACT

A famous insurance professional said, “Insurance is the first choice and the last choice.” The axiom means that we cannot get any protection without buying insurance but cost of insurance is so high that we have to engage loss control to reduce the total cost. One main purpose of my research is to specify the importance of loss control clearly as a challenge for growing market of crop natural disaster insurance. Another purpose of it is to stress the significance of farmers’ participation in insurance operation within farming community for saving transaction costs. In Japan, leading farmers within community play a role in marketing crop insurance and appointed farmers perform a damage assessment after natural disaster. Truly, risk management is important for farmers but they do not have enough resources to do it because most of them are small-scale. The conclusion of the research is that governments need to establish the system and framework for supporting risk management for farmers in all aspects.

Keywords: A spirit of mutual aid, Cost of Insurance, Farmers’ Participation, Loss Control, Risk Management, Supporting System for Farmers

INTRODUCTION

Recently, natural disasters have posed a growing threat to agricultural sector over the world. Major disasters caused some USD 1.5 trillion economic damages in the decade from 2003 to 2013 worldwide (FAO 2015). One of characteristics of agricultural risk is large fluctuation in its damage year by year. In addition, there are large regional gaps in the damage although many disasters may occur around the country. Farmers have to manage such a risk. However, they have difficulty in early recovering from a heavy damage or loss by their own effort because most of them are small-scale. In Japan, family-run business occupied 97.6 percent of farming entities in 2015 (MAFF 2015). Consequently, many governments introduce an agricultural insurance program to protect farmers from agricultural disaster and secure the stability in agricultural income. The Japanese government started the agriculture (livestock) insurance program in 1928 when the Federal Crop Insurance Corporation carried out the federal crop insurance program in the United States of America. Main purpose of my research is to explain the experiences of Japan and examine a few suggestions for sustainable growth in crop insurance market.

Recent Agricultural Damages in Japan

As with East and Southeast Asian countries, Japanese agriculture is prone to natural disasters, bad weathers, pests and others. Table 1 shows annual damages ranged from USD 600 million to USD 11 billion in recent years. In 2011, the Great East Japan Earthquake caused unprecedented damages to the agricultural sector¹. While 93.3 percent of them were for agricultural lands and facilities, 1.6 percent was for crops and the like². We take a brief look at current agricultural insurance market before examining an insurance function for agricultural risk.

¹ The 2016 Kumamoto earthquake caused USD 692 million to the agricultural sector, including in crop damages of about USD 9 million.

² The amount of agricultural insurance payment (livestock and greenhouse) was about USD 1.7 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).

Table 1. Agricultural damages^a caused by major disasters^b (dollars in millions)

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	11,456	NA	11,456
2012	216	813	136	0	122	1,287
2013	389	519	1,452	0	297	2,657
2014	104	457	0	21	0	582

^aThe figure is the sum of damaged crops, agricultural lands and facilities.

^bThe 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)

Current Agricultural Insurance Market

Agricultural insurance market has been growing recently. The premium worldwide reached USD 23.5 billion in 2011 (Swiss Re 2013). North America had 55 percent of the market share, Europe 18 percent, Asia 22 percent, Oceania 0.8 percent and Africa 0.5 percent respectively. In Asia, China had 45 percent of the market. In 2009, as for penetration rate of agricultural insurance³, Japan was the highest at 1.75 percent among seven countries except Taiwan. South Korea was at 0.5 percent, Philippines at 0.012 percent and other countries at less than 0.01 percent (World Bank 2012). However, nowadays there are some signs of new developments among these countries. In Indonesia, The Ministry of Agriculture implemented several pilot projects of crop insurance in 2012. In Taiwan, the Council of Agriculture started the first crop insurance policy in 2015.

In Japan, agricultural insurance premium was USD 1.2 billion in 2013, 17.6 percent less than in 2000 as Table 2 shows. By items, the premium for paddy rice was the largest and occupied about 20 percent of the total in 2013. The main cause of the decrease in it was reduction tendency of agricultural production, especially paddy rice. Only field crops such as potato, soybean and others increased in premium during them.

Table 2. Agricultural insurance premium in Japan

Year	premium by items (in millions of USD)						total
	Rice and wheat	Livestock	Fruit	Fruit-tree	Field Crop	Green house	
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	711	98	56	1,231

Source: MAFF

We have a brief look at what farmers take out agricultural insurance. Table 3 shows the rate of insured items based on area or livestock numbers. Rice and wheat are on average at about 90 percent because all farmers who grow rice, wheat and barley in fields above a certain size must participate in crop insurance compulsory. They are core agricultural produce in Japan. Dairy cattle are also more than 90 percent. The main reason is that cattle farmers have to obtain livestock insurance on all the cattle collectively if necessary and they can receive medical care and disease diagnosis service by veterinarians. Field crops reached nearly 70 percent. On the other hands, swine and fruit are low, on

³ It represents the ratio of premium subsidies to agricultural GDP.

average at about 20 percent although swine are increasing slowly. As for fruit, the charge of insurance is so high that low-risk farmers choose not to obtain insurance. It is certain that the size of market is decreasing, but the demand for insurance is not always decreasing in parallel.

Table 3. The rate of insured items based on area or livestock numbers

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 ^a
2012	25.6	21.6	24.4	67.6	46.6 ^b
Avg. 2000-12	22.6	18.6	25.0	57.8	47.4 ^c

^a2007, ^b2013, ^c2007, 2008, 2010, 2011 and 2013

Source: MAFF

Costs and Benefits of Insurance

Generally, insurance benefits society in two ways. First, 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. Because participating in insurance reduces uncertainty of loss through transferring risk, a policyholder relieves his anxiety about a decrease in income and is devoted to his business, for example, farming if he is a farmer. Second, 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. Agricultural production depends on weather, natural disaster, pests and others. Damages caused by them often affect a broad range of farmers. Table 4 shows the payment rate of agricultural insurance claim. As is obvious from the table, many farmers receive insurance claim except rice and wheat every year.

Table 4. The payment rate of agricultural insurance claim

Year	The ratio of farmers received insurance payment to those purchased insurance (in %)				
	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 ^a	4.50	5.90	3.19	8.28	9.58
CV ^b	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 ^a	1.88	4.58	0.99	0.99	0.81
CV ^b	99.3	35.6	35.5	47.1	73.4

^a standard deviation, ^b coefficient of variance

Source: MAFF

Particularly, yearly averaged 30 percent policyholders with field crop insurance received insurance payment during the period. On the other side, the payment rate of claim numbers in dwelling house fire insurance was average 2.1 percent in the past five years from 2008-2012(GIROJ 2012)⁴. The average during the same period was 4.8 percent in Rice and wheat, 15.1 percent in fruit, 12.1 percent in fruit-tree, 30.2 percent in field crop and 15.1 percent in Green house. The payment rate of claim amounts in dwelling house fire insurance was average 0.07, while 1.58 percent in Rice and wheat, 3.62 percent in fruit, 0.98 percent in fruit-tree, 6.80 percent in field crop and 0.86 percent in Green house. Consequently, many farmers face more risk of suffering damages than homeowners.

Ideally, the burden on each insured famers might be closely equal to the expected value of loss for him due to the law of large numbers. A wide-area or covariate disaster, however, can weaken the effect of risk pooling and he has to bear more than cost of risk. Actually, 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). Higher premium makes it more difficult to purchase insurance. Therefore, the government subsidizes about half of premium⁵ and burdens portion of the administrative and operating costs, which was USD 996 million in 2014. Table 5 shows loss or reimbursement ratio in agricultural insurance, which means the ratio of claim payment to premium (exclude subsidy). The total ratio was average 180.4 percent during 2000-2013 compared to 59.1 percent in general insurance⁶. Obviously, policyholders receive more payment due to subsidy. The operating expense ratio was 25.9 percent compared to 32.2 percent in general insurance industry.

⁴ “Number of claims” represents the total number of payments of losses from policies in force during fiscal year. However, number of policies in force is not available. I used number of new contracts rather than number of policies in force when I calculated the ratio.

⁵ Most governments carrying out agriculture insurance also subsidize premium in a similar way (Mahul and Stutley 2010).

⁶ The ratio of net claims paid to net premium.

Table 5. The loss or reimbursement ratio in agricultural insurance

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 ^c
Avg. 2000-13	100.3	178.8	189.7	165.5 ^d
SD ^a	160.4	149.8	3.9	51.8 ^d
CV ^b	159.9	83.8	2.0	31.3 ^d
Year	Fruit-tree	Field Crop	Green house	Total
2000	136.8	168.7	99.8	166.9
2013	293.2 ^c	189.1	368.8	188.9
Avg. 2000-13	190.6 ^d	180.6	154.7	180.4
SD ^a	66.3 ^d	89.2	112.9	88.3
CV ^b	34.8 ^d	49.4	72.9	48.9

^a standard deviation, ^b coefficient of variance, ^c 2012, ^d2000-2012

Source: MAFF

In addition, governments provide underwriting capacity with insurers through a reinsurance contract and they can reduce the cost of risk bearing when extraordinary accidents happen. In Japan, cold weather, heavy rain, typhoon and the like led to an unprecedentedly poor harvest in 1993 since WWII. The national average of crop situation index on rice was 74 and the damage reached USD 8.5 billion⁷. Especially, the index in Tohoku region was 56 and it was damaged USD 4.2 billion by cold weather. The insurance payment was USD 3.9 billion and the government beard 89.8 percent of it as the reinsurer or last resort. In this way, reinsurance takes a significant role in more stable farm management.

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. Agricultural insurance program in Japan adopts compulsory participation on rice⁸ and wheat as well as blanket participation on others to prevent adverse selection. In blanket participation, farmers have to insure all by items under certain conditions if they choose to participate. The competent ministry, MAFF, sets premium rate based on risk by area or degree of damages.

Moral hazard shows failure to make an effort for preventing a loss after an insurance contract. For example, some farmers may claim more payment without reducing damage post-disaster. Generally, agricultural insurance policy adopts deductible clauses. Agricultural Mutual Relief Associations (AMRAs), which manages and operates AMR program, deduct from agreed percentage of an insurance claim, while farmers pay it by themselves. The retention of a partial loss causes them to be careful after purchasing insurance. No claim return or rebate is also useful in giving an incentive for preventing a loss. MAFF does not use experience-rating system, which means premium rate changes depending on loss experience of each farmer. However, it classifies and adjusts the premium rate by area according to actual damages periodically.

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

A famous insurance professional said, "Insurance is the first choice and the last choice."

⁷ The ratio of farmers received rice insurance payment to those purchased insurance was 48.4 percent and the ratio of rice insurance payment to policy amount was 23.8 percent.

⁸ Crop insurance for paddy rice covered 71.8 percent of agricultural output in 2014.

It is seemingly contradictory. However, 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. Theoretically, these costs are trade-off. The more we engage loss control, the less the loss cost is but the more the control cost is. Therefore, the optimum level of loss control is at the level where it minimizes the total costs of them.

This is just the case with agricultural insurance. Particularly, 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. Table 6 summarizes loss control about items as follows.

Table 6. Examples for loss control in agricultural insurance by AMRAs

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

As for rice, National Agricultural Insurance Association (NAIA) investigates in disease forecasting in cooperation with prefectural plant protection offices and advises whether to take pest control. As for crop, AMRAs collect soil samples and analyze soil property and component for an improvement of farming. With respect to Livestock, NAIA provide computer with animal doctors and they perform medical care with it.

Some AMRAs introduce traveling clinic car, which carries equipment for blood test and the like, analyze and evaluate cattle on site. They also advise farmers in light of scientific knowledge. Finally, NAIA establishes Networked Information System on Agricultural Insurance. This database contributes greatly to loss prevention and reduction. It is quite important to develop a scheme or system for reducing insurance cost and supporting them because small farmers have not enough resources to control accidental loss such as money, time, skill, human resources, information and others.

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. During his term, usually three years, he engages in collecting premiums, soliciting applicants, distributing papers, collaborating in loss control, and so on. In short, he serves as contacts between an association and each farmer. Additionally, many AMRAs and NAIA sell farmers' house insurance as well as farm equipment insurance without government subsidies. Farm equipment insurance is extremely popular among farmers. The relationship of farmers and them create a synergy effect when they promote the selling of these insurance.

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. In the Great East Japan Earthquake, AMRAs devoted all their attention to adjust and pay claims in a rapid way although they also were disaster victims. In rice crop, valutors selected from farmers investigate

promising yield amount by watch, touch or actual measurement at all the damaged rice paddies on an area-by-area basis. Valuers are expert in wet-rice farming and carry out their duties with fairness and correctness to all. *NOSAI Buchyo* often serves as a valuator. In turn, evaluation members and AMRA's staff examine above a certain samples to confirm the balance of the evaluations among areas. The federation of AMRAs also conducts a sample survey to checks fairness of the primary evaluation and certifies a reduced crop yield. Finally, MAFF examines the application by the federation and approves it. In this way, multiple checks ensure fairness among suffered farmers and prevent ex-post moral hazard, which means excessive insurance claims after disasters.

AMRA is an autonomous and not-for-profit membership organization similar to cooperatives. It holds on to the democratic principle of "association of the members, to the members, for the members." In addition, NAIA supports the national movement for expanding agricultural mutual aid network (Morishita 2014) among farmers and fostering strong the tie between farmers and AMRAs.

Technology holds increased potentiality for loss control. NAFF embarked on a project for establishing a damage assessment with the use of satellite remote sensing images in rice crop insurance since 2010. All the prefectures started trial studies in turn.

AMRAs urgently need to adopt work saving technology in evaluating all the damaged rice paddies because they recently have faced many elderly valuers and a shortage of them. There are many challenges in implementing the new assessment system such as accuracy enhancement of estimated formula for yield amount, cost saving on satellite images, shortened delivery time of them and so on.

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. At that time, there were only three classes of insurance: crop, cocoon and livestock. Subsequently, house (1949) and farm equipment (1951), fruit (1973), green house (1979) and field crop (1979) were added in the program. Nowadays, it covers about 50 items including most major kind of crops, fruit and livestock animals and there are wide variations of underwriting. Thus, the government takes various roles as a reinsurer, a regulator and a designer or planner of the system including product development and improvements.

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. Actually, price risk ranks high among the risks farmers are concerned about, according to attitude survey (NAIA 2010). The government started an investigation for revenue insurance program in 2014. It provides farmers with coverage for lost revenue caused by yield decrease or lower price for all agricultural crops. Thus, it contributes the more stability of agricultural management. The second, AMRAs promoted the large-scale merger of them several times since 1970. The eventual goal is "One prefecture, One AMRA." Main objective is to manage and operate agricultural insurance business more efficiently and effectively, including governance, internal auditing, compliance and the like. The third, farmers and AMRAs employees are aging. They need to secure human resources and train experts to insurance. Finally, IT utilization is increasingly important.

Implication for family farming under developing countries

Family-run famers 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. What implications does Japanese experience have for future growing in crop insurance market under these countries?

Remember the proposition that "Insurance is the first choice and the last choice." If it is true, 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. Theses means except subsidy are useful for averting adverse selection. 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.

On the other hand, 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 (Bangladesh, Cambodia, India, Indonesia, Philippines, Thailand and Vietnam). The partnership, called as Remote sensing-based Information and Insurance for Crops in Emerging economies (RIICE), supports farmers in order to determine the extent of rice growing. It also estimates yield and damage on rice crop as well as offers crop insurance through its insurance partners (RIICE 2013).

By the way, 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. There was a relatively new movement to introduce such an innovative insurance in North America, Asia and Africa countries. The total sum insured reached USD 265.5 million during 2004-2009 (WFP 2010). As Table 7 shows characteristics of weather index-based insurance. 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.

Table 7. A comparison between traditional indemnity and index-based crop insurance

	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.

However, basis risk may be substantial in index-based insurance. It means the potential mismatch between the index-triggered payouts and the actual losses suffered by the policyholder (WFP 2010). Main causes of the mismatch are as follows: positional relation between meteorological stations and farms (spatial basis risk), timing difference between occurrence of the insured event and seasonal growing phases (temporal basis risk) and the presence of the other important risks (variable or product basis risk). Where basis risk is higher, the insurance will lose credibility for the correctness and fairness in claim payment with farmers and other policyholders. Consequently, the biggest challenge for gaining popularity is minimizing it to acceptable level. In addition, index-based insurance involves costs such as replication, technical capacity and expertise, and weather data collection (WFP 2011). Finally, the index-based insurance does not incorporate incentive for loss control. We should examine effectiveness of loss control in this type of insurance and a mechanism for encouraging farmers to decrease risk to the benefit of them under the contracts.

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). Under the scheme of public sector insurance, the government is the main or exclusive reinsurer and provides reinsurance with the entity that usually operates as the sole or monopoly insurer in the country such as India and Philippines (Mahul and Stutley 2010). The objective of PPP is to conduct highly public business through public and private cooperation in developing countries. In agricultural insurance, there two types of PPP. One is government-led or national agricultural insurance. Single insurer offers standard policy forms with uniform rating structure and engages in loss adjusting. The government supports premium subsidy and reinsurer such as Korea, Thailand and Vietnam (Mahul and Stutley 2010). Table 8 shows a summary of PPP in agriculture insurance. The other is market-driven insurance. The government introduces the principle of competition for commercial insurers to a greater or lesser extent. It plans policy design and controls premium rate such as USA (MPCI), while it mostly subsidizes premium. Highly competitive market may not be suitable for smallholder farmers because a part of them can be uninsured unless the insurance is compulsory. The government should give priority to increasing penetration rate in the initial stage.

Table 8. A summary of PPP in agriculture insurance

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

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 famers in some cases. As Appendix shows, 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 famers and partnership with stakeholders for small-size famers. 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. Rice production and crop insurance premium in Southeast Asian countries

	Countries								
	IDN	JPN	KOR	MYS	PHL	THA	TWN	VNM	World
Rice Production (MT) in 2013	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
Index (1990 = 100)									
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
Total premium in 2009(USD mil.)	1	1,200	116	1	3	0.04	-	0.1	-
Subsidy for premium in 2008 (%)	-	50	50	-	48-63 ^a	No	-	-	-
Institutional framework	-	Pub	PPP	Pri	Pub/Pri	Pri/PPP	-	Pri/PPP	-

^a variable subsidy,

Pub:Public, Pri:Private and PPP: Public Private Partnership

Source: FAO (rice production), World Bank 2012 (premium), Mahul and Stutley 2010 (subsidy)

REEREENCE

Akiko, Kida 2014. Agriculture Market in Asia. *Report by Sompo Japan Nipponkoa Research Institute Inc.* vol. 64:70-87 (http://www.sjnk-ri.co.jp/issue/quarterly/data/qt64_4.pdf; Accessed 18 May 2016) (in Japanese)

Cabinet Office 2006. On Agricultural Insurance Program.

(http://www8.cao.go.jp/kisei-kaikaku/old/minutes/wg/2006/1114/item_1114_05.pdf; Accessed 22 May 2016) (in Japanese)

FAO (Food and Agriculture Organization of the United Nations) 2011. *Agriculture insurance in Asia and the Pacific region.* (<http://www.fao.org/3/a-i2344e.pdf>; Accessed 24 May 2016)

FAO 2014. *The State of Food and Agriculture: Innovation in family farming.*

(<http://www.fao.org/3/a-i4040e.pdf>; Accessed 25 May 2016)

FAO 2015. The impact of Disasters on Agriculture and Food Security.

(<http://www.fao.org/3/a-i5128e.pdf>; Accessed 18 May 2016)

GIROJ (The General Insurance Rating Organization of Japan) 2012. Statistics Compiled by General Insurance Rating Organization of Japan (http://www.giroj.or.jp/disclosure/toukei/toukei_h24_01.pdf; Accessed 22 May 2016) (in Japanese)

Ko, Morishita 2014. *Developing Agriculture and supporting it with insurance.* Nikki. (in Japanese)

Kunihisa, Yoshi 2014. A Preliminary Study of the Whole-farm Revenue Insurance Scheme in Japan. *The Journal of Insurance Science* 627: 107-127. (in Japanese)

MAFF (Ministry of Agriculture, Forestry and Fisheries of Japan) 2012. the Great East Japan Earthquake and Agricultural Insurance.

(http://www.maff.go.jp/j/council/seisaku/kyosai/bukai/h240125/pdf/23_sankou2.pdf; Accessed 26 May 2016) (in Japanese)

MAFF 2015. The Census of Agriculture and Forestry.

(http://www.maff.go.jp/j/tokei/kouhyou/noucen/pdf/census_15k_s_20160427.pdf; Accessed 18

- May 2016) (in Japanese)
- MAFF Website on The scheme of Compensation Against Agricultural Loss.
(http://www.maff.go.jp/j/keiei/hoken/saigai_hosyo/index.html; Accessed 22 May 2016) (in Japanese)
- Mahul, Oliver and Charles J. Stutley 2010. *Government Support to Agricultural Insurance: Challenges and Options for Developing Countries*, World Bank.
(<https://openknowledge.worldbank.org/handle/10986/2432> License: CC BY 3.0 IGO.” ; Accessed 22 May 2016)
- NAIA (National Agricultural Insurance Association) 2007. Cases on Risk Management in Agricultural Mutual Relief Associations. (in Japanese)
- NAIA 2010. A Report on the Attitude Survey for Farmers. (in Japanese)
- NAIA 2011. A lesson of the Great East Japan Earthquake. *NOSAI* (monthly) vol.63, October and December. (in Japanese)
- NAIA Website on the support on risk management. (http://nosai.or.jp/nosai_kasou/nosai_page06.html; Accessed 23 May 2016) (in Japanese)
- RICE (Remote sensing-based Insurance and Information for Crops in emerging Economies) 2013. RIICE-Brochure
(<http://www.riice.org/wp-content/uploads/downloads/2013/12/RIICE-Brochure.pdf>; Accessed 23 May 2016)
- Swiss Re 2013 (Swiss Reinsurance Company) 2013. Partnering for Food Security in Emerging Markets. *Sigma* No.1 (http://media.swissre.com/documents/sigma1_2013_en.pdf; Accessed 18 May 2016)
- World Bank 2012. *ASEAN: Advancing Disaster Risk Financing and Insurance in ASEAN Member States: Framework and Options for Implementation*, Global Facility for Disaster Reduction and Recovery
(https://www.gfdr.org/sites/gfdr/files/publication/DRFI_ASEAN_REPORT_June12.pdf; Accessed 18 May 2016)
- World Food Programme 2010. *The potential for Scale and Sustainability in Weather Index Insurance*, International Fund for Agricultural Developments.
(<http://documents.wfp.org/stellent/groups/public/documents/communications/wfp220176.pdf>; Accessed 29 May 2016)
- World Food Programme 2011. *Weather Index-based Insurance in Agricultural Development : Technical Guide*, International Fund for Agricultural Developments.
(<http://documents.wfp.org/stellent/groups/public/documents/communications/wfp242409.pdf>; Accessed 29 May 2016)
- Yutaka, Maekawa ed. 2007. *Risk Management for Farmers*, IE-NO-HIKARAI Association.

(Submitted as a resource paper for the FFTC-RDA International Seminar on Implementing and Improving Crop Natural Disaster Insurance Program, June 14-16, 2016, Jeonju, Korea)