Study on the Lessons Learned from the National Agriculture Insurance Pilot Program in Vietnam

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Ha Noi, February 2017

ABSTRACT

Agriculture, the main economic engine and income source for 70% of Vietnamese, is highly exposed to risks. Different measures are being adopted to mitigate these risks, by both farmers and government, of which, international experience indicates that agricultural insurance (AI) can be an effective tool. AI has been implemented in Vietnam for nearly 30 years but was not well developed. In 2011, to further develop the AI market for promoting agricultural production and ensuring social security, the Vietnamese government issued the National Agricultural Insurance Pilot Program (NAIPP). After three years of implementation from 2011-2013, this program achieved a number of significant results and the Vietnamese government has directed the Ministry of Finance (MoF) and the Ministry of Agricultural and Rural Development (MARD) to continue to develop AI in Vietnam. In this context, this research aims to review and explain the development of AI in Vietnam, specifically NAIPP. This research uses both qualitative and quantitative methods to evaluate the achievements and shortcomings of NAIPP and the impacts of NAIPP on rice and livestock farmers' livelihoods. Combining this approach with a review of international experience in developing AI, this research makes recommendations for policy makers in Vietnam and other ASEAN countries for improving the effectiveness and efficiency of AI programs.

Results from this research show that before NAIPP, the AI market was rather small, AI companies were lacking agricultural experts and the linkage between different stakeholders related to AI were limited. Moreover, farmers' awareness about AI have been inadequate and their small and fragmented production scale causes a lot of constrains for insurance companies to penetrated agriculture markets. During the NAIPP period, more than 300 thousand farmer households and agriculture enterprises participated in the Program, of which 77% were poor households and 15% were near-poor. This indicates a low voluntary participation rate because poor and near-poor households enjoyed a 90-100% premium exemption. Total value insured by the pilot programme was VND 7,747.9 billion (USD 342.2 million), total revenue from AI premiums was VND 394 billion (USD 17.2 million) and total compensation paid was VND 701.8 billion (USD 31.0 million). While the compensation rate in the rice and livestock sectors were reasonable and and insurers were able to make profit, the overall compensation rate in the aquaculture sector reached 306.83% and caused the overall loss of the Program.

Emperical analysis results show that impacts of NAIPP on farmer production differed between sectors. In Dong Thap (rice sector), NAIPP did not have significant impacts on farmer's income, cost and profits. In Vinh Phuc (livestock sector), the impacts were much more significant. After controlling all other factors, the research shows that NAIPP helped to increase farmers' income, reduce production costs, and thus, increased their profit. Participants in Vinh Phuc were also more specialized as contribution of livestock production in their total income is higher than other households.

From the research results, we recommend the Vietnamese government to narrow down the objectives of the AI development policy to increase effectiveness. The government should not expand NAIPP to all crops and livestock but to focus on the main commercial crops and cattle. Aquaculture insurance is only feasible once Vietnamese farmers are in a better position to manage their internal (production process) and external (water source, quality of inputs) risk. The AI program should also be associated with current supporting policies to avoid duplication, supplement each other's and thus, reduce state budget pressure and increase effectiveness. With regards to the subsidization of insurance premiums, this research recommends a 50-70% supporting rate, similar to international experience. We also propose the government to provide preferential subsidy rates to farmers engaged in contract farming contracts with enterprises to promote large-scale production zones and integrate value chains.

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Dang Kim Khoi

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ACRONYMS

A&O	Administration and Operating
ABIC	Agricultural Bank Insurance Corporation (Vietnam)
AMS	ASEAN Member States
AgriBank	Bank for Agriculture and Rural Development (Vietnam)
AI	Agricultural Insurance
ASEAN	Association of Southeast Asian Nations
ATT	Average Treatment Effect on the Treated
CAP	Centre for Agricultural Policy
CRN	Climate Resilience Network
CSA	Climate Smart Agriculture
DARD	Department of Agricultural and Rural Development (Vietnam)
DID	Difference in Differences
FAO	Food and Agriculture Organization of the United Nations
IBI	Index-Based Insurance
IMHEN	Vietnam's Institute of Meteorology, Hydrology and Climate Change (Vietnam)
IPSARD	Institute of Policy and Strategy for Agricultural and Rural Development (Vietnam)
MARD	Ministry of Agricultural and Rural Development (Vietnam)
MONRE	Ministry of Natural Resources and Environment (Vietnam)
MoF	Ministry of Finance (Vietnam)
NAIPP	National Agricultural Insurance Pilot Program (Vietnam)
PPP	Public-Private Partnership
PSM	Propensity Score Matching
USA	United States of America
VARHS	Vietnam Access to Resources Household Survey
VIA	Vietnam Insurance Association
VinaRe	Vietnam National Reinsurance Joint Stock Corporation

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1. INTRODUCTION

1.1. Context

Agriculture, the main economic engine and income source for 70% of Vietnamese (GSO, 2015) is highly exposed to risks, especially related to climatic events. According to the 2017 Global Climate Risk Index, Vietnam is in the top ten countries susceptible to extreme climate phenomena due to the impact of global climate change (Kreft, et al., 2016). At the household level, statistics from the 2014 Vietnam Access to Resources Household Survey (VARHS) indicate that 17.2% of surveyed farming households have suffered from natural shocks - floods, hurricanes and other natural disasters. Regionally, the South-Central region and Central Highland region observed nearly 122,000 hectares of drought damaged crops in 2015 and a 35.5% of the rice-growing area in the Mekong Delta were negatively affected by salinity intrusion (MARD, 2016). The Ministry of Natural Resources and Environment's (MONRE) 2015 projections indicate that climate change and sea level rise are happening faster than expected (ISPONRE, 2009).

To mitigate these risks, many on-farm measures are being implemented in Vietnam. Famers are encouraged to select products with less risks and shorter production cycles, to diversify their production, connect with enterprises and to insure their crops (Nowak, et al., 2016). In Nam Dinh province, farmers in coastal districts have converted from traditional rice varieties to salt-tolerant varieties to adapt to saltwater intrusion. Farmers in the Ninh Thuan province switched from producing tobacco to growing apples and sheep farming in response to water shortages. In Soc Trang province, farmers have shifted season timings, planting the winter– summer crop earlier to avoid a lack of fresh water towards the end of the growing period. In the coastal area of Mekong River Delta, farmers have switched from ordinary rice production to rice-shrimp rotational cropping models to cope with early sea water intrusion. Nevertheless, this strategy may result in a lower farmers' average income as it might reduce specialization and cause constraint of production flexibility or require sufficient capital reserve.

Experience throughout the world indicates that agricultural insurance (AI) can be an effective tool to mitigate risks in agricultural production, reduce burden to government budget and promote agricultural production. AI provides farmer's protection and compensation in the event of losses and reduces the burden on state budget. The value of compensation from AI is also higher than government support, which allows farmers to maintain their production cycle without any gap, thus, stabilizing national agricultural outputs. From experiences in other countries, AI can also enable the expansion of agricultural credit, with the insurance contract serving as collateral, demonstrating the repayment ability of the farmer to credit institutions. Having a protected investment also encourages farmers to adopt technical advances in production, leading to productivity increases.

While being initiated quite early (in 1982), AI in Vietnam has yet achieved marked results, with agricultural insurance premium revenue accounted for only 0.012% of total premium revenue of the domestic insurance industry (MoF, 2011). Recognizing the importance of AI in agricultural sector development, the Government issued Decision 315/2011/QD-TTg to implement the NAIPP from 2011-2013 to cover rice, livestock and aquaculture for selected risks. This program focused on production risks commonly encountered, including major diseases and pests as well as natural disasters (storms, floods, drought, cold, frost, and tsunami). Governed by MoF and MARD, NAIPP was implemented in 20 provinces with the participation of three insurance companies: Bao Viet, Bao Minh and the Vietnam National Reinsurance Joint Stock Corporation (VinaRe).

NAIPP ran as a three-year pilot program from 2011 to 2014 and the Vietnamese Government has directed MoF and MARD to prepare to renew and expand this program. The impacts and results of NAIPP are controversial, achieving positive results but with efficiency concerns. A literature review by the research team shows that there is no study systematically overviewing the development of AI in Vietnam with discussions about its achievements/shortcomings or quantitative evaluations about its impact on farmer's livelihood. To fill this knowledge gap and create actionable insights for future insurance programs, the research team in the CAP (within IPSARD) conducted the study '*Vietnam Agricultural Insurance Experiences: Lessons from the NAIPP"*. The study proposed recommendations for the development of the AI in next stage in Vietnam as well as other ASEAN countries.

AI is an ex-ante measure to manage agricultural production risks and increase resilience; it has been promoted for years in a number of ASEAN Member States (AMS). These predominately pilot projects (apart from Thailand and the Philippines) have explored different approaches like indemnity based or weather index-based insurance. Through ASEAN-CRN, knowledge exchange events have broadened the understanding of policies and practices throughout AMS on effective AI schemes. Progress is mixed, with challenges remaining to promote a market environment where crop insurance is available to the majority of farmers in a country, include the most vulnerable. This study has been facilitated by ASEAN-CRN to contribute to the regional process on promoting climate resilience in the region. The study aims to provide valuable experiences, lessons, and actionable insights for other countries facing similar impacts of climate change.

1.2. Study Objectives

1.2.1. General Objective

This study aims to draw lessons learned from the NAIPP of Vietnam through reviewing the development of AI in Vietnam, discussing the achievements and shortcomings, and quantitatively evaluating its impacts on the livelihoods of farmers. Actionable recommendations for policy makers in Vietnam and other ASEAN countries are given with the goal of promoting AI and improving the effectiveness and efficiency of AI.

1.2.2. Specific Objectives

- To review and explain development of AI in Vietnam
- To qualitatively evaluate the achievements and shortcomings of NAIPP
- To quantitatively evaluate NAIPP's impacts on the livelihoods of farmers
- To summarize lessons learned from the development of the AI globally, practically applying lessons to NAIPP
- To recommend solutions for policy makers in Vietnam and other ASEAN countries on improving the effectiveness and efficiency of AI programs

1.3. Methodology

1.3.1. Data Collection Methods

1.3.1.1 Literature Review

Literature review was conducted to establish an understanding of the development of AI globally in general and ASEAN in specific and access the initial assessment of the NAIPP and its impacts. Few countries with developed AI market are studied in more detail to draw lessons and development of AI within ASEAN countries were also studied to provide proper recommendations. NAIPP related reports (program mid-term report, final report,

guidelines for MoF, MARD) at central and provincial level was studied to exploring the implementation process of the program. Journal articles, reports and news are also reviewed to get the initial picture of the program's impacts.

1.3.1.2 Policy Review

To discover AI-related policy gaps and overlaps, a review of how policies related to AI are developed over time was conducted. All government policies related to AI, especially ones on NAIPP implementation was collected from a professional web-based policy database: http://thuvienphapluat.vn/, a free database of Vietnamese legal documents (Appendix A). For each policy, the authors evaluated the context around policy development/introduction, its purpose, main contents, time of issue, finally evaluating its successes and constrains.

1.3.1.3 In-depth Interviews

Interviews were widely implemented through various stages of data collection, including (i) to explore the situation of AI in Vietnam, (ii) to provide background for designing survey questionnaires, (iii) to provide consultation for stratified sampling procedure (at provincial, district and commune level) to ensure representative sampling at household level, and (iv) to provide input for policy review and institutional mapping. From central to local levels in Ben Tre, Dong Thap and Vinh Phuc provinces, the research team conducted in-depth interviews with representatives of MARD, MoF, Bao Minh and Bao Viet insurance companies, and VinaRe, the national reinsurance company (Appendix B).

1.3.1.4 Focus Group Discussions

Focus groups were used to understand and document how farmers perceive about the performance of NAIPP. Four focus group discussions in three provinces (Ben Tre, Dong Thap and Vinh Phuc) were conducted with participants selected specifically according to different criteria - production scale, age, sex and educational levels.

1.3.1.5 Household Survey

Sampling strategy: Following the recommendations of MoF, MARD and insurance companies, the research team surveyed only producers in the rice and livestock sectors. This is because, aquaculture insurance has been studied in FAO (2016).

Regarding the rice sector, Dong Thap province was selected because of its high percentage of voluntary participation (20%, 2nd after An Giang) and large number of voluntary households (more than 2000 households, 2nd after Nghe An)[1].

Vinh Phuc province was selected for livestock insurance survey because it's the only province where agriculture insurance was still maintained, and the impacts of insurance are easier to measure.

[1] Percentage of voluntary participation of An Giang was much higher than Dong Thap (74.5%), however, their number of voluntary households is only 978 households. The number of voluntary households in Nghe An was more than 2500 households, nonetheless, these households live scattered and voluntary rate of this province is only 3.46%.

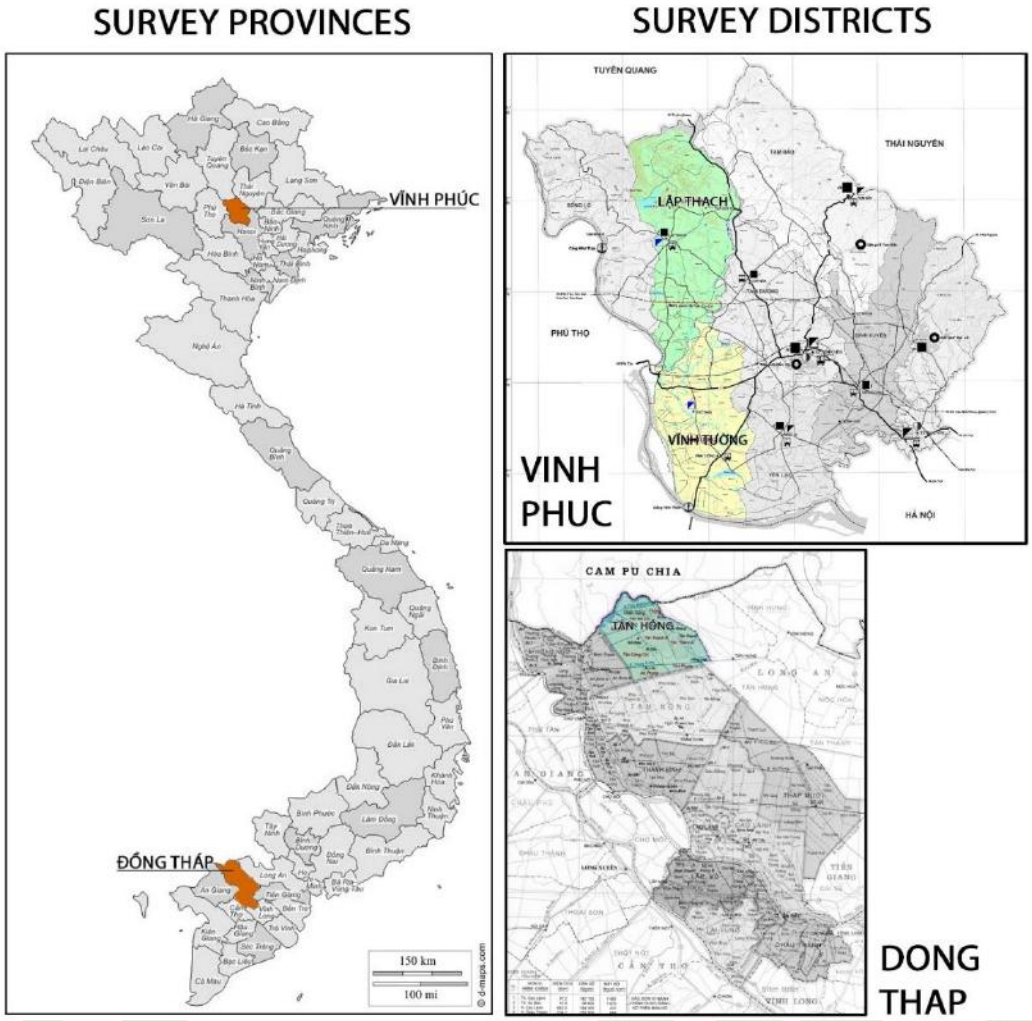

Figure 1. Survey Sites *{Source: Created by CAP research team (2016)).*

Due to limited resources, the Judgment Sampling Method was used to select districts and communes to survey. As rice production system in Dong Thap was relatively homogenous, only one district (Tan Hong) was selected as recommended by DARD and the local Bao Viet branch. Three communes in Tan Hong with a large number of NAIPP members were selected. In each commune, the team collaborated with local communal staff to select 50 insured agricultural households using random sampling technique in Stata from the full insured household list. The selected sample of 51 households, which represent 275 insured farmers in Tan Hong at 90% significant level. Non-insured agricultural households with similar production and demographic characteristics to the insured agricultural households were selected as control groups within the same villages.

A similar sampling strategy was applied in Vinh Phuc with insured livestock producers of pigs, sows, buffalo, cows and dairy cow. Based on recommendations from Vinh Phuc DARD, three communes (Binh Duong, Tuan Chinh and Thai Hoa) in two districts (Lap Thach and Vinh Tuong) were selected – which are best represent livestock production of Vinh Phuc province. 63 households were chosen for a statistically significant sample size given the 821 insured agricultural households in the two districts[2]. Non-insured agricultural households were chosen as a control groups.

[2] The selected sample is significant at 90% confident level according to Yamane T. (1967)

Table 1. Sample Household Survey

Province	Type of Household	Number of Households		
		Non-insured	Insured	Total
Dong Thap	Poor	12	10	22
	Near poor	9	5	14
	Normal	77	36	113
Vinh Phuc	Poor	5	11	16
	Near poor	3	4	7
	Normal	78	49	127
Total		**184**	**115**	**299**

Source: CAP research team (2016).

Questionnaires: Two structured questionnaires were used in household surveys for rice and livestock farmers. They included questions on household characteristics, social capital, income, expenditure, perception and understanding of AI, perception of agricultural risks and willingness to pay for AI in the future. The only differences were on production, specific to rice and livestock.

Survey process: Final-year and newly-graduated students from the University of An Giang and Hanoi University of Agriculture were recruited to conduct household surveys in Dong Thap and Vinh Phuc, respectively. After training courses, students took a test and only qualified students were selected for the survey. Each survey team consisted of 14 people - two CAP supervisors, one team leader, eight interviewers, two data entry members and one CAP data analyst. After interviewing farmers, the completed questionnaires were given to the team leaders to check for possible mistakes. Once approved, the questionnaire data was recorded in Excel. During the data entry step, the data analyst provided feedback on the quality of responses to the team leaders and interviewers. Finally, the data analyst consolidated data, prepared a do-file in Stata software to check for possible errors and sent this list to supervisors for re-checking.

1.3.2. Data Analysis Methods

Institutional Mapping

Institutional Mapping was used to understand the existing distribution of power (threat, information, political, etc.) to influence the outcome of a decision-making process (McFadden et al., 2010). This research was employed to explore institutional and governance structures related to AI, particularly to understand potential roles of involved stakeholders and institutions, identify potential coalitions of support for NAIPP, for scenario and strategy building and to assess the relative risks entailed.

Descriptive Analysis

Stata software was used for data illustration purposes, initially used to describe basic features of surveyed data in this research. Descriptive Analysis was also used it to explore potential determinants of farmers' insurance participation (age, education, labor, risk, social capital, location) and its impacts on their livelihoods (income, per capita income, outputs).

Empirical Analysis

To evaluate the impacts of the NAIPP on a farming household's livelihood status, two econometric techniques - Propensity Score Matching (PSM) and Difference in Difference (DID) – were used. Impacts of a household's participation in NAIPP (denoted as D) on

her/his livelihood status (denoted as Y) is measured as the difference between the livelihood of a household who participated in the program and her/his livelihood if she/he would have not participated in such program at time *t*. For each household *i*, the impact of the policy is calculated as follow:

$$\delta_i^t = Y_{1i}^t - Y_{0i}^t \mid D=1 \quad (1)$$

Where,

- Y_{1i}^t and Y_{0i}^t are the livelihood status of household *i* in the case that he/she participated in the NAIPP compared to the case that he/she did not participate in such program at time *t*;
- D=1 refers to the fact that a household i participating in the NAIPP; D=0 means this household did not participate in this program.

The impact of D on a group of farmers are measured by the average impact of D each individual in this group, the Average Treatment Effect on the Treated (ATT):

$$ATT = E(Y_1^t - Y_0^t \mid D = 1) = E(Y_1^t \mid D=1) - E(Y_0^t \mid D=1) \quad (2)$$

The magnitude of the ATT estimate represents the impact of NAIPP on Y. If ATT = 0, then NAIPP had no impact on the livelihood status of households; if ATT > 0, then the NAIPP had a positive impact on impact on the livelihood status of households (increase farmers' income or profit); if ATT<0, then the NAIPP had a negative impact on impact on the livelihood status of households (decrease farmers' income and profit).

However, as $Y_0^t|D=1$ (counterfactual) cannot be observed in practice, its expected value must be used to calculate ATT via two ways.

Firstly, the actual livelihood status of the group of farmers who did not participate the NAIPP at time t is used as a control group (denoted as $Y_0^t|\ D=0$) by assuming that $E(Y_0^t|D=1) = E(Y_0^t|D=0)$. ATT may be biased due to the difference in some characteristics between the treated and control groups, so the PSM technique was used for the estimation to avoid this problem. PSM attempts to reduce the bias due to confounding variables that could be found in an estimate of the treatment effect obtained from simply comparing outcomes among units that received the treatment versus those that did not.

Another way to estimate $Y_0^t|D=1$ is to use the livelihood scores of NAIPP participants in the previous period before their participation in the program (Y_0^t-1|D=1). However, there might be other factors affecting Y beside the NAIPP (D) over time. To remove these possible factors, DID was used to compare the difference in Y between NAIPP participants and non-participants in two points in time: before and after participation in NAIPP.

2. DEVELOPMENT OF AGRICULTURAL INSURANCE

2.1. Global agricultural insurance

2.1.1. Concept of agricultural insurance

Insurance is a form of *risk management used to hedge against a contingent loss*. Agricultural insurance is a special type of property insurance applied to agricultural firms and individuals. It is not limited to crop insurance, it also applies to livestock, forestry, aquaculture, and greenhouses (Iturrioz, 2009).

The principle of insurance is that combining risks faced by a large number of individuals who contribute through premium to a common fund which is used to cover the losses incurred by any individual in the pool (Bielza, et al., 2008). Specifically, agricultural risks are insurable if certain conditions are met:

(i) *Symmetric information*: the insurer and the insured have the same information concerning with the probability of a bad outcome
(ii) *Risk should be independent across insured individuals*: if risks are systematic (dependent), special measures have to be taken in order to make insurance solution viable
(iii) *Calculable*: In order to fix the premium rates, the insurance company must be able to calculate the chance of loss so, the average frequency and the average severity of loss. Actual losses occurring must be determined and measurable
(iv) *Premium must be affordable* (Bielza, et al., 2008).

2.1.2. Global Development of AI

Review of international practices shows that AI has a long history but it AI has faced difficulties attracting the participation of farmers and insurers. Table 2 shows that except in some developed countries such as Canada, Spain and the USA, market penetration rates[3] for crop insurance in most countries in 2011 were less than 50%. One noticeable point is that the claims ratio[4] of AI is normally higher than other non-life insurance at 60-70%.

Table 2. Market Penetration Rate and Claims Ratio of AI Select Countries in 2011

Nation	Market penetration rate for crop (%)	Market penetration rate for livestock (%)	Claims Ratio (%)
Canada	63-74		74
China	10	80	55
India	14		
Japan	44		94
Philippines	2		
South Korea	31	35	85
Spain	80	10	91
Turkey	23		
USA	80		70

Source: Adapted from (FAO, 2011), (Mahul, et al., 2012), (Mahul & Stutley, 2010).

[3] The market penetration rate refers to the share of (insurable) agricultural production or (insurable) agricultural surface, physical production or production value that is insured. It is an indicator of how insurance is spread in a country (Bielza et al. 2008).

[4] Average loss ratio for a certain number of years is defined as the total indemnities paid by insurance companies divided by the total premiums collected. If it is lower than 1 or 100%, it means that the system is actuarially sound (Bielza et al. 2008).

There are probably a number of reasons for this poor performance of AI. Firstly, insurers may not understand production process as thoroughly as the farmer, creating moral hazard and adverse selection problems more seriously than with other insurance classes. Losses in agricultural sector can be more difficult to measure, making accurate and objective quantification of the risk to base premiums on even more challenging. Finally, farmers who carryout primary production have a low share of the value added in the value chain, often translating to low incomes, especially in emerging markets, making insurance often too expensive.

International experience shows that governments traditionally played a key role in the development of AI. The government involvement often takes place through a premium subsidy, either paid directly to the farmer or to the insurance company (Table 3). Governments may subsidize administrative, operational and loss assessment expenses of the private companies, as is the case in the USA. The United States government also provided subsidies for A&O expenses and the loss assessment costs of the insurers; and subsidies for Training and Education and for Product Research and Development by the Risk Management Agency (RMA). A core role of the government is to set up a legal framework to encourage the involvement of private companies and to provide certain protections to farmers.

Table 3. Characteristics of AI Management Systems in selected countries

Nation	Management type	Subsidy*	Choice mode of farmers
Canada	Private, public	40-60	Voluntary
China	Public, PPP	No data	Voluntary
India	Public, Private	50	Voluntary for normal farmers, compulsory for bank lenders
Japan	Public	50	Voluntary, compulsory
Philippines	Crop: public, livestock: PPP	48-63	Voluntary
South Korea	Pool co-insurance PPP	50	Voluntary
Spain	Pooled PPP	53-59	Voluntary, compulsory
USA	PPP, private	13-67	Voluntary

** % of insurance premium*
Source: Adapted from (FAO, 2011), (Mahul, et al., 2012), (Mahul & Stutley, 2010).

Private insurers have often played a role in developing the AI market. According to Pro. et al, (2015), private insurance companies in different countries could offer AI for small scale risks and less compensation. Nevertheless, these companies could not afford alone the coverage of other riskier events, like drought or floods.

2.2. Agricultural Insurance in ASEAN

The development level of AI is different between ASEAN countries, while some countries have developed AI market for more than 40 years, AI still hasn't appeared in several others. At the moment, there is negligible agriculture production in Brunei and Singapore; Laos and Myanmar are just now developing their agricultural sectors and creating legal frameworks that could support the introduction of AI in the near future.

Table 4. AI in ASEAN Countries

Country	AI development	Year started	Scope
Brunei, Singapore Laos, Myanmar	None	N/A	N/A
Philippines	Philippine Crop Insurance Corporation – managed by the government	1976	Nationwide
Cambodia	Small pilot model on rice	2015	3 provinces
Indonesia	Pilot models	2012	3 provinces
Malaysia	Industrial crops since 1980, cereals crops insurance expected to launch in 2017	1980	N/A
Thailand	Indemnity & Weather index	1978	Nationwide

Source: Adapted by CAP research team (2016)

2.2.1. The Philippines

The Philippines is one the largest economies in ASEAN, considered a newly industrialized country, and has seen the proportion of agriculture in GDP is decrease gradually in the last 40 years. In 2014, agriculture only account for 11.32% of the country GDP (Worldbank, 2016). However, the Philippines agriculture is vulnerable to natural disasters such as typhoons, floods and droughts and crop insurance was first studied there in 1976 (FAO, 2011). The feasibility study for crop insurance was undertaken by an Inter-Agency Committee for the Development of the Philippine Crop Insurance System (IAC-PCIS Study Group) since 1976. Results of the study were later on approved by the President of the Philippines, ushering in the creation of the Philippine Crop Insurance Corporation (PCIC). The PCIC implemented an insurance program nationwide starting on May 7, 1981, and initially covering only rice production. Corn was added as a covered commodity in 1982; tobacco in 1991; high value crops in 1993 and; livestock and fishery in 2000 (Celia & Sonny, 2009).

According to the data provided from Food and Agriculture Organization of the United Nations (FAO) paper (2011), Philippines' agricultural insurance schemes appear successful from an actuarial point of view, as their ratio of paid claim vs. premiums and lost ratio have generally reduced and stabilized over timey. However, as PCIC is a government office and its legal mandate is to serve the small-farmers, even in the remote area, its operational costs are very high. In mid-2000, the financial pressure was so serious that it had to reduce more than half of its personnel (from 500 to 222 people). Without direct government support, the sustainability of the program may be in peril (Celia & Sonny, 2009).

2.2.2. Thailand

In Thailand, agriculture is the main use of land and rice represents Thailand's primary harvested crop, outstripping others such as cassava and rubber (CIA, 2011). It has the fifth largest harvested area of rice worldwide (11,630,300 ha), with rice accounting for 48.7% of arable land ((FAO, 2016) and cultivated by 4.4 million families (76% of all agricultural households (Duangmanee & Freansen, 2013). However, in many parts of Thailand the rice yield depends mainly on rainfall and is vulnerable to drought and flood.

The first crop insurance program in Thailand was an indemnity insurance policy for all natural risks for cotton in 1978. Maize, sorghum and soybean covers were provided from 1990 to 1991. However, the program was not a complete success as the collected premiums were less than the indemnity payments. In 2005, the World Bank established a Weather Index Insurance pilot scheme in Thailand supplying technical assistance, advice

regarding administrative procedures, pilot programmer monitoring and feedback on international experiences. This pilot model focused on drought in maize production. Subsequently, weather index insurance for rice was introduced in 2008.

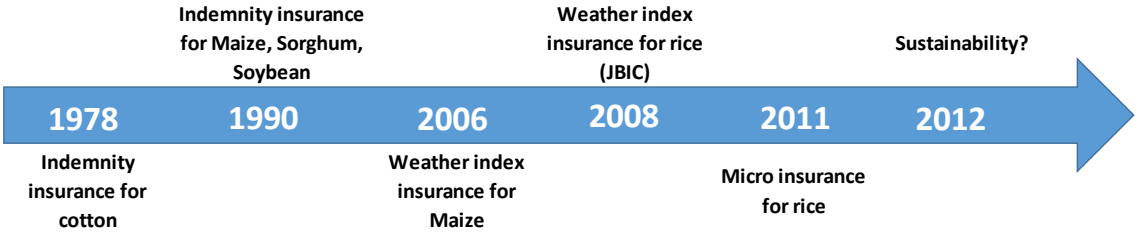

Figure 2. Development of Crop Insurance in Thailand
Source: (Jeerachaipaisarn, 2012)

Micro insurance for rice was established in 2011, linked to Disaster Relief Program. The main advantage of this model was to keep the claim administrative cost at a minimum level by utilizing the existing loss assessment mechanism of government. Within 45 days of launch, 56,780 farmers nationwide with 170, 000 ha signed up, paying premium of USD3.5 million. However, a serious flood occurred, submerging 68,000ha and causing USD16 million in damage – a claims ratio of 453% (Jeerachaipaisarn, 2012).

2.2.3. Indonesia

In 2012, agricultural sector employed 49 million Indonesians, representing 41 percent of the total Indonesian labor force. The agricultural sector of Indonesia comprises large plantations (both state-owned and private) and smallholder production modes, in which the smallholder farmer's focus on rice, soybeans, corn, fruits and vegetables (Indonesia Investment, 2016). Regarding rice production, Indonesian government aim to achieve self-sufficiency in rice, reducing dependency on import, and improving farmer's income.

Agricultural insurance in Indonesia, especially rice insurance was considered since 2011 when Indonesian Ministry of Agriculture established a special task force in agricultural insurance (AIWG) to study current situation of agricultural production, review possible insurance product and mechanism and conduct polot in some ecological region. In 2013, Indonesian government issuded the law number 19/2013 on Farmer's Protection and Empowerment and Protection, in which, article 37 of the law clearly mentioned the obligation of central and local government to protect farmers against harvest failure in the form of agriculture insurance. Following this law, the rice crop insurance program has been prepared and conducted in 2012, which was implemented by Ministry of Agriculture, the state-owned insurance company with the support from state-owned fertilizers companies and JICA. The rice crop insurance program is basically applicable to small farmers (less than 2ha) who belong to Farmers Group (Kelompok Tani) with active management administration and adhere to good agricultural practices as directed by MoA office at district level. The program was conducted nation-wide (with some specific requirements on location), covered standard risks but did not cover loss due to fire and natureal calamities (earthquake, volcanic eruption, lanslide, tsunami, wind storms and others). A flat premium of 3% is applied after reviewing data on havesrt failures in the last 10 years, howerver, the premium is fixed without the different variation in the degree of risk or location. Government cover 80% of premium via the state-owned fertilizers companies. With the sum insured of USD 500 per ha, the insurance premium is USD 15/ha. In 2014, total budget allocation for agricultural insurance is approx USD30 million which cover insurance fee for 2 million ha of rice. The claim ratio of the program was quite high (13%), led to a high compensation ratio (nearly 400%), especially in East Java area. The program was paused in 2015-2016 for overall evaluation (Sahat, 2016)

2.2.4. Malaysia

The agriculture sector plays an important role in Malaysia's economic development – providing rural employment, uplifting rural incomes and ensuring national food security. There are two types of crop in Malaysia - industrial crops for export (rubber, palm oil, and cocoa) grown on large scale plantations and domestic crops (bananas, coconuts, durian, pineapples, rice, rambutan) grown by smallholders. Malaysia is not food self-sufficient for paddy rice, only producing 60% of the country rice consumption; in 2015, it imported 1 million tons of rice from Thailand, Vietnam, Pakistan and others.

According to FAO (2011), Malaysia has never had a national crop or livestock insurance program. There has been some limited private commercial insurance of plantation export crops such as rubber, oil palm, coconut, fruit and cocoa since the 1980s and these crops are also insured under a forestry/planation fire policy with additional perils (FAO, 1986, FAO, 1991, FAO, 2011). These plantation crops' insurance "cover against the loss of the tree (standing asset) as a result of fire plus allied perils of flood, windstorm, and sometimes animal damage" (FAO, 2011). Up until now, there has been no crop insurance for cereals and other field crops, despite the multiple attempts to introduce crop insurance such as in 2002 and 2004, encouraged by the national government. There was also a proposal in 2008 for a livestock and poultry insurance scheme, which was approved, but has not yet been put into action. The fire and allied perils cover is voluntary, and currently, there is no government support for AI in Malaysia. However, according to Embun Majid of New Straits Times (2016, Oct. 26), crop insurance scheme is currently being drafted and reviewed, and hopefully will be introduced at the end of 2017.

2.2.5. Cambodia

Agriculture is the traditional mainstay of the Cambodian economy, accounting for 36% of GDP and 65 percent of the country employment (Worldbank, 2016) in 2014. In terms of production, paddy rice, cassava and maize are the three commodities with highest production area and value. Industrial crops accounts for the majority of export value - rubber, palm oil, and sugar raw centrifugal. AI started in Cambodia in 2015, when the Cambodia Micro Agriculture Insurance Scheme (CAMAIS) was launched. It aims to support local smallholder rice farmers by providing insurance payouts to those affected by severe weather-related events attributed to climate change. When participating in the scheme, farmers also receive consultation on farming techniques and get an insurance payout if their crop is damaged either by flood or drought.

This scheme attracted participation of 153 rice households in the first season, paying a total premium of USD1,230 to ensure 136 ha of rice. About 50% of farmers claimed for compensation but only 30% met the criteria for receiving compensation. The model was considered successful and will be expanded to other provinces. The current model is small scale requiring international support and would require significant government effort to create a larger scale AI program.

3. AGRICULTURAL INSURANCE IN VIETNAM

3.1. AI in Vietnam Before 2011

3.1.1. 1982-1998

AI was implemented relatively early in Vietnam (Định, 2013; Vân, 2014) with Bao Viet Insurance Company implemented AI in all rice production area of Nam Ninh and Vu Ban districts in 1982. After a two-year pilot implementation, due to Vietnam's agricultural reform from collectivization to household production, the pilot implementation was halted. From 1993 to 1998, Bao Viet Insurance Company continued to implement rice insurance in 12 provinces[5] and later extended to 16 provinces in 1996, with a focus on Ha Tinh province which faces disease, storm, and flood. By 1995, 208,900 ha were insured, covering 315,200 households, though only 1.16% of Vietnam's total cultivated area.

Despite farmer uptake of the product, leadership from MoF, and local government support (Ha Tinh government paid 20% insurance premium), Bao Viet Insurance Company experienced a claims ratio of 110% (14.40 billion VND claimed/13.05 billion VND premium revenue or USD636,000 claimed/USD576,000 premium revenue). Consequently, insurance market narrowed and the company is unable to identify effective AI models; Bao Viet Insurance Company halted sales in 1984 year (Association Insurance Vietnam, 2010).

Beside rice insurance, from 1996-1998, Bao Viet Insurance Company also continued to implement insurance for industrial crops and forest fire. Nevertheless, the insured area only accounted for a small proportion of production are, with 10% of rubber production area was insured. The total AI premium collected was 3.4 billion VND (USD150,172), with 200 million VND (USD8,834) paid out during 1996-1998. Insurance for eucalyptus was also implemented for a joint-venture afforestation project of 44,000 ha in 1997-1998 with the premium revenue of USD 120,000. After a few years of implementation, this insurance could not be expanded and Bao Viet Insurance Company stopped the product due to large operational costs (Vietnamese Communist Party, 2011).

3.1.2. 1998-2010

After AI trials from 1992-1998, AI still occupied a small proportion of the national insurance total premium. The AI premium in 2010 was 2.5 billion VND (USD110,400) accounting for 0.05% of total non-life insurance premium; AI coverage rate was only 1% of total crops area and number of livestock (MoF, 2011).

Table 5. Implementation Results of Vietnam AI from 2006-2010

Indicators	Unit	2006	2007	2008	2009	2010
Revenue from insurance premium	Billion VND	0.737	0.833	1.377	1.696	2.450
	USD	32,552	36,792	60,820	74,909	108,212
Insurance compensation amount	Billion VND	0.535	0.647	0.344	0.345	0.719
	USD	23,630	28,577	15,194	15,238	31,757
Compensation rate	%	72.59	77.67	25.31	20.36	29.35
AI premium/non-AI premium rate	%	0.012	0.010	0.015	0.010	0.050

Source: (Association Insurance Vietnam, 2010).

[5] An Giang, Binh Dinh, Binh Thuan, Bac Giang, Ben Tre, Ca Mau, Can Tho, Dong Thap, Ha Tinh, Kien Giang, Soc Trang, Vinh Long.

Groupama Insurance

In 2001, Groupama Insurance Synthetic Limited Company in Vietnam (100% foreign owned) also implemented livestock and crop insurance, property damage insurance in agricultural production, accident insurance for agricultural workers, and shrimp insurance (launch 2002 in Mekong Delta). Although strong effort was shown, revenue from AI for Groupama was also mediocre and the claims ratio was high, including a 2005spike of4,426% due to storm damage. Consequently, in 2006, after 5 years of implementation, Groupama temporarily halted AI to reevaluate market, review loss and develop new strategy (Association Insurance Vietnam, 2010).

Livestock insurance fund in Moc Chau

In 2004, the 'Livestock insurance fund' was established in Moc Chau by Moc Chau Dairy Cattle Breeding Joint Stock Company (Moc Chau Milk Company) and still operating at the moment. Moc Chau Milk Company gather dairy herders, help them elect their representative, which is called Insurance Fund Management Board. This board includes 13 members, who are in charge of managing the fund as well as inspecting cases when farmers claim for insurance. The initial operating capital was provided by Moc Chau Milk Company, but after 12 years of implementation, the fund has reached 20 million VND (USD 883,000) from profit of insurance activities and money lending (farmers who buy insurance can borrow money from the fund with favorable interest).

This fund provides two insurance products, including livestock insurance (dairy) and milk price insurance. Dairy cow premiums are 250,000 VND(USD11) for calves, heifers, cattle breeding and 600,000 VND(USD27)/head for dairy cows under milking regime. Average compensation for dairy cows under milking regime is VND12 million (USD530) if the cattle is dead, and 10 million VND (USD441) if the cattle is alive but cannot produce milk. This compensation ensures farmers have enough money to buy a calf to maintain their production. The milk price insurance premium is 50 VND/kg (USD2/ton). When the farm gate milk prices decrease from 25% to 30%, insurance fund will pay for 60% of the difference.

Livestock and milk price insurance in Moc Chau is considered a success, with 100% herder households in Moc Chau joining the fund. This model enables farmers to rebuild cattle herds when risks happen. Other success factors include:

(i) *Nature of dairy production*. All farmers in this model raise dairy cow at a similar scale, same technic (follow company's guidance), sell their product to the same company (Mocchaumilk) and live in the same district (Moc Chau District). These similarities reduce the transaction cost to design insurance products and collect risk information. Since most farmers rely on dairy production as their main income source, the value of the dairy cow is high, and farmers make an adequate income from selling milk, they are willing to pay for insurance.

(ii) *Suitable management system*. The management board was elected from the herders, including herders themselves, veterinarians and other members. This small and one-level management board proved effective, responding quickly when risks happen and –paying compensation quickly. These people understand each farmer's production, minimizing the risk of insurance fraud. They also work part-time, keeping operational costs low.

(iii) *Involvement of the company*. Despite being managed by the board at the moment, this insurance model was first developed by Mocchaumilk Company and the company had to invest their own money at the beginning of the model

implementation. There are mutual benefits between farmers and the company, with more stable milk inputs coming from quicker recovery of production[6].

Credit Security Insurance by ABIC

In 2007, Vietnam Agriculture Bank Insurance Joint Stock Corporation (ABIC) was founded with 100% capital from Vietnam Bank for Agriculture and Rural Development (Agribank) and was built on the combined bank – insurance distribution system (Banc assurance), taking full advantage of the widespread branch network of Agribank (Figure 2).

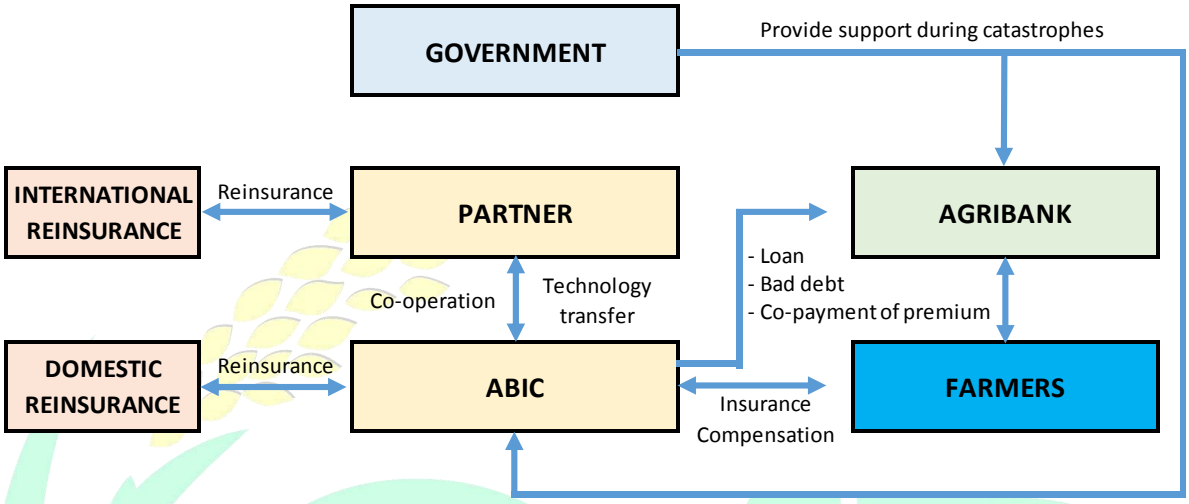

Figure 3. ABIC Credit Insurance Model
Source: Created by CAP research team (2016).

Agricultural credit insurance is a new insurance product from ABIC, which insured objects are not farmers' risks directly, but farmers loan with Agribank. ABIC would help farmers to pay for their loan with Agribank when they suffered from objective risks - leading to inability to pay debts (accidents, disease, property damage and etc.). The insurance premium is determined by the amount of loan, age of customer, duration of insurance. This credit insurance model shows dual-effects in promoting the development of insurance and farmers' investment in production using credit as the insurance limits risk impacts from using investment sources in production activities.

Insurance Fund in Dong Thap and Dak Lak

Since 2009, index AI for temperature and weather was researched and piloted by GlobalAgRisk Inc. Insurance Fund in Dong Thap and Dak Lak.

Two insurance products were introduced, including flood insurance in Dong Thap and drought insurance in Dak Lak. In Dong Thap, insurance would be triggered when water levels measured at Tan Chau hydrological station among 280cm-350cm. The maximum payout would be USD1 million. Similarly, to assess drought risks in coffee, a rainfall calculation was used as the insurance basis in Dak Lak. However, the program was discontinued (GlobalAgRisk, 2009).

This insurance form has shown many positive outcomes including reducing the evaluation cost, insurance payouts can be paid quickly for farmers and at low cost, so more people

[6] Because of the close link between farmers and company, they can be considered as half-worker of the company.

may be willing to participate. However, these activities are still in the pilot phase. If successful, this program should be studied in more detail and expanded to the Red River Delta region, among others.

Other insurances

Since 2010, more companies have joined the AI market, including Bao Minh and Investment and Development Bank Insurance Corporation (BIC) insured rubber, ABIC insured dairy cows. Other organizations like GlobalAgRisk Inc. conducting research on flood index in Dong Thap and drought index in Dak Lak, The World Bank also supported AI development. Nevertheless, all of these activities have stopped at only the research or pilot implementation phase (Association Insurance Vietnam, 2010).

Most AI implemented in Vietnam up to 2010 were considered failures as most farmers did not consider AI as an adequate solution to cope with production risks. Only 1% crops; 0.24% cattle herd; 0.1% pigs and 0.04% poultry were insured in 2010 (MoF, 2011). When natural disasters and diseases happen, most farmers still rely on the government subsidies. In addition, Agribank, which is considered the key lender to farmers, had to freeze and relive debt, thus leading to a paradox in which Agribank functions like an AI company whose cost of risk is covered by state budget instead of by insurance premium, contributed from producers.

3.1.3. Agricultural Insurance Policies Vietnam Before 2011

Although AI in Vietnam had been implemented for nearly 30 years, there were no specific policies supporting the development of AI. Most policies merely focused on encouraging insurance companies to widen their AI products.

Table 6. Summary of Pain Policies Related to AI before 2011

Policy	Main contents
Article 4, Law of insurance business (2000)	To encourage AI business that served socio economic goals, especially agricultural, forestry and aquaculture development.
Decision 175/2003/QD-TTg	To encourage insurance companies researching and implementing insurance for agriculture, forestry and fisheries, focusing on widen to remote areas.
Decree 18/2005/ND-CP	To decide the establishment, organization and operation of mutual insurance organizations in the fields of insurance business (membership, rights and obligations of the members of the mutual insurance organization, regulations on the organization, operation and licensing of mutual insurance organizations, regulations on capital and financial problems of mutual insurance organizations).
Decision 4056/QD-BTC (13/12/2006)	To promote businesses to implement insurance in agriculture, forestry and aquaculture.
Decree 45/2007/ND-CP	To implement some articles of the Law on Insurance Business, which came into effect in 2007.
Decree 46/2007/ND-CP	To regulated financial issues for insurance broker companies, which came into effect in 2007.
Decision 172/2007/QD-TTg (16/11/2007)	To implement research in building self-finance funds and insurance funds for disaster
Resolution 26-NQ/TW (05-8-2008)	To pilot AI, guarantee minimum living standards for rural residents.
Resolution 22-NQ/CP (23/9/2008), Resolution 24-NQ/CP (28/10/ 2008), Decree 41/2009/ND-CP	To issue AI policy in the market economy.

Source: Compiled by CAP research team (2016).

From the above overview, it can be seen before 2010, the legal and policy systems for AI were not synchronized. There were no regulations on coordination mechanism between insurance companies and the central management agencies or relevant departments. The government had not designed a reinsurance mechanism for insurance companies and reinsurance companies. No focus was put on investigation, research and forecasting to develop AI policies. Databases and information for calculating principle insurance premiums and compensation was also limited. Finally, there was no coordination between the government, insurance companies, reinsurance companies, financial and credit organizations and farmers in delivering synchronous insurance and credit services to promote and improve the development of AI market.

3.1.4. Discussion

The underdevelopment of AI in Vietnam before 2010 can be explained in following reasons.

Regarding insurance companies:

- Implementing insurance operations (sale, monitoring and loss assessment) in agricultural sector were costly due to fragmented production and dispersed over large areas. It also caused lots of trouble controlling insurance fraud.
- The insurers also lacked qualified agricultural experts.
- Revenue from AI was too low compared to compensation paid out. Natural disaster risk proved too high and the financial losses exceed the capacity of the insurance companies
- Loose connection between insurance companies, local governments, managerial governmental agencies, socio-political organizations, agricultural technical departments and local agencies in the implementation of AI, the marketing and awareness creation campaigns had limited impact on farmers. When risks occur, insurance companies received little cooperation and assistance from local government and extension units.

Regarding target farmer insurance clients:

- Farmers did not have a tradition of taking up AI for protection from natural disasters. With this limited awareness, farmers wanted to buy insurance for products with frequent risks but with a very small premium.
- Farmer's income was low and the financial capacity to participate in AI markets was limited.
- Agricultural production is small scale and fragmented, farmers do not follow a production standard procedures, therefore, it was difficult to evaluate the causes of loss

3.2. National Agricultural Insurance Pilot Program

The year 2011 was considered a groundbreaking year for AI in Vietnam with the implementation of NAIPP. This program was directed directly by the Prime Minister with the support of MoF and MARD, as well as local government at different levels. Hundred thousand of farmers in 13 provinces have participated in this program within 4 years of the Program implementation. In the following part of this report, we will focus in describing the Program, analyse its impacts and draw lessons learnt from it.

3.2.1. Overview

Decision 315/QD-TTg on 'Pilot Implementation of Agricultural Insurance in the Period 2011 – 2013' was issued on 1st March, 2011 to implement Resolution 24/2008/NQ-CP dated 28th October, 2008 of the Communist Party Central Committee about Agriculture, Rural Areas and Farmers (*Tam Nong*). This policy established a legal framework and organizing operational structure to attract enterprises to invest in Vietnam's AI market.

A Public-Private Partnership (PPP) approach was used to operate NAIPP in Vietnam. It was modeled off of effective approaches in countries like South Korea, Turkey and Spain to develop their own agricultural insurance markets. In these countries, their governments usually supported insurance in two major forms: subsidizing insurance premium (at least 50% of total premium) and subsidizing operational costs for insurance companies. Following the global trend, the Vietnamese government supported farmers and farmer organizations to be involved in the program via subsidizing training, communication strategy and operational costs of steering committees from central to local levels. Meanwhile, insurance companies were involved in designing insurance products, setting up insurance agent systems, and organizing marketing and informational brochures for the program. Two insurance companies were selected to participate in NAIPP, namely the Vietnam Insurance Company (Bao Viet) and Bao Minh Insurance Corporation – the two largest insurers in Vietnam. VinaRe was responsible for reinsuring and providing technical advice in designing NAIPP (with help from SwissRe).

With intensive financial support from the government and the participation of reputable insurance and reinsurance companies, there was clear determination to promote AI in Vietnam. NAIPP was though launched when AI had faced difficulties to develop a market due to the policy framework, national management agencies, limited awareness and poor risk management by farmers.

3.2.2. Objectives

Noticeably, NAIPP was a "not for profit" program aims to *"support farmers to actively overcome and compensate for impacts of natural disaster and disease, contribute to ensure social security in rural areas and promote agricultural production"*[7]. In general, AI was considered as a financial mechanism to provide financial support for agricultural producers to mitigate risks and stabilize their production in order to ensure social security and promote agricultural production. This objective was considered ambitious.

In term of *ensuring social security,* NAIPP aimed at poor households, which is similar to Spain, Korea, Turkey and other countries. However, there has not been any comparison between AI and other risk financing methods (e.g. direct support, budget allocation…).

In term of promote agricultural production, AI was also expected to promote the development of agricultural credit, collaborative relationships between farmers and businesses, attract business to invest in agriculture sector and promote commodity production.

Unlike other countries, NAIPP put less emphasis on the welfare of insurance companies. Insurance combines risks faced by a large number of individuals who contribute through premium to a common fund which is used to cover the losses incurred by any individual in the pool (Bielza et al. 2008). Moreover, insurers normally have two more objectives: (i) develop new products and new markets with profit potential, (ii) if the program is a success and continues to be expanded, companies can occupy the available markets by

[7] Decision 315/QD-TTg and Decision 358/QD-TTg by the Minister & Circular 121/2011/TT-BTC

establishing systems and customer relationship in the pilot area. In other words, agricultural insurance should be developed according to market-oriented mechanism, in which the state only supports legal formation, or the legal framework for the operation of the AI market. No further intervention by the government on business activities, such as product design (risk, valuation, and compensation levels), building distribution systems, etc. should be required.

The initial objective set by Decision 315 is too ambitious given the fact that NAIPP was a pilot program. Designing and deploying the program in three years was quite short compared to other nations' experience which showed that the development of successful insurance products required a great deal of time. As a result, after three years of implementation, it is challenging to evaluate how successful the program is for two reasons. First, a pilot program should contain content of assessing the results of implementation; however, NAIPP was evaluated by the implementing agency (MoF), not independent assessors. Second, the lack of time for development leads to a program designed on an incomplete database.

In summary, the goal of NAIPP was ambitious and challenging to achieve given its short implementation time, causing difficulties and challenges for operationally and then for evaluating the program's results. Although the program created remarkable results in the improvement of legal and institutional framework for AI markets in rice and livestock and are posed for expansion, the level of completion of the overall goals of Decision 315 is not clear due to insufficient basis to assess its impact on social welfare.

3.2.3. Implementation process

The NAIPP was implemented in six steps, as illustrated in Figure 6.

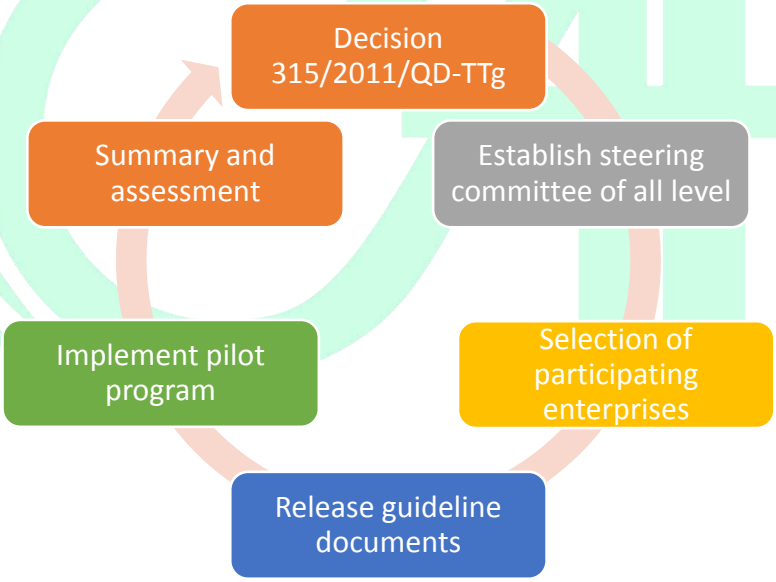

Figure 4. NAIPP Implementation Process in Vietnam
Sources: CAP research team (2016).

Step 1. Issue of Decision 315

NAIPP started in March 2011, after the Prime Minister issued Decision 315/QD-TTg. It defined objectives, pilot geographical areas, beneficiaries, products, government support mechanism, and responsibilities/tasks for stakeholders in the implementation process. On this basis, within three years of implementation, the national government, MoF and MARD

issued 17 documents[8] about organization, direction, guideline and amendment of NAIPP. Most documents (13/17) related to guiding the implementation adjustment and amending the content of the program (Figure 5) that had been formed. They also completed a legal framework for the operation of AI in Vietnam.

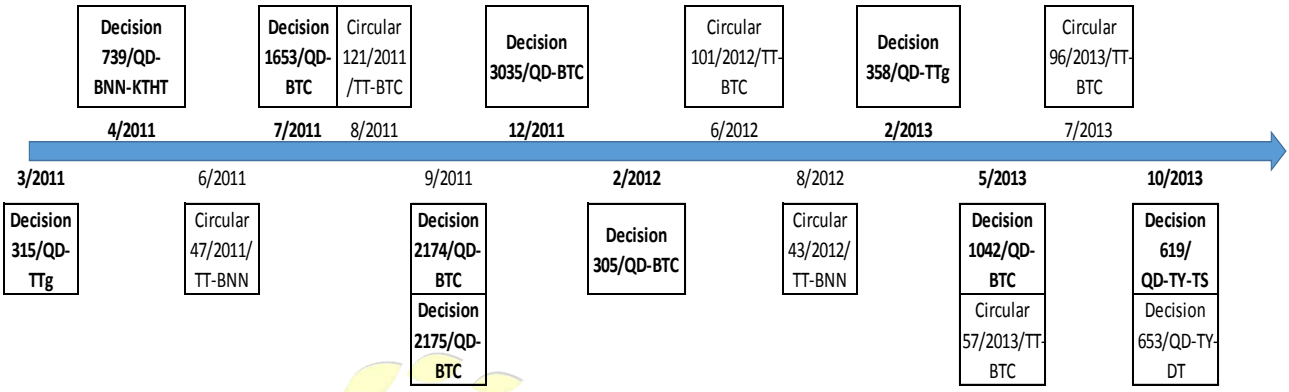

Figure 5. Timeline of policies related to AI in Vietnam
Sources: CAP research team (2016).

Step 2. Establishment of NAIPP Steering Committees

After the issuance of Decision 315 by the Prime Minister, NAIPP steering committees and administrative management were established and strengthened at the central, provincial, district and commune levels. Central Steering Committee included Ministries' leaders (Chairman), and representatives from related agencies (members).

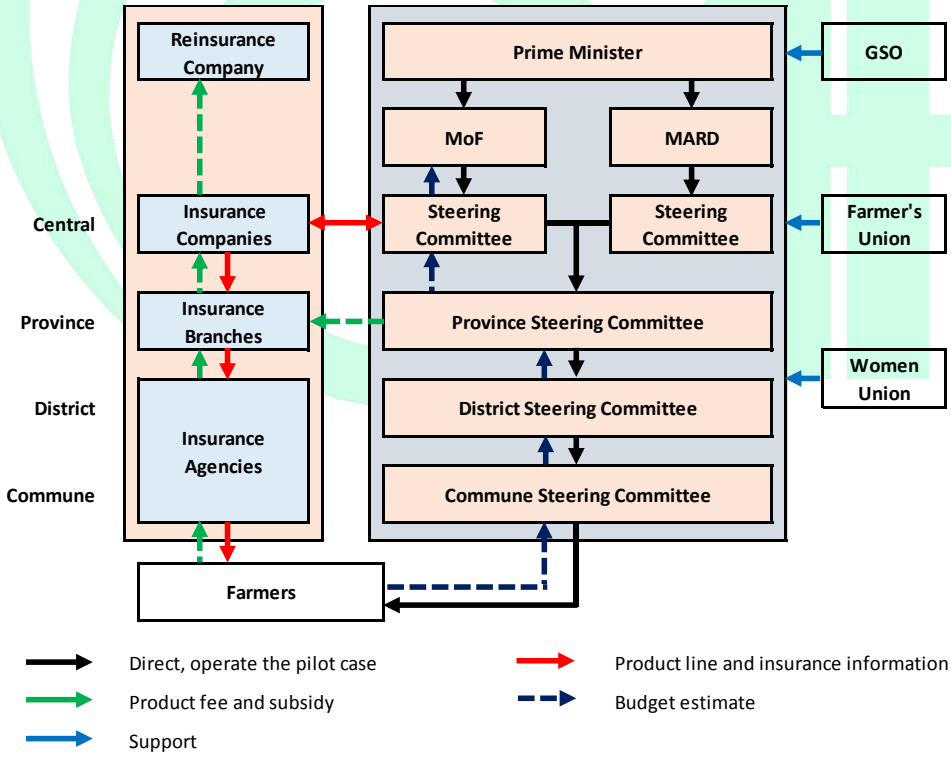

Figure 6. Key Stakeholders in NAIPP
Sources: Created by CAP research team (2016).

[8] Readers refer to for a detailed description of all policies.

Committees provided general supervision, issued instruction documents, inspected, monitored and evaluated during and after the implementation process. MoF played a key role in NAIPP by issuing legal documents about insurance products, beneficiaries, pilot areas, insurance profile and procedures, and financial mechanism guides for program stakeholders. MARD prepared instructions for selecting the pilot areas, insurance coverage, regulations on agricultural production and disease monitoring and collaborated with MoF in formulating insurance terms and guidelines, and deployed trainings for local authorities and insurance companies.

At the local level, each Provincial People's Committee established an AI Provincial Steering Committee and set up District Steering Committees and Commune Steering Committees in its pilot areas. Steering Committees at all levels determined eligible households for insured agricultural products, collected data on yield and economic value of insured products (as a basis for formulating a loss assessment process and compensation rate). Local-level Steering Committees consisted of diverse participants, including leader of People's Committee (head of Steering Committee), leaders of Department of Agricultural and Rural Development (DARD) and Department of Finance (DoF, deputy head of the Committee), and representatives from other related entities such as Labor, Invalid and Social Affairs, Statistics, Environmental Resources, Police, local leaders and insurance companies.

Step 3. Selecting Insurance and Reinsurance Companies

Bao Viet, Bao Minh and VinaRe were selected and approved to participate in NAIPP based on Circular 121/2011/TT-BTC, Decision 2174 / QD-BTC and 2175 / QD-BTC. Insurance and reinsurance firms were responsible for collaborating with the Steering Committees to provide recommendations to MoF in formulating the insurance regulation, terms, and premium rates. Companies also worked with local authorities in mobilizing households' participation in NAIPP, supported local authorities in collecting statistics and monitoring disease situations. The national insurance join-stock corporation was assigned in implementing reinsurance contracts for the program.

Step 4. Release Guideline Documents

At this point, guidelines and revised documents were developed to identify insurance regimes (risks, products, value, cost, application forms, evaluation of damages and compensation), forming the legal framework for the operation of insurance products and guidance on administrative procedures. They also guided disbursement and finalization of funding support from the state, activities and use of funds by the insurance companies and steering committees, etc. Due to lack of experience with AI, most guidelines were issued late. It was not until 2012, nearly one year after Decision 315 was issued, that farmers started learning about AI products. As many documents were issued when the pilot period nearly came to an end, they caused difficulties for the local authorities and insurance companies and could not be applied effectively. A noticeable point is that the government, MoF, and MARD issued six amendment documents. This shows great efforts to improve institutional and legal frameworks, as well as insurance products. These policy revisions reflected the government's flexibility and ability to capture and adapt to difficulties in real-life implementation process contributing to the development of better AI.

Step 5. Implementing NAIPP

The actual implementation of NAIPP included three main activities:

1. Steering Committees prepared estimated annual budget for NAIPP activities operated in all levels and a number of farmers who might buy the insurance. All

information was transferred to the MoF to estimate the supporting funding in the next year.

2. Insurance companies collaborated with local Steering Committees to encourage farmers to buy insurance products.

3. Once farmers signed AI contracts, MoF provided supporting funds (premium subsidy) to insurance companies. This fund was based on the estimated annual budget and reports about AI with farmers' contracts from insurance companies.

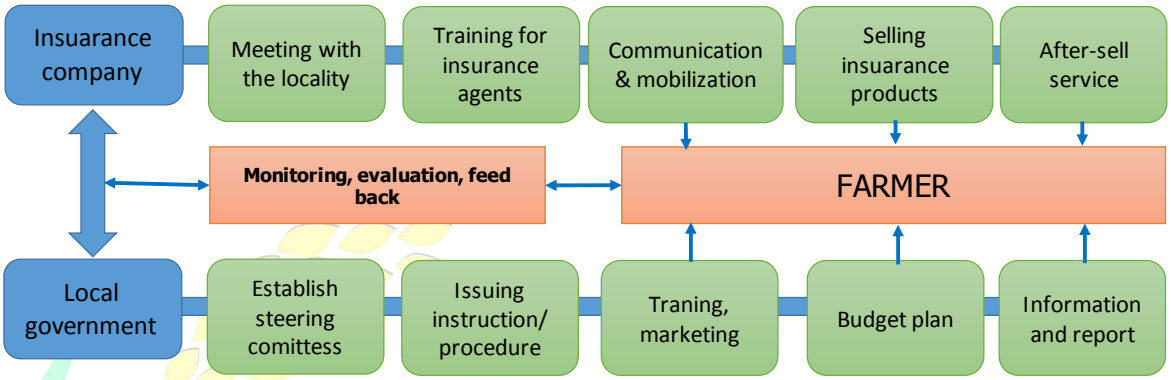

Figure 7. Interactions Between Insurance Companies and Farmers
Sources: CAP research team (2016).

Step 6. Review and Evaluation

Review and evaluation of NAIPP's results were conducted after the program ended in 2011? With relevant agencies (MOF, insurance companies) preparing aggregated reports on performance.

Over three years, the fact that NAIPP established a legal and institutional framework, operational mechanism and AI product portfolio showed the efforts of governmental agencies at all levels in implementing the program to establish an AI market in Vietnam. This provides a strong theoretical and practical basis for the formation of specific AI laws in Vietnam in the future.

Concerns still exist. First of all, there was a lack of strong collaborations between Steering Committees with insurance companies. In fact, most of mobilizing and training activities were implemented solely by insurance companies, so the purpose of those activities was selling insurance not enhancing farmer's awareness about risk management. Another problem is that feedback channels (mainly through insurance sales) were not yet developed, causing delayed and inefficient assessment of farmer's feedback about the program. Finally, the process to reimburse for support at provincial level was complicated and delayed.

3.2.4. Beneficiaries of NAIPP

The pilot area of NAIPP was determined in Decision 315/QD-TTg, specifying provinces and insurance products, shown in Table 7. The beneficiaries of the AI policies were selected households, farmer associations and agribusinesses within the pilot areas. Rice insurance was piloted in 7 provinces, including 21 districts with 481 communes. Livestock insurance was offered in 9 provinces, with 27 districts and 180 communes. Aquaculture insurance was in5 provinces located in the Mekong Delta, including 21 districts and 84 communes.

The selected provinces and commodities covered most of the ecological regions and important agricultural products of Vietnam. Three sectors were selected in NAIPP, including cultivation, livestock and aquaculture. Different types of livestock and aquaculture products were selected, however, only rice was selected in cultivation sector. 20 provinces were selected to participate in NAIPP, which were wide spread among 4/6 ecological zone of Vietnam but mostly located in Mekong River Delta and Red River Delta. Surprisingly, Northern Mountainous and Central Highland, 2 poorest regions in Vietnam was not included in the program, despite the fact that "ensuring social security" is the first objective of the program. As to the 2nd objective to "promote agricultural production", these 2 regions should also be included because they are the main producer of 4 among 10 Vietnamese agricultural products with more than 1 billion USD of export value (coffee, rubber, pepper & cassava).

Table 7. Pilot Insurance Areas, Products and Scope

Insurance Products		Location	Scope	Type
Rice Insurance		Nam Dinh, Thai Binh, Nghe An, Ha Tinh, Binh Thuan, An Giang, Dong Thap	3 districts/ provinces	Index
Livestock Insurance	Pig	Ha Noi, Vinh Phuc, Hai Phong, Bac Ninh, Thanh Hoa, Nghe An, Binh Dinh, Binh Duong, Dong Nai	3 communes/ districts 3 districts/provinces	Multiple-peril
	Chicken	Bac Ninh, Hai Phong, Vinh Phuc, Dong Nai		
	Duck	Bac Ninh, Hai Phong, Dong Nai		
	Beef Cow	Vinh Phuc, Thanh Hoa, Nghe An, Binh Dinh, Dong Nai		
	Dairy Cow	Ha Noi, Binh Dinh, Binh Duong, Dong Nai, Vinh Phuc		
	Buffalo	Vinh Phuc, Thanh Hoa, Nghe An		
Aqua-culture Insurance	Catfish	Ben Tre, Tra Vinh	3 communes/ districts 3 districts/ provinces	Multiple-peril
	Shrimp	Ben Tre, Bac Lieu, Ca Mau, Soc Trang, Tra Vinh		

Source: 315/QD-TTg, Circular 47/TT-BNNPTNT, Circular 43/TT-BNNPTNT

The insured had to meet all the requirements specified in Clause 4, Article 1 of Decision 315/*QD-TTg* and Circular 47/2011/TT-BNNPTNT. They must be located within the area of pilot program and follow production procedure issued by MARD or DARD. According to international experience, agricultural insurance program was normally associated with other supporting program, such as agricultural credit. This factor was not considered in the NAIPP in Vietnam.

Regarding the benefits of agricultural producers joining the insurance, the government subsidized insurance premium for farmers participated in the AI pilot program. Specifically, State budget covered 100% of the insurance premium for poor households, 80% for near poor household (later adjusted to 90% in Decision 358/QD-TTg) and 60% for regular households[9]. These subsidies were considered high comparing to other countries in the world (about 50-65%).

3.2.5. Product Design

In the framework of NAIPP, designing the insurance products was instructed by the MARD, MoF and the People's Committees of pilot provinces.

[9] Poor and near poor households were identified based on Decision 09/2011/QD-TTg

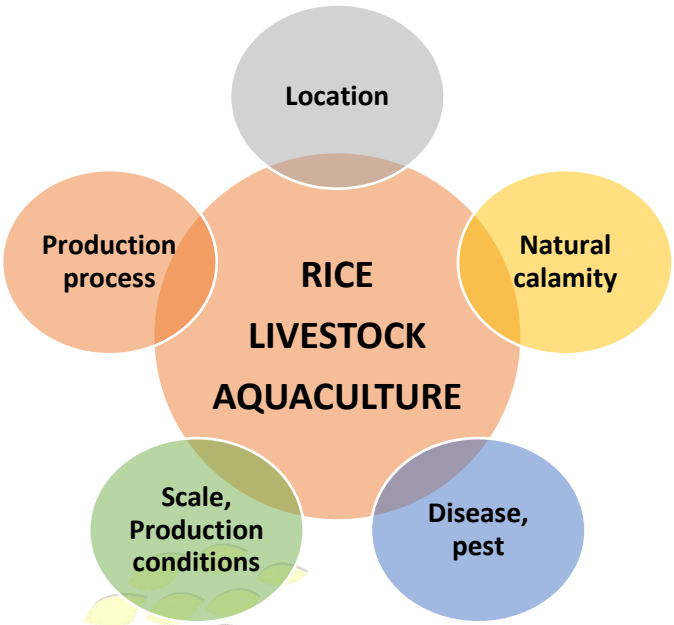

Figure 8. General Regulations on NAIPP Insurance Products
Sources: CAP research team (2016).

The evidence suggested that the involvement of insurance companies in designing the NAIPP was still limited. In fact, they merely focused on recommending the insurance premium with the assistance from reinsurance companies. Therefore, some products were not suitable. In addition, because of the nature of a pilot program, only few insurance products were introduced, therefore, farmers could only choose whether to participate in AI or not.

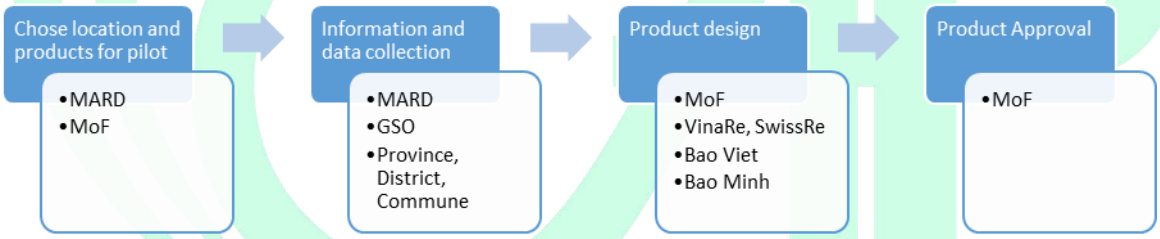

Figure 9. Designing and Promulgating Process of NAIPP products
Sources: CAP research team (2016).

Insurance product pricing was formulated by experts and actuaries of insurance companies based on statistical data from the commune level. This data is a large cross-sectional dataset, however, only in a short period of time (5 years), therefore, product pricing was not confidently reliable.

The concept of AI was new to the majority of target beneficiary farmers and therefore, product design must be accompanied by an attractive awareness creation and marketing strategy to engage the farm households. When people are fully aware of the role and importance insurance in agricultural production and then voluntarily participate in the program, the AI policy of the government can be considered a success. The rates of voluntary participation remained low in the pilot, only accounted for a small proportion of production scale in the pilot areas.

3.2.6. Insurance and Reinsurance Companies

According to regulations, enterprises involved in AI must meet the requirements mentioned in Decision 315/2011/QD-TTg and Circular 121/2011/TT-BTC of the MoF; accordingly, companies must have a complete profile, registration documents for implementing AI pilot program, including: a request to be piloted AI; documents proving that the company meet all the requirements under the Section 8, Article 1 of Decision 2174/QD-BTC and business plan in 3 years of the AI piloted implementation and the reinsurance program according to the current regulations law.

On 09/09/2011, MoF issued Decision 2174/QD-BTC and Decision 2175/QD-BTC, granting Bao Viet Insurance Corporation and Bao Minh Joint Stock Corporation (two insurance companies which have the capacity and highest financial capability in insurance sector currently in Vietnam) the rights to participate in implementing of NAIPP. The Decisions clarified the objectives, specified the locations and insurance products that businesses were allowed to implement in the pilot program.

VinaRe was assigned to provide the reinsurance for the AI pilot program. According to Circular 121/2011/QD-BTC, VinaRe was responsible for accepting the reinsurance and ceding it to domestic insurance companies. In case the domestic insurers cannot cover all the insured liability, VinaRe would cede the reinsurance to foreign reinsurers, such that the national benefit was ensured. Otherwise, VinaRe was responsible for collecting, analyzing, recommending the solutions and then subsequently reporting to the MoF. When the company suffered a loss due to the AI business operations, which exceeded 10% of its equity, MoF would provide a guideline or report to the Prime Minister to consider.

Insurance and reinsurance companies have played a key role in formulating the AI pilot program in Vietnam. Domestic insurance companies collaborated with foreign reinsurers, technical consultants and researchers in order to advise MoF about the regulations, terms, and premiums relevant in agriculture. They also developed, issued and completed the processes of operation, evaluation and compensation as guidelines. Bao Viet and Bao Minh recruited and trained new staffs to implement the program, formed a division specialized in AI operation and compensation, and developed a network including all member companies located in the pilot areas. The businesses also coordinated with local authorities to encourage the agricultural producers participating in the insurance program, guaranteed strictly and safety insurance contract; enhanced risk management (especially in aquaculture), collaborated with the local authorities in collecting statistical data, tracking the diseases, confirming the actual damages and carrying out the compensation procedure. VinaRe coordinated with insurance companies to successfully arrange the reinsurance for AI pilot program.

During implementation, companies faced obstacles, such as the lack of experience, monitoring ability, and databases for operational purposes. AI was a new and complicated insurance, which had been piloted for the first time thus, insurance companies did not have much experience with it. The number of monitoring agents was relatively small; therefore, the insurers cannot provide enough supervision of production operation to reduce risks. Insurers also had difficulties evaluating the damage and the making the decision about compensation in indemnity insurances.

When examining countries with successful AI, the have a lead agency to implement and are often organized as an association of insurance companies, such as in Spain, Turkey or as agricultural cooperatives in Korea. This lead agency represents all companies participating in the association to take responsibility for developing terms of insurance contracts, determining a premium rate, sharing the risk among members, managing the subsidies from the government, evaluating the losses and compensating the damage. In

Spain, ENESA – an agency under Ministry of ???? had the main function to make a detailed annual plan for AI. Based on this plan, AGROSEGURO – an association of 60 private companies participating in the insurance contracts - determines the premiums for different areas corresponding to the level of risk and managing cost in each area. These are the lessons, which have not been applied in NAIPP; however, it can be a good direction for a sustainable development of AI in Vietnam in the future.

3.2.7. Risk Assessment Methodology and Compensation

Regulations on risk assessment and compensation were issued under Circular 43/2012/TT-BNNPTNT, adding to provisions about the announcement jurisdiction from Circular 47/2011/TT-BNNPTNT by MARD, Decision 3035/QD-BTC by MoF. It stated clearly about the insurance events, assessment process, compensation profile, as well as duration and the payment of compensation.

Accordingly, the chairman of a provincial People's Committee announced when disasters and diseases occurred in the local area, as the procedure of the current law. For some case, where the diseases happened but did not meet sufficient conditions to be announced under the regulations, the district People's Committee was responsible for confirming the diseases based on the testing and assessing results performed by professional entities such as: Plant Protection Sub-department, Veterinary Sub-department, Fisheries Sub-department or Aquaculture Sub-department. This was used as the basis to compensate in a fast and convenient way.

To accomplish this, MARD issued three processes to disclose and confirm the selected diseases in the AI pilot program, including: the process of disclosure and confirmation of rice disease 1846/BVTV-TV dated on 28/09/2012 by Plant Protection Sub-department; the process of disclosure and confirmation of livestock disease, the outbreak investigation process mentioned in Decision 653/QD-TY-DT dated on 28/10/2013 by the Director of Veterinary Department, and the process of disclosure and confirmation of aquaculture disease (shrimp/fish) mentioned in Decision 619/QD-TY-TS dated on 18/10/2013 by the Director of Veterinary Department. However, 2/3 of this document can only be used to complete the legal framework and guidelines as it was issued when NAIPP was about to the finish.

The level of insured damage was covered in Circular 47/2011/BNNPTNT. If disasters or epidemics made the rice productivity lower than 75% of the average production over the last 3 years, livestock loss at 20% and aquaculture loss at more than 30% (economic value), the farmers could be compensated. If rice, livestock, and aquaculture participating in the pilot insurance were sick/diseased and taken care by veterinary or plant protection companies, or treated by producers, the farmers can be compensated the medicine and treatment costs, but not exceeding 20% of the total insurance value. However, this was amended in Circular 43/2012/BNNPTNT. Based on the results determined by the professional bodies about the disasters, diseases and impacted areas, insurance companies and participants of AI would negotiate the damage level and compensation. In case the two parties could not come to an agreement, the People's Committee at the commune level would resolve the problems. If not, the problem will be resolved by the People's Committee at province level. If one of these two parties still could not make any deal about the compensation, this case will be settled in accordance with the law on economic contracts. After three years of implementation, there were no cases resolved by the courts. Although Vietnam has a comprehensive legal system, operations of the legal system in Vietnam have many challenges and legal costs for dispute resolving are very high and time-consuming for all parties.

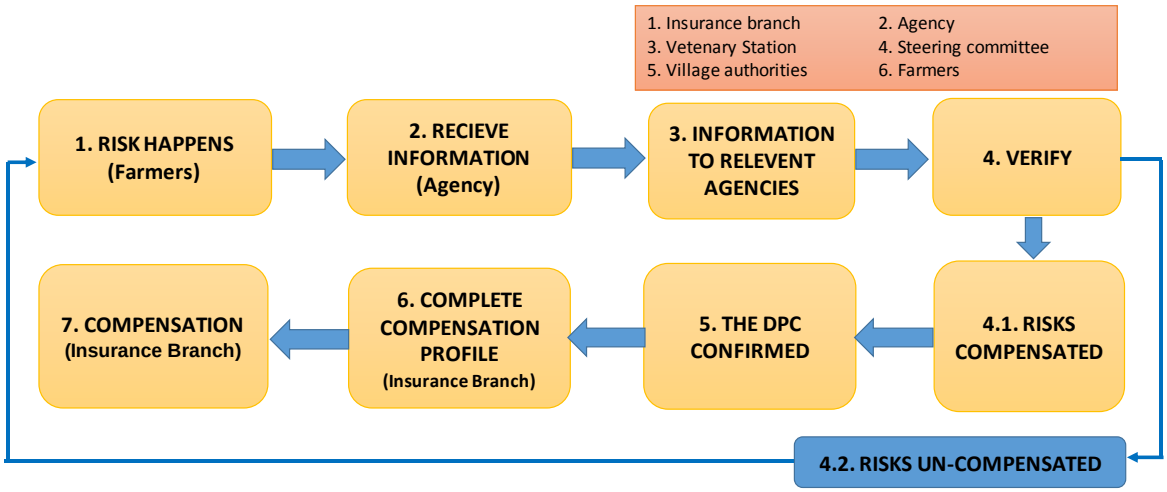

Figure 10. Appraisal and Compensation Processes in NAIPP
Sources: CAP research team (2016).

Regarding rice insurance, the insured amount would be calculated case by case by multiplying the rice insured area by the average productivity over the past 3 years and then multiplied with the rice price. For livestock and aquaculture insurance, the premium was calculated by the formula based on the rate of insured damage and premium.

Evaluating damage and claims in the AI pilot program was challenging and appeared as a weakness. The notification of natural disasters and epidemics was complicated and divided into many stages. When disasters or diseases happened, farmers had to inform the insurance agencies and the local authority, and then, insurance agencies will notify the insurance companies. The process went through many stages, which led to many problems in terms of time and timeliness in providing handling measures. The process of compensation also required a number of stages from announcing the disaster and disease to assessing, deciding, measuring and compensating, taking up to x months. There were insufficient agencies and employees in insurance companies, and when disaster and disease occurred on a large scale, the insurance companies did not have enough capacity to manage, monitor and compensate farmers. Insurance companies sometimes faced late payments of compensation, especially in aquaculture insurance due to the large amount of compensation. On the rice insurance, although some households experienced damage, since it is an index of the commune, they are not qualified for compensation – basis risk.

Experience from other countries indicates it is necessary to have an independent appraisal organization to reduce the fraud in insurance, especially in a large insurance event such as the case of aquaculture in Vietnam in pilot period. Korea constructed an agency to protect the benefits of the insurance participants. This can be a good lesson for Vietnam while farmers have limited awareness and knowledge of insurance.

4. GENERAL RESULTS OF NAIPP DURING 2011-2013

4.1. Overall result

After 3 years of implementation, NAIPP has achieved certain achievement regarding number of participants. The program attracted the participation of 304,017 households/agricultural production organizations. Regarding household types, there were 233,361 poor households, 45,944 near poor households and 24,711 normal households. The low rate of normal households participating in the program (8.1%) indicates that the appeal of these insurance products was not high when they were offered at market rates, the marketing strategy to mobilize normal households were not really effective.

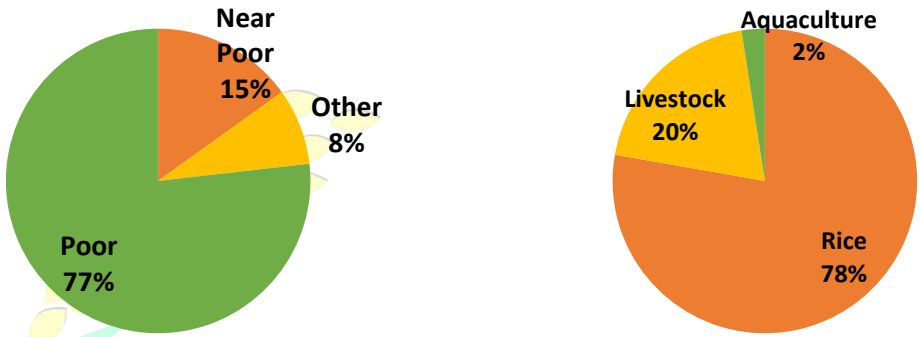

Figure 11. Household Structure and Insured Subjects in NAIPP
Source: (MoF, 2014).

Rice commodity have the largest number of participants but the insured value of rice insurance is also the lowest. Number of rice participants of nearly 240 thousand households. Number of participants in livestock and aquaculture insurance are 60,133 and 7,487 respectively. Although the number of households participating in aquaculture insurance only accounted for 2.46% of total participants, the insured value of aquaculture was the highest. The number of households participating in rice insurance accounted for approximately 79% of total participants but the insured value of rice was the lowest (2,151 billion VND/USD95 million). This result has shown the imbalance in insured value and the different appeal of insurance products in pilot program.

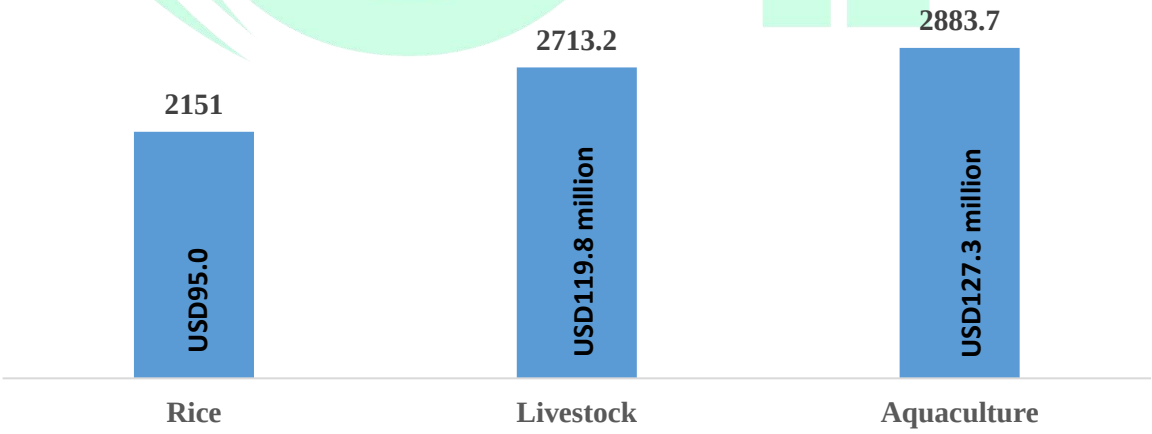

Figure 12. Insured Value by Product Group *(Unit: billion VND)*
Source: (MoF, 2014).

The revenue from premiums shows differences among insurance products; revenue from aquaculture premium was much higher than those from rice and livestock premium, it

accounted for 55% of total revenue of the program. The compensation rates of rice and livestock were reasonable for insurance companies and maintained principles of the insurance market. However, compensation rate of aquaculture insurance was up to 306%, which made the NAIPP, overall, losses.

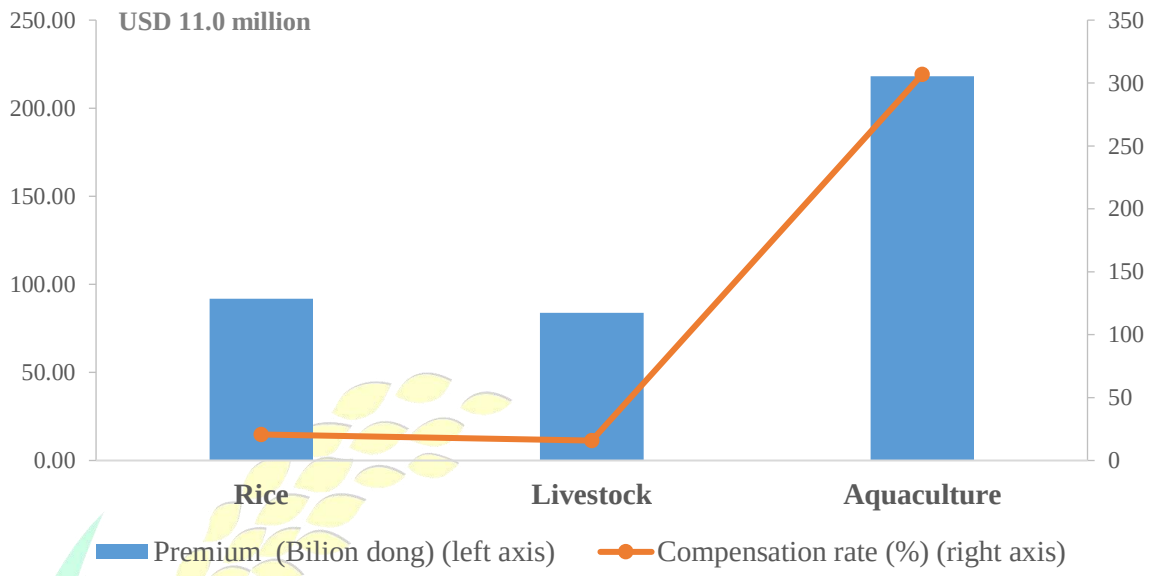

Figure 13. Premiums Loss Ratios
Source: (MoF, 2014).

In conclusion, looking at the number of insured households, the voluntary participation rate, the revenue from premium and the claims ratio, NAIPP had certain success and several challenges. The rice and livestock sector insurance products were quite suitable and the compensation rate is reasonable, however, the voluntary participation rate of these two commodities were too low and many farmers are not aware of the role of insurance. The voluntary rate of aquaculture was much higher, nonetheless, the production risks were not considered precisely during the design of the insurance products making the claims ratio too high, leading to serious losses of NAIPP.

4.2. Rice Insurance

Rice insurance experienced successes in the pilot program with a large number of participants and a low claims ratio. 236,397 households/production organizations participated in rice insurance, of which 76.45% were poor households – who got supported 100% of insurance premium under the regulations; near poor households accounted for 17% and others households only accounted for 6.7% of total participants. It is possible that participation in rice insurance did not come from the producers' actual demand, with a small proportion of the voluntary participants, but rather households participated because of the big premium support from the government.

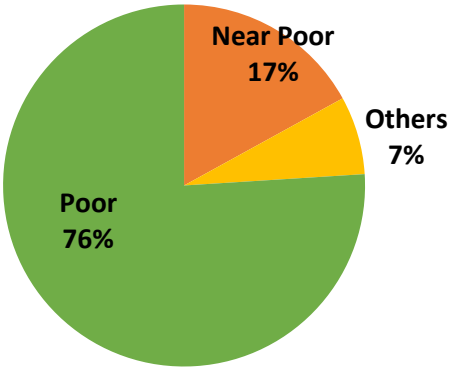

Figure 14. AI Participation Rate in Rice by Household Type
Source: (MoF, 2014).

Among provinces where rice insurance was implemented, Nghe An had the highest number of participants (112,487 participants); Thai Binh ranked 2nd (61,940 participants) and Nam Dinh was the 3rd (27,170 participants). An Giang and Dong Thap, two provinces in the key rice production for export area in Vietnam, recorded a much lower rate of participants compared to other provinces. However, the rate of voluntary participants in these two provinces was relatively high, (74% in An Giang and 20% in Dong Thap). Dong Thap and An Giang appealed to rice purchasing companies and input suppliers to support farmers participating in the insurance (20% of total insurance premium), creating a new model that linked the responsibilities of stakeholders in rice supply chain. This may be explored when the government AI program is reintroduced

Most of the insured area is from North Central of Vietnam, where risks, climate risks are more likely to happened. Total insured area of Nghe An and Ha Tinh account for more than 50% of total insured area. While in An Giang and Dong Thap, two main rice producers of Vietnam, total insured area is even lower than Nam Dinh and Thai Binh.

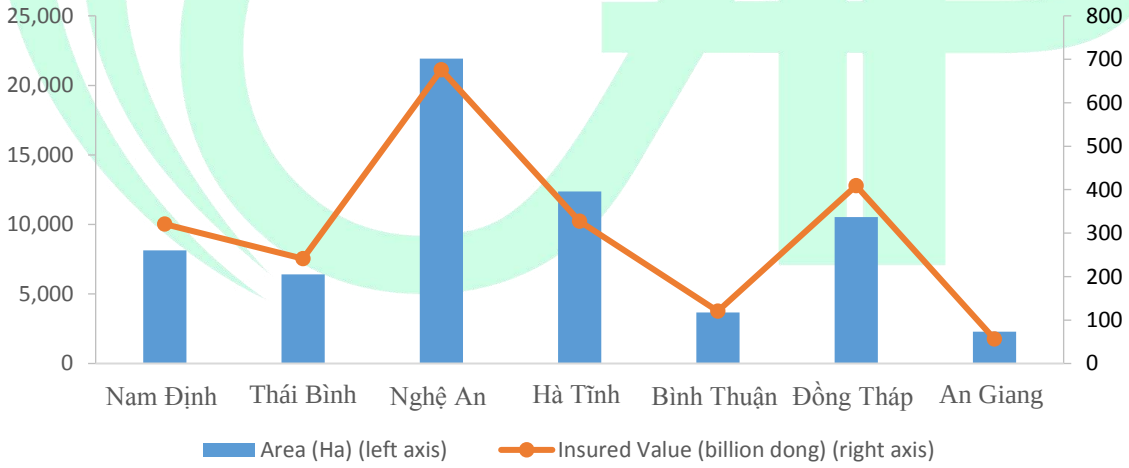

Figure 15.Total Insured Rice Areas and Value
Source: (MoF, 2014).

This counter-intuitive result may be due to the higher poverty rate in Nghe An and Ha Tinh led to a higher rate of participation when the poor households were supported. The results of pilot implementation relied a lot on the attention, guidance and involvement of the local authorities in the implementation process, these provinces performed well under the guidance of Decision 315 and guidelines from the government.

As rice insurance premium is similar in most provinces, the distribution of total premium revenue is according to above insured area. Of which, total revenue from the rice premium was 91.9 billion VND (USD4.1 million), Nghe An had the highest revenue from premium with 31.3 billion VND (USD1.4 million), followed by Nam Dinh with 16.2 billion VND (USD715,000), Ha Tinh with 15.4 billion VND (USD680,000) and Thai Binh with 12.3 billion VND (USD543,000).

The claim ratio and value of compensation in rice insurance is quite low, except for Nghe An**.** Total compensation for rice insurance was low with 19 billion VND (USD839,000) paid out and a claims ratio of 20.6%. Nghe An had the highest claims ratio at 42.9%, followed by Thai Binh (22.6%) and Dong Thap (23.7%) because the insured households experienced disaster risks (storms, floods).

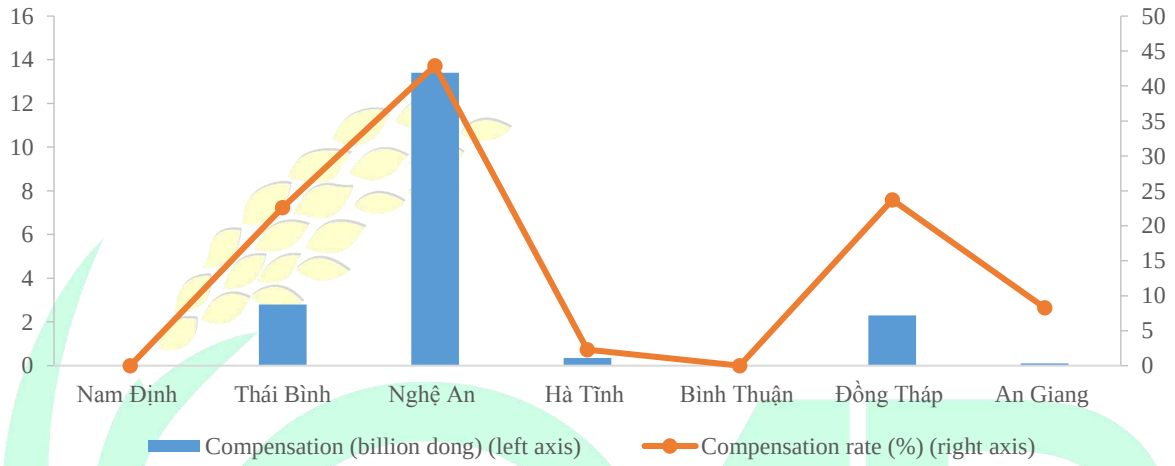

Figure 16. Total Insurance Compensation and Claims Ratio in Rice
Source: (MoF, 2014).

Ha Tinh and An Giang had a very low claims ratio; in Nam Dinh and Binh Thuan there was no compensation while the revenue was relatively high; the revenue in Ha Tinh was 16.2 billion VND (USD715,000) while it was 5.8 billion VND (USD256,000) in Binh Thuan.

4.3. Livestock Insurance

Similar to rice insurance, most of livestock participants are poor households. Among 60,133 households/production organizations participating in livestock insurance during the three years of pilot, 84% of them are poor households. Near poor households account for 10% and other households account for 6% of the participants.

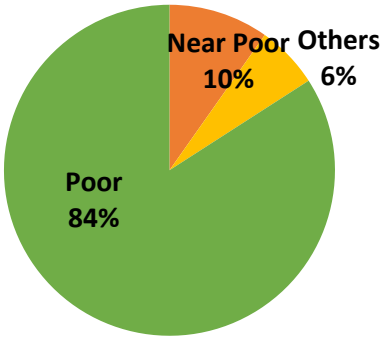

Figure 17. AI Participation Rate in Livestock by Household Type
Source: (MoF, 2014).

Despite participant provinces of livestock insurance scattered all around Vietnam, the vast majority of participants were located in Nghe An province. Number of participants in Nghe An was 40,471, accounted for 67.3% of the total number. Vinh Phuc followed with 5,963 households (9.9%); Binh Dinh with 4,509 households (7.5%) and Thanh Hoa with 3,876 households (6.45%).

Table 8. Livestock Insurance Results in 2011-2013

Province	Premium		Compensation		Claims Ratio (%)
	Million VND	*Thousand USD*	*Million VND*	*Thousand USD*	
Nghe An	47,000	2,075	4,300	190	9.15%
Vinh Phuc	14,500	640	3,000	133	20.69%
Others	22,400	989	6,000	265	26.78%
Total	**83,900**	3,705	**13,300**	587	**15.85%**

Source: (MoF, 2014).

Total revenue from premium was correlated to the number of participants, where Nghe An province contributed more half of the total premium. Total revenue from livestock premium was 83.9 billion VND (USD3.7 million), of which, Nghe An had the largest amount of revenue with 47 billion VND (USD2 million), followed by Vinh Phuc with 14.5 billion VND (USD640,000), Binh Dinh with 8.8 billion VND (USD388,000) and Ha Noi with 5.2 billion VND (USD229,000).

Livestock insurance have the lowest claim ratio of 15.85%. In contrast to rice production, Nghe An have a relatively lower claim ratio comparing to other provinces (9.15%). Total actual value of compensation for livestock was 13.3 billion VND (USD587,438), the average rate of compensation was low (15.85%), of which, Hanoi had the largest amount of livestock compensation with 4.4 billion VND (USD194,000); followed by Nghe An with 4.3 billion VND (USD190,000); Vinh Phuc with 3 billion VND (USD132,505); and Dong Nai recorded revenue without any compensation for livestock insurance (the revenue from livestock insurance was 857 million VND/USD132,500).

4.4. Aquaculture Insurance

Aquaculture insurance have the highest voluntary participation rate among 3 insured sectors. Aquaculture insurance was implemented in 5 provinces, including Ben Tre, Soc Trang, Tra Vinh, Bac Lieu and Ca Mau. During 3 years of implementation, 7,487 households participated the NAIPP, of which, poor and near poor households only account for less than one third, opposite to other sectors. The reason of this is the nature of aquaculture production in Vietnam, which requires a lot of initial investment and most poor households cannot afford[10]. Among provinces where aquaculture insurance was implemented, Soc Trang had the highest number of participants with 3,400 households; followed by Ben Tre (1,718 households); Bac Lieu (1,465 households) and Ca Mau (811 households).

[10] The estimated investment for 1 ha of white leg shrimp is 1 – 1.5 billion VND ($50.000 - $75.000 USD).

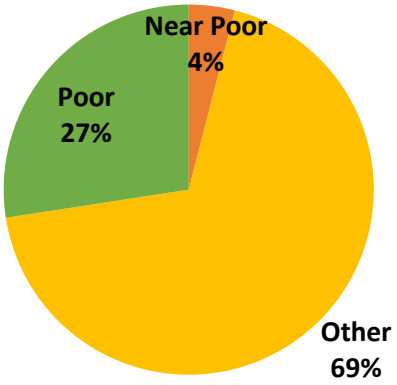

Figure 18. AI Participation Rate in Aquaculture by Household Type
Source: (MoF, 2014).

The insured area of aquaculture insurance did not allocate according to the production area. Total insured area of Soc Trang province was 3.214 ha, accounted for 55% of the total insured area (5,803 hectares) while the aquaculture production area of Soc Trang only accounted for 11.4% of total production area of the 5 provinces. On contrary, production area of Ca Mau was 296.5 thousand ha, 4.5 times higher than Soc Trang province but the insured area was only 284 ha, less than one tenth of insured area in Soc Trang.

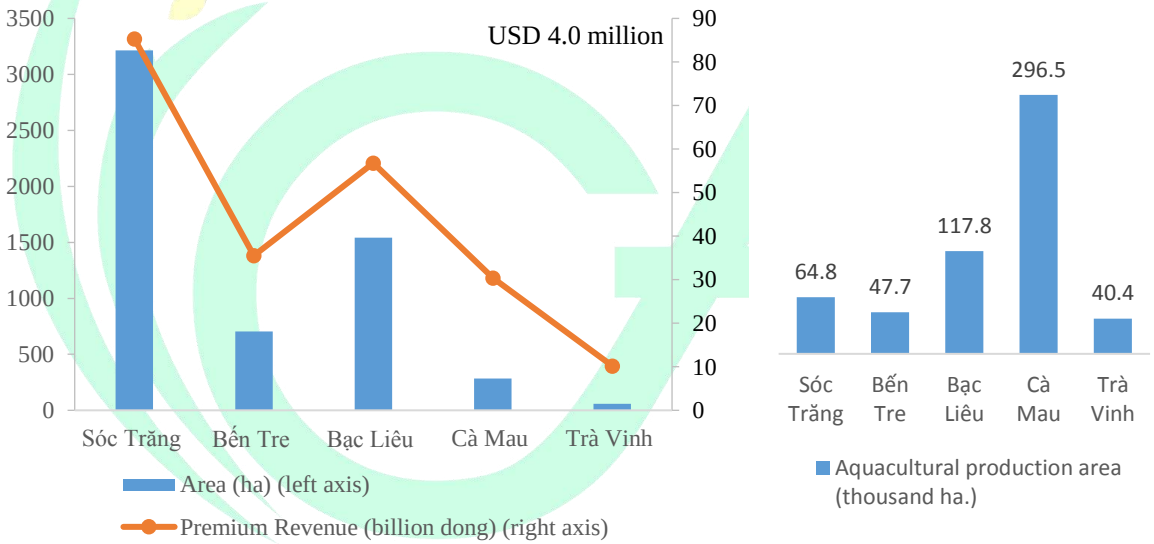

Figure 19. Area and Premium Revenue in Aquaculture Insurance in 2011-2013
Source: (MoF, 2014), GSO (2016)

The insured value and premium revenue was according to the insured area. Total insured aquaculture value during the pilot period was 2,883.7 billion VND (USD127.3 million). Total revenue from aquaculture premium was 218.2 billion VND (USD12.4 million), of which Soc Trang and Bac Lieu recorded the highest revenue. However, it can be seen that the value to area ratio in Ben Tre and Ca Mau was much higher than other provinces.

Compensation rate of aquaculture insurance was the highest among 3 insured sectors, with led to the overall loss of NAIPP. Total actual compensation of aquaculture was 669.5 billion VND (USD29.6 million), the average claims ratio was 306.83%. Especially, Tra Vinh province only implemented aquaculture insurance after the supplement of Circular 43/TT-BNNPTNT, one year later compared to other provinces but the claims ratio was up to 466.7%.

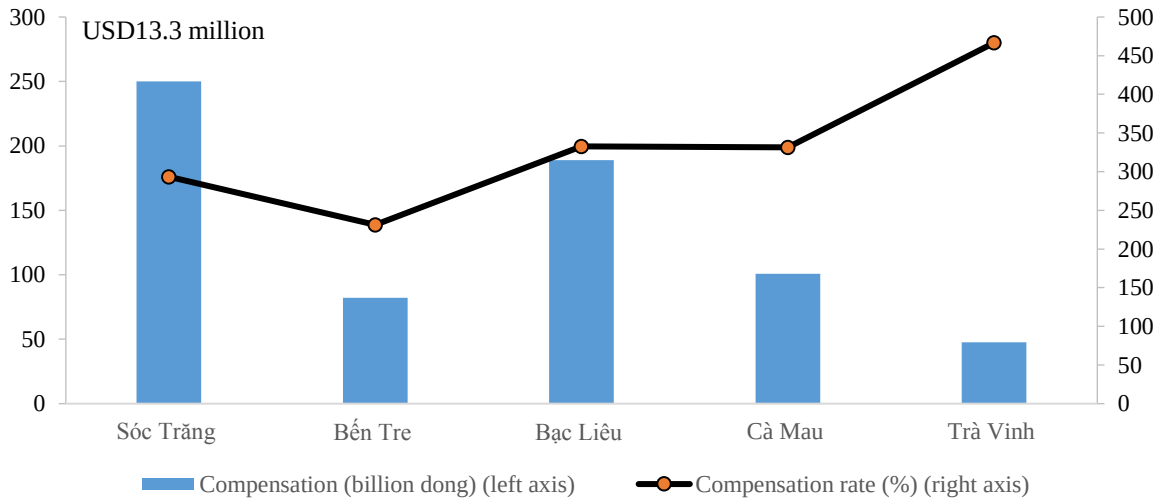

Figure 20. Compensation and Claims Ratio of Aquaculture Insurance in 2011-2013
Source: (MoF, 2014).

The results show a significantly high rate of compensation in aquaculture insurance. The result from the author's focus group discussion in Ben Tre show significant difference in the frequency of disease outbreak in NAIPP years comparing to earlier years. Insurance fraud did happen, but was not considered big problem. The problem with aquaculture insurance lies in the previous risks evaluation activity - the insurance companies underestimated the risk of diseases to aquaculture. One of the respondents from our survey - who is both a farmer and an aquaculture veterinary with nearly 10 years of experience in aquaculture production - said that, diseases co-exist with aquaculture production in Mekong River Delta and every year, he loses at least 30% of his production to diseases, but still remains the most productive aquaculture farm in his village. Controlling diseases in aquaculture is not only problem with farmers but also with Vietnamese government, and until these diseases are controlled at a certain level, its insurance is not recommended.

5. QUANTITATIVE ASSESSMENT OF NAIPP'S IMPACTS ON FARMER'S LIVELIHOODS

In the previous section, we have looked at NAIPP at national level. In this section, we will analyze the impacts of NAIPP at household level using data from household surveys, in-depth interviews and focus group discussions.

5.1. Statistical Analysis

The results in Table 9 show that direct consultation was the most popular and important channel where farmers accessed information about NAIPP. In Dong Thap 77% of household got information about NAIPP from local government and insurance company staff, 67% of farmers considered this channel as one of the three most important channels. The situation was quite similar in Vinh Phuc where this channel was the information source of 75% of farmers and considered as the important channel by 59% farmers. This result was expected by the research teams as NAIPP was a major program by the Vietnamese government. During the implementation of the program, different stakeholders in the government from central, province, district, and commune were mobilized to raise people awareness of all farmers about the program using different marketing channels. Village meetings were co-organized by local government and insurance companies to introduce AI products and their premium and government subsidy rates. After these meetings, farmers could also contact government staff (usually crop department for rice, fishery division for fishery and veterinary center for livestock) and local branches of insurance companies for a detailed consultation. Apart from these two channels, farmers also knew about the NAIPP via introduction from other farmers (30%) or acquaintances (21%), whose references were considered a reliable source of information for them.

Table 9. Channels for Receiving NAIPP Information

Channel	Percentage of farmer receive information from this channel (%)		Percentage of farmer consider this channel is one of the 3 most important channels (%)	
	Dong Thap	Vinh Phuc	Dong Thap	Vinh Phuc
TV	10.53	7.14	12.28	4.76
Loudspeaker	8.77	26.67	7.02	21.43
Local meetings	28.07	60.78	24.56	40.48
Brochure, advertisement	1.75	24.00	1.75	16.67
Local government staffs, insurance company staffs	77.19	75.00	66.67	59.52
Recommendation from acquaintances	21.08	13.04	15.79	11.9
Other farmers	29.82	2.17	24.56	0
Other	3.51	0	3.51	0

Source: CAP research team (2016).

Farmers received information about the benefits of AI in general and regarding NAIPP specifically. They were made aware that AI would help compensate part of their losses when risks happen. It is the main reason 80% of households in both Dong Thap and Vinh Phuc participated in NAIPP. The second most important reason was that farmers could access premium exemption and reduction, especially poor and near poor households, who did not have to pay any premium. These households might not be aware of the role of AI or how it works, but since they did not have to pay anything, they participated. Some farmers in Dong Thap found out that their neighbors were buying AI and followed the trend. Also in Dong Thap, rice contract farming is popular - where enterprises provide inputs and buy production from farmers - and some contract farming companies required farmers to buy AI before signing the contract. However, they also provide their own premium support, so that regular households, besides 60% exemption from government, received 20% support from

company and only had to pay 20% of the premium. This was the motivation to buy AI for 42% household in Dong Thap.

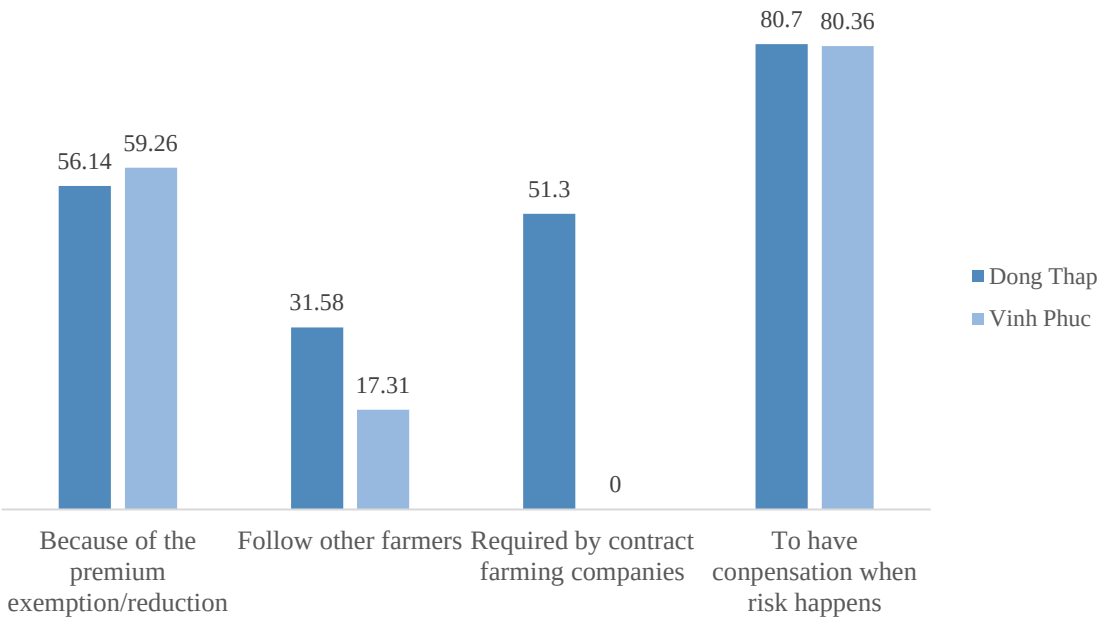

Figure 21. Reasons Farmers Participated in NAIPP
Source: CAP research team (2016).

Illustrated by Table 10, AI products is suitable for both farmers and insurance companies. There were two main AI products, including insurance for climate risk[11] and insurance for disease/pest risks[12]. While disease/pest risks happened to most farmers (75.8%) and regularly (7.7 times), the losses were not too high (21.8% of production). Climate risk caused serious losses (58.3%), but rarely happens (1.3 times) and only a small percentage of farmers witnessed these events. There are also three risks which farmers witness regularly, but were not included in NAIPP, including heavy rain (39.6% of farmers), rat (71.1%) and Asian rice gall midge (muỗi hành) (40.3%).

Table 10. Production Risks for Rice Farmers in Dong Thap

Risk	Percentage of Farmers %	Frequency		Average Production Loss (%)	
		Mean	SD	Mean	SD
Insured climate risks	12.1	1.3	0.8	58.3	34.4
Insured diseases and pests	75.8	7.7	7.0	21.8	19.6
Noninsured climate risks	39.6	2.7	2.5	32.3	28.9
Rat	71.1	6.5	3.5	15.5	14.3
Asian rice gall midge	40.3	2.4	2.9	25.3	19.5
Other	14.7	7.8	2.8	17.6	15.4

Source: CAP research team (2016).

In Vinh Phuc, risks happened less regularly and damage was not too serious. No farmers in Vinh Phuc suffered from climate risks (or the impacts of these risks were insignificant).

[11] Including: Storm, flood, typhoon and drought
[12] Including: Rice Grassy Stunt Virus (Vàng lùn), Rice Ragged Stunt Virus (Lùn xoắn lá), Black streaked dwarf (Lùn sọc đen), Rice Blast Disease (Đạo ôn), Blight of rice (Bệnh bạc lá lúa), Brown plant hopper (Rầy nâu) and Stem borer (Sâu đục thân).

The most common risk was diseases[13], which 45% of farmers suffer from at least once and on average 2.2 times during 2011-2016. However, farmers' production losses due to these diseases were not too serious (only 24.8%). Production losses due to other diseases[14] were similar (25.8%) and as frequent (2.2 times) but only witness by a very small number of farmers (12.7%).

Table 11. Risks Experienced by Rice Farmers in Vinh Phuc

Risk	Percentage of Farmers	Frequency		Average Production Loss (%)	
	%	*Mean*	*SD*	*Mean*	*SD*
Insured climate risks	0	0	0	0.0	0.0
Insured diseases	45.3	2.2	2.3	24.8	25.5
Noninsured diseases	12.7	2.2	2.4	25.8	33.6

Source: CAP research team (2016).

While farmers in Dong Thap only participated in NAIPP in the first year, more and more farmers in Vinh Phuc participated in the program. In Dong Thap province, most farmers only bought AI products one or two times, respectively 22.8% and 36.8%. Table 12 shows a decreasing trend in Dong Thap where farmers mostly participated in NAIPP in the first year of 2012, and this number reduced by half in 2013. On contrary, only 50% of farmers in Vinh Phuc participated in the program in 2012 and nearly 80% of them participated in 2013. In 2014, the national program was stopped, but the Vinh Phuc government support using their own budget AI for dairy farmers.

Table 12. Percentage of Farmers Buying Insurance by Seasons and Year

Province	Season	2012	2013	2014
Dong Thap	Winter-Spring	64.9	36.8	0
	Summer – Autumn	54.4	22.8	0
	Autumn - Winter	19.3	5.26	0
Vinh Phuc		50.0	79.7	43.8

Source: CAP research team (2016).

In Dong Thap, among compensated farmers, most of them got compensation due to climate risks, including storm/flood (41.9%) and typhoon (16.3%). However, average compensation received from these risks was lower than disease risks (10.3 million (USD455) for storm/flood and 2.9 million (USD128) for typhoon). Farmers who suffered from Rice Blast Disease got the most compensation of 38.6 million VND (USD1700), Stem borer average compensation was 19.0 million VND (USD840) and Brown Plant hopper compensation is 15.0 million VND (USD560).

[13] PRRS, FMD, Bird flu, New Castle, Gumboro, Swine Fever, Pneumonic Pasteurellosis and Anthrax
[14] Including: Colibacteriosis, Edema disease, Diarrhea, Swine pox…

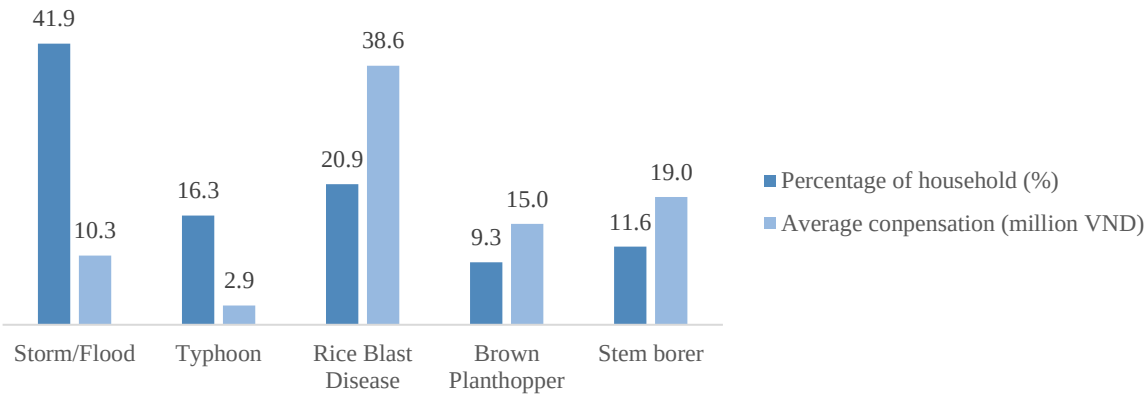

Figure 22. Insured Risks and Compensation in Dong Thap
Source: CAP research team (2016).

In Vinh Phuc, Pasteurellosis was the most common disease where farmers received compensation (71% of compensated households) and also received the highest compensation (37.4 million VND /USD1650). The value of compensation from other risks (Storm/flood, FMD, Anthrax, Salmonellosis) was quite high (19.8 million VND/USD870 - 36 million VND/USD1590 per household) but only occurred in a small proportion of household (less than 10%).

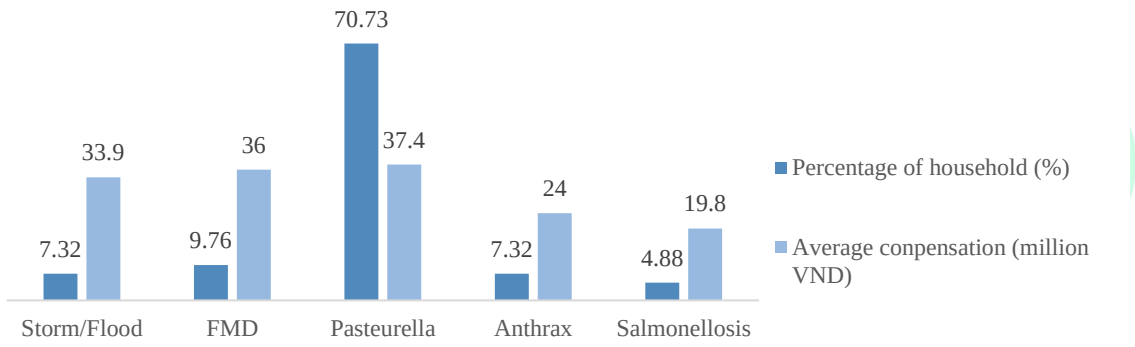

Figure 23. Insured Risks and Compensation in Vinh Phuc
Source: CAP research team (2016).

Most households in Dong Thap and Vinh Phuc used their compensation to recover their production (87.9% and 92.0% respectively). This money was used to pay for production inputs (mostly seeds for rice households and animal feed for livestock households) for the next season. Only a few households used compensation for other purposes, including for food, medical expenses or to pay loan interest.

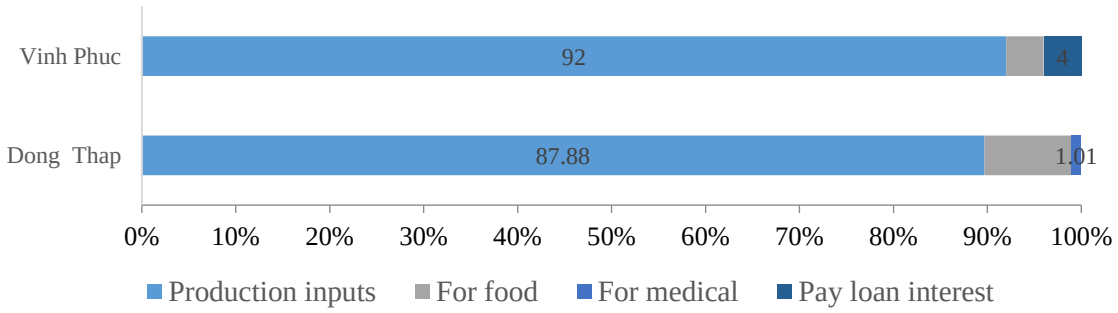

Figure 24. Uses of Compensation
Source: CAP research team (2016).

According to focus group discussions, because of the delay in receiving compensation, most household had to buy inputs for the next season on credit and use the compensation to pay the inputs dealers. On average, after finishing all the compensation procedures, farmers had to wait about one month to get the money. Less than 10% of farmers received compensation after 1 weeks, nearly 20% of them have to wait up to two months for the compensation or even some household had to wait 3 months (16.67% household in Dong Thap and 6.06% household in Vinh Phuc) (detail compensation process in Figure 10). This might be a dis-advantage of index insurance comparing to indemnity insurance products.

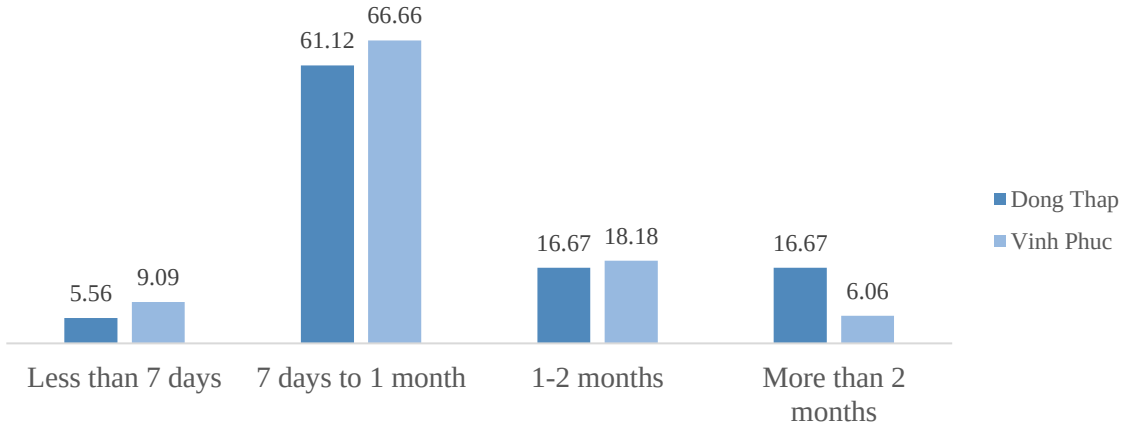

Figure 25. Time to Receive Compensation
Source: CAP research team (2016).

Despite the efforts of government and insurance companies, most farmers in Dong Thap showed a neutral or negative attitude towards AI. Because index insurance is quite new in Vietnam, even many government staff do not understand this insurance form. Farmers and local staff were used to health insurance, loan insurance or car insurance which is clear that whoever suffers from losses will get compensation. However, with the index insurance, in many cases where some specific farmers suffered from serious losses, but the average yield of the area did not reach the identified level, they wouldn't get compensation. These were the cases where farmers were not satisfied with AI.

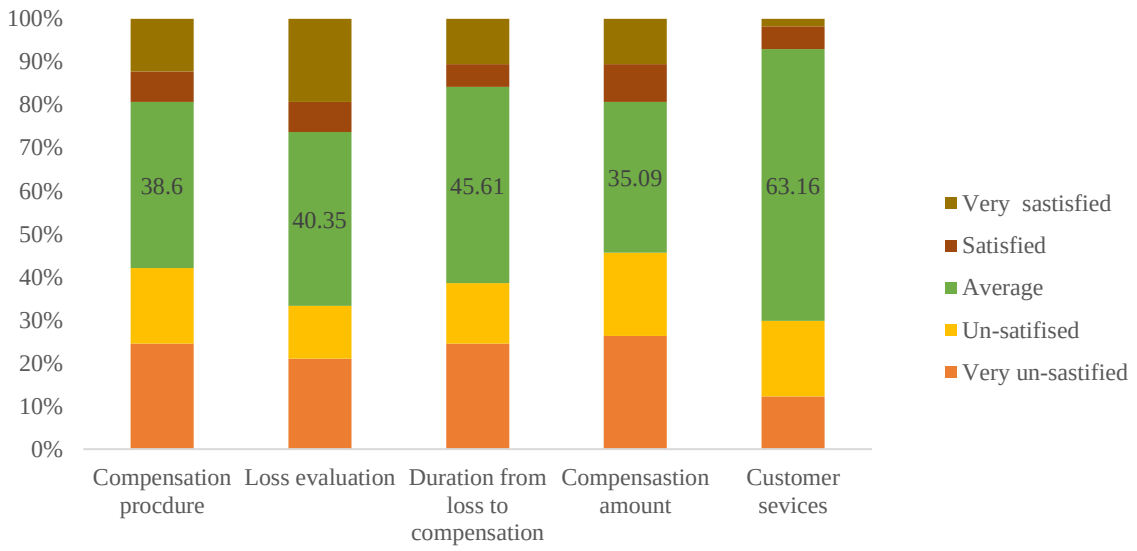

Figure 26. Dong Thap Farmers' Evaluation of NAIPP
Source: CAP research team (2016).

Farmers in Vinh Phuc shows a much more positive attitude toward AI. There were some concerns in the beginning about the compensation procedure, however, information from focus group discussions showed that when loss events happened, farmers just needed to call the representative of the AI company in the area. This representative will be in charge of contacting other members of the NAIPP board and they would visit the farmer within 24 hours.

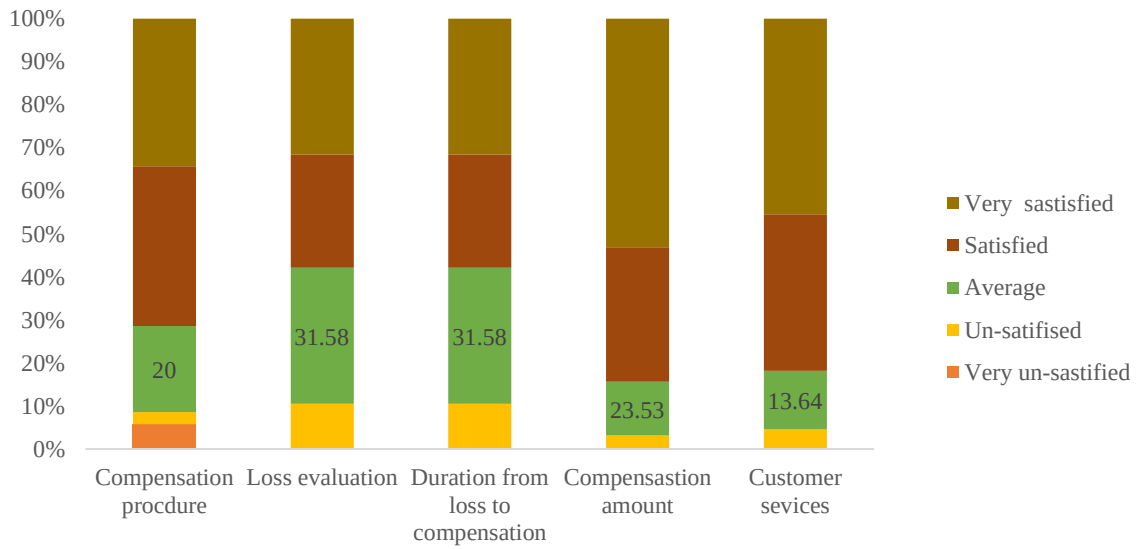

Figure 27. Vinh Phuc Farmers' Evaluation of NAIPP
Source: CAP research team (2016).

Apart from farmers who participated in AI, the research team also interviewed farmers who did not participated in the program as a control group. Unfortunately, only 28% of those in Dong Thap and 40% in Vinh Phuc knew about NAIPP. The main reasons those people did not participate in the NAIPP was lack of information about the program (64% of households in Dong Thap and 48% in Vinh Phuc) and could not see the benefits of the program (21% in Dong Thap and 38% in Vinh Phuc). This result shows that the dissemination of NAIPP information still has many gaps that need to be improved. Besides, 463% of farmers in

Vinh Phuc thought that their production scale was too small to buy AI and 27% of farmers in Dong Thap were afraid of the complicated compensation procedure.

Table 13. Perception of Non-insured Farmers About NAIPP

Questions	Dong Thap	Vinh Phuc
Does household know about the NAIPP	27.78	39.74
Does household want to participate in the NAIPP	34.25	52.00
Reasons farmers did not participate in NAIPP		
Do not understand about the NAIPP	63.89	48.15
Do not see any benefit	21.3	38.46
Premium too high	1.85	12.50
Household production scale too small	1.85	46.43
Strict production procedure	0	0
Strict quarantine requirement	2.78	0
Complicated registration procedure	9.26	0
Complicated compensation procedure	26.85	0

Source: CAP research team (2016).

Percentage of farmers willing to buy insurance in the future is adequate. 54% of households in Dong Thap and 68% of households in Vinh Phuc intended to buy AI if NAIPP continued. However, without government support, this percentage reduced sharply to 24% in Dong Thap and 40% in Vinh Phuc. Because of the difference in insurance products and insurance forms (traditional verse index), it indicates that NAIPP was implemented more suitable in Vinh Phuc than in Dong Thap.

Table 14. Prospective on AI in the Future

	Dong Thap	Vinh Phuc
Will household buy AI if the NAIPP continues	53.69	67.79
Will household buy AI if there is no premium exemption/reduction	24.16	40.27

Source: CAP research team (2016).

In conclusion, the insured risks under NAIPP were suitable in Dong Thap and Vinh Phuc, with adequate frequency for both farmers and insurance companies. The percentage of farmers witnessing covered risks and receiving compensation were not high. Compensation was used for production, the purpose of NAIPP. However, there were still many problems with the implementation of NAIPP at the local level as many farmers did not understand about the program or AI, especially index insurance. Some farmers who participated in the program had negative attitudes toward NAIPP, especially the slow compensation procedure.

5.2. Determinants of NAIPP Participation, Impacts on Farmer Livelihoods

5.2.1. Rice Insurance

Determinants of NAIPP Participation

Table 15 describes possible characteristics that influenced the possibility of AI participation by rice cropping households. In most studies, researchers used demographic characteristics (age, sex or education level) of household head (farm owner). However, in many cases in Vietnam, household heads do not participate in agricultural activities (too old or went to work in cities) and they don't make the decision related to agricultural production. Therefore, using household head's characteristic might not be reliable. Thenceforward, in our recent survey, in demographic section of each member, we asked whether this member is the key household labor who make decisions on agricultural production. Demographic information of this member will be used in the following analysis. There is no significant different in the age of key household labor between participants and

non-participants. However, key labor in participant's household had significant higher education level and labor.

There was a higher rate of poor households (in the order: 1 = poor household, 2 = near poor, 3 = normal household) participating in NAIPP. With the premium subsidy policy (free to the poor, 50% of premium to near poor families), if the insurance premium is a factor that farmers consider to take part of the AI, the poorer a household was the more attractive the insurance program.

Table 15. Statistic description of control factors

	Non-AI	AI	Total			t-test
			Mean	*Min*	*Max*	
Age of household key labor (year)	47.49	49.51	48.18	23	74	0.3025
Education of household key labor (year)	**5.44**	**7.53**	**6.15**	**0**	**18**	**0.0012**
Number of laborers working on rice production	**1.4**	**1.71**	**1.5**	**1**	**4**	**0.0087**
Type of household (0=; 1=Poor; 2=Near poor; 3= Normal households)	2.66	2.51	2.61	1	3	0.2262
Farmers awareness of risks in the future	13.3	14.94	13.86	1	54	0.3413
Household borrow money/Household income (%)	20.69	24.07	21.85	0	444.44	0.6900
Maximum amount of cash that household can access during emergency (million VND)	**6.74**	**14.18**	**9.29**	**0**	**150**	**0.0912**
Whether household was currently borrowing money	**0.35**	**0.62**	**0.44**	**0**	**1**	**0.0010**
Distance from households to commune center (km)	0.35	0.63	0.44	0	1	0.2184
Household production area in 2011	6.57	5.07	6.06	0.2	40	0.1730
Number?	98	51				149

Source: CAP research team (2016).

It could also be that the poor farmers have a greater proportion of agricultural income over total income hence they participate in the insurance program to protect their main income (the average of this proportion of two provinces is 74.5% - the highest level amongst groups). In 2011, the participant group's area of rice crop is bigger than the non-participants', meanwhile the average of loan value is smaller. Area of rice field may not affect to a farmer's decision-making process or it can impact in a nonlinear order. A higher value of borrowed money / loans may be a factor that stimulates a household to buy insurance and expand their production. In addition, if the location of production is far from the community center, the information on risk mitigation and new technologies comes late and is incomplete. All of these factors can impact the farmer's decision to participate in the insurance program. After eliminating controlling variables that make the model unbalancing, the estimator of the propensity score is given in Table 16.

Table 16. Result of Probit Regression

Farmers' participation to AI (1=Yes; 0=No)	Probit Model				Marginal Effects	
	Coef.	Std. Err.	z	P>z	dy/dx	Std. Err.
Type of household	-0.3326*	0.1804	-1.8400	0.0650	-0.1157	0.0623
Age of key labor	0.0174*	0.0102	1.6900	0.0900	0.0060	0.0036
Education level of key labor	0.1397***	0.0370	3.7700	0.0000	0.0486	0.0127
Maximum loan value before 2011	0.0083*	0.0050	1.6500	0.0990	0.0029	0.0018
Maximum loan value before 2011 (squared)	0.8320***	0.2528	3.2900	0.0010	0.2894	0.0866
Farmers' awareness of risks in the future	0.0126	0.0117	1.0700	0.2830	0.0044	0.0041
Size of field in 2011	-0.1387**	0.0596	-2.3300	0.0200	-0.0482	0.0207
Squared size of field in 2011	0.0031*	0.0018	1.7100	0.0860	0.0011	0.0006
_cons	-1.3707**	0.6845	-2.0000	0.0450		

Source: CAP research team (2016).

With a significance level of 10%, the farmers' awareness of risks does not effect on the farmer possibility of insurance participation. Except this factor, all of other variables (type of household, age and education level of key labors, whether or not the household borrowed money and the maximum value of loans, and size of cultivation area in 2011) influenced the propensity of a farmers' insurance participation. In detail: the richer a household is the more willing they are to join the insurance; it is the same situation with age, education, and whether they were in debt. Size of crop field only has effect on the propensity score in squared level. That means the possibility that farmers participate in NAIPP decrease gradually when farmers production area get larger, however, when the production reach certain level, this possibility start to increase. If other factors are given, the farmer possibility of joining the program reaches the minimum level at 22.37 hectares/year. Nevertheless, only 3.7% of farmers in survey sample have production area larger than 22.37 ha, so mostly smaller households are more likely to participate in the Program.

Impacts on NAIPP Participation

Table 17. Statistical Description of Outcomes by the Treatment AI

Variable	Mean	Std. Dev.	Mean	Std. Dev.
	Non-AI		AI	
Per capita rice production income in 2013	50.7	51.72	43.85	47.69
Per labor income from rice cultivation in 2013	78.12	81.69	75.33	80.21
Per capita income in 2013	66.93	90.05	57.33	53.16
Per labor income in 2013	105.19	163.87	97.5	95.58
Income from rice producing in 2013	170.93	176.15	156.12	158.37
Income from agricultural production in 2013	180.81	175.21	178.59	165.79
Total income in 2013	218.76	239.38	206.47	192.61
Total production cost in 2013	145.27	308.43	1,227.07	7,864.42
Profit from rice cultivation in 2013	25.66	299.96	1,071.05	7,765.77
Agricultural income over total income in 2013 (%)	86.76	19.62	85.67	20.18
Rice cultivation income in total income in 2013	80.99	22.65	71.81	24.91
Productivity of rice cropping in 2013	7.5	1.59	7.11	1.44
Total output in 2013 (ton)	46.81	45.27	40.47	39.2
Rented field in 2013	1.37	3.72	1.14	3.47
N		98		51

Source: CAP research team (2016).

On average, outcomes represented for the rice production (including income, productivity and output) of the participant group are higher than ones of the control group at the time when the program has finished. The rented cropping area of the nonparticipant group is also bigger, meanwhile their production expense is less than the participant group.

Table 18. Statistical Description of Outcomes by Time

Variable	Mean	Std. Dev.	Mean	Std. Dev.
Y|D=1	**t= 2011**		**t=2013**	
Per capita rice production income	39.99	46.95	43.85	47.69
Per labor income from rice cultivation	69.01	78.55	75.33	80.21
Per capita income	53.5	51.95	57.33	53.16
Per labor income	91.5	93.08	97.5	95.58
Income from rice producing	142.8	155.02	156.12	158.37
Income from agricultural production	165.75	163.29	178.59	165.79
Total income	194.02	188.28	206.47	192.61
Total production cost	1,209.49	7,817.76	1,227.07	7,864.42
Profit from rice cultivation	-1,066.69	7,717.18	-1,071.05	7,765.77
Agricultural income over total income (%)	86.26	20.35	85.67	20.18
Rice cultivation income in total income	71.78	26.08	71.81	24.91
Productivity of rice cropping	7.26	0.88	7.11	1.44
Total output (ton)	36.56	37.46	40.47	39.2
Rented field	0.76	2.97	1.14	3.47
N		51		50

Source: CAP research team (2016).

Comparing the outcomes of the participating group between two periods, before and after participating the insurance program, it can be seen that income (income and average of income), cost and rented area indicators, all of them have increased but yield and proportion of agricultural income in total income went down.

However, as the above analyzing part, this comparison is not accurate due to differences amongst characteristics of two groups, therefore, in the next section empirical methods will be used to analyze the real impacts of NAIPP.

Based on five blocks in the common support interval, matching and comparing are carried out. All results of the models are displayed in Appendix H. However, most of the results are not statistical significant, there is no outcome witness a significant t value for all matching methods. In Table 19, results where the impacts NAIPP is significant are presented.

Table 19. Matching propensity score and comparisons of outcomes

Outcome	Method	n. treat.	n. control.	ATT	SE	t	Outcome changed
Per labor income from rice cultivation in 2013	Nearest neighbor	51	28	19.544	20.347	0.961	
	Radius	51	65	11.48	13.109	0.876	
	Stratification	51	65	17.936	10.106	1.775	+
	Kernel	51	65	16.961	19.705	0.861	
Difference of per labor income from rice cultivation 2013 -2011	Nearest neighbor	51	28	3.175	3.117	1.018	
	Radius	51	65	4.262	2.791	1.527	+
	Stratification	51	65	3.565	3.299	1.081	
	Kernel	51	65	3.696	2.688	1.375	+
Profit from rice cultivation in 2013	Nearest neighbor	51	28	-1.12138	0.807636	-1.388	-
	Radius	51	65	-1.12409	0.966188	-1.163	
	Stratification	51	65	-1.12958	1.176075	-0.96	
	Kernel	51	65	-1.12783	1.393063	-0.81	
Difference of productivity of rice cropping in 2013	Nearest neighbor	51	28	-0.161	0.109	-1.487	-
	Radius	51	65	-0.144	0.131	-1.102	
	Stratification	51	65	-0.217	0.26	-0.833	
	Kernel	51	65	-0.204	0.246	-0.83	
Change in output 2011-2013	Nearest neighbor	51	28	1.571	2.495	0.63	
	Radius	51	65	3.3	2.292	1.44	+
	Stratification	51	65	2.042	2.17	0.941	
	Kernel	51	65	2.283	1.459	1.565	+

Source: CAP research team (2016).

Total income per laborer had increased 17.9 million VND (USD791) thanks to the NAIPP using PSM model and stratification method. DID model also witness a 3.6-4.6 million VND (USD159-USD203) increase in farmers' income before and after AI, thanks to NAIPP (Radius and Kernel method).

Despite the increase in total output of 3.3 tons/ha (DID method), results of DID models show that farmers' production cost increased 12-13 million VND (USD530-USD574) after joining NAIPP and their profit per ha is 1.1 million VND (USD49) lower than non-AI household in PSM model (Nearest neighbor matching). Productivity of rice also reduced by 0.16 tons/ha in the result of the same model and matching method.

Generally, the effect of NAIPP in Dong Thap is not clear; some outcomes on households changed and became more negative, but only in certain models and matching methods.

5.2.2. Livestock Insurance

Determinants of NAIPP Participation

To analyze the determinants of farmers' participation to NAIPP, the research team did descriptive analysis to explore the initial difference between participants and non-participants. The result in Table 20 show that there are significant differences between age of household key labor, number of livestock labor, type of household, maximum non-deposit loan they can get during emergencies and their relative location. There is not much difference in other factors, including education level of household key labor, their awareness of risks, and their percentage of borrowed money among their total income and the proportion of livestock income among total income.

On average, age of key household labor is about 51.2 years old and finished secondary school (9.36 years of education). AI household have 2.27 laborers working in livestock production while non-AI household only have 1.73 laborers, maximum number of laborers in a household is 6 people while some households only have 1 laborer. Household type is also expected to have a significant impact of their decision because of the difference in premium exemption/reduction. Table 20 also shows that while 23% of AI participants are poor households, only 9.3% of the non-participant is poor.

Table 20. Controlling Variables of Participants and Non-Participants

	Non-AI	AI	Total			t-test
			Mean	Min	Max	
Age of household key labor (year)	52.8	49.1	51.2	26	75	0.0419
Education of household key labor (year)	9.37	9.34	9.36	0	16	0.9827
Number of labor working on livestock sector	1.73	2.27	1.96	1	6	0.0000
Type of household (0=Normal household; 1=Poor/near poor households)	0.09	0.23	0.15	0	1	0.0174
Farmers awareness of risks in the future	11.8	11.44	11.65	6	16	0.3124
Household borrow money/Household income (%)	7.47	17.02	11.58	0	375	0.1206
Maximum amount of cash that household can access during emergency (million VND)	6.77	15.09	10.32	0	200	0.0617
Distance from households to commune center (km)	0.97	1.26	1.09	0.03	3.5	0.0008
Percentage of livestock income in total household income before NAIPP (%)	49.96	52.48	51.04	0	100	0.6560

Source: CAP research team (2016).

Farmers' awareness of risk is measured by their prediction of production risks occurring in the future. The research team asked farmers to rate the possibility of different types of production risks, including climate risks and disease risks in the future from 1 (Decrease sharply) to 5 (Increase sharply). The total points from their evaluation represent their point of view of the future. No difference between these two group in this descriptive analyze was shown.

In the survey, the maximum amount of cash that farmer can get during an emergency was used as a proxy to measure their social capital. It was hypothesized that the more money they can borrow during emergencies, the more easily they can adapt to risks and therefore, the less likely to buy insurance. Descriptive results showed that AI households can access

to 15.09 million VND (USD667) during emergencies while non-AI household can only access 6.77 million VND (USD300). Another hypothesis was that households who live near commune centers find it easier to get off-farm jobs, thus they can adapt to production risk without AI Results from descriptive analysis supports this assumption where non-AI households live 0.97 km from commune center where AI households live 1.26 km from the center. Another assumption is that farmers who rely on livestock production are more vulnerable to risk, therefore, they have to rely on AI to stabilize their income, but descriptive statistic shows no significant difference.

After the preliminary descriptive analysis, Probit regression was used to analyze the real determinants of each factors to the farmers' decision to join AI, results are shown in Table 21.

Table 21. Determinants of farmers' NAIPP participation – Probit model

	Probit				Marginal Effects	
Farmers' participation to AI (1=Yes; 0=No)	Coef.	Std. Err.	z	P>z	dx/dy	Std. Err.
Age of household key labor (year)	**-0.02**	**0.01**	**-2.12**	**0.03****	**-0.01**	**0.00**
Education of household key labor (year)	-0.01	0.03	-0.52	0.60	-0.01	0.01
Number of labor working on livestock sector	**0.88**	**0.21**	**4.14**	**0.00*****	**0.35**	**0.08**
Type of household (0=Normal household; 1=Poor/near poor households)	**0.75**	**0.35**	**2.18**	**0.03****	**0.29**	**0.13**
Farmers awareness of risks in the future	**-0.11**	**0.06**	**-1.92**	**0.06***	**-0.04**	**0.02**
Household borrow money/Household income (%)	-0.12	0.29	-0.42	0.67	-0.05	0.11
Maximum amount of cash that household can access during emergency (million VND)	0.01	0.01	1.10	0.27	0.00	0.00
Distance from households to commune center (km)	**0.65**	**0.25**	**2.57**	**0.01****	**0.25**	**0.10**
Percentage of livestock income in total household income (%)	0.00	0.00	1.26	0.21	0.00	0.00
_cons	-0.35	1.05	-0.33	0.74		

Source: CAP research team (2016).

Regression results give a quite similar picture to the descriptive analysis. Age of household key labor has significant and positive impact on AI participation, which means younger households are more likely to participate than older households. As AI is still very new in Vietnam, young farmers may find it easier to absorb new concepts and practices. This marginal effect result shows that every year younger of household key labor will increase their probability to participate in AI by 1%.

Households who participated in AI have to follow a standard procedure provided by the government, which is more time consuming and labor intensive. Therefore, it is not surprising when households with more labors in livestock production are able to participate in AI. If household have 1 more livestock labor their chance of buying AI will increase 34.57%.

The difference in farmers' awareness of risks was not significant in the descriptive statistic, but was significant in this regression analysis. However, it is opposite of the original hypothesis that households who foresee more risk would be more likely to buy AI. In this regression result, farmers who see more risks are less likely to buy AI. Follow up with several farmers lead to an understanding that AI farmers are applying more standard production procedure and therefore, think they suffer from less risks than non-AI households.

The distance from household to commune center is also significant at 5% level and similar to the descriptive analysis, the closer household to the commune center, the less likely they are to buy AI. Marginal effect shows that 1 km further to the commune center increase the participation probability 25%.

Impacts of NAIPP Participation

In this section, PSM and DID methods are used to analyze the impact of NAIPP on farmers' different outcomes.

Table ***22*** shows information of AI and non-AI household in 2013.

Table 22. Statistics of Livestock Outcomes of AI and non-AI Households in 2013

	Non-AI	AI	Total	Min	Max	t-test
Household income (mil. VND)	160.4	221.72	186.74	15	1,250.00	0.0788
Agricultural income (mil. VND)	101.07	151.32	122.51	10	1,065.00	0.0914
Per capita income	39.26	52.45	44.93	4	370	0.1607
Per labor income	57.09	76.45	65.41	5	600	0.1387
Livestock revenue	94.83	151.46	118.99	10	1,045.00	0.0554
Livestock production expenditure	67.94	82.18	74.02	0	1,000.00	0.5496
Livestock profit	38.61	63.34	49.37	2	420	0.0234
Profit over revenue ratio	42.23	45.46	43.63	8.86	90	0.3519
Agricultural income over total income (%)	58.57	65.44	61.52	0	100	0.2101

Source: CAP research team (2016).

On average, income of AI household is significantly higher than non-AI households in 2013, their total average income was 221 million VND (USD9760), which is 38.3% higher than non-AI households. The difference in agricultural income of AI households and non-AI households is even larger, non-AI households only earn about 100 million VND (USD4416) from agricultural activities in 2013, two third of AI households.

The difference in per capita and per labor income of these two groups is large but not statistically different. On average, per capita income of AI households is 52.45 million VND (USD2317) and per labor income is 76.5 million VND (USD3380), this number for non-AI households are 39.3 million VND (USD1735) and 57.1 million VND (USD2522), respectively.

When it comes to livestock revenue, the gap is much wider, the difference is 56.6 million VND (USD2,473) in absolute and 60% in percentage. Larger production scale also brings larger livestock expenditure as well as profit. However, the profit over revenue ratio of AI household is slightly higher than non-AI households (45% comparing to 43%). AI households also more specialized and rely more on agricultural production than non-AI households, 65% of their income comes from agricultural while this number for non-AI households is 58%. However, it is not significantly different.

Apart from the difference between AI and non-AI households, he changes of farmers' income and production before the NAIPP in 2011 and after NAIPP in 2013 was examined. The results in Table 23 show a significant change of households' income and profit after their participation in NAIPP. Overall, household income increased 68 million VND (from 153 million VND to 221 million VND) or USD3,003 (from USD6,758 to USD9,761), of which, increase in agricultural income is 48.98 million VND (USD2,208). That makes their per capita income and per labor income increase 15.7 million VND (USD693) and 23.49 million VND (USD693) respectively.

Their livestock revenue increased 58 million VND (USD2,562) while production expenditures only increased 40 million VND (USD1,767), a 21.1 million VND (USD932) increase in their profit. However, the difference in profit over revenue ratio is significant but the difference is only around 3%. Changes in their proportion of agricultural income among household total income is not statistically different.

Table 23. Statistics of Livestock Outcomes of AI Households in 2011 and 2013
Unit: Million VND

	2011			2013			t-test
	Mean	Min	Max	Mean	Min	Max	
Household income	153.51	20	892	221.72	30	1,000.00	0.0000
Agricultural income	102.34	0	872	151.32	10	890	0.0002
Per capita income	36.75	3.33	297.33	52.45	5	370	0.0000
Per labor income	52.96	7.5	297.33	76.45	10	370	0.0000
Livestock revenue	92.8	0	797	151.46	10	880	0.0000
Livestock production expenditure	42.17	0	660	82.18	10	727	0.0024
Livestock profit	42.2	2.3	215	63.34	3	300	0.0001
Profit over revenue ratio	42.18	10	87.5	45.46	10	83.33	0.0698
Agricultural income over total income (%)	62.51	0	100	65.44	8	100	0.4908

Source: CAP research team (2016).

The difference between AI and non-AI households might be because of other factors (whether household is poor, or production scale, etc.). Therefore, in the next section, PSM and DID methods were used to eliminate the impacts from these factors to access the real impacts of NAIPP. Table 31 shows no difference in households' total income using PSM models, however, with DID methods and Radius matching methods, it shows that that NAIPP increased farmers income by 18 million VND (USD795). It also helped increase farmers' income from agriculture by 32 million VND (USD1,413) in Radius method of PSM and 28 million VND (USD1,237) in Kernel method of DID model.

Table 24. Impacts of NAIPP on Households' Total Income and Agricultural Income

Outcome		Method	n. treated	n. control	ATT	SE	t	Outcome changed
Household total income	PSM	Nearest neighbor	62	28	-30.694	72.734	-0.422	
		Radius	57	71	26.635	36.611	0.728	
		Stratification	62	71	-61.228	53.992	-1.134	
		Kernel	62	71	-57.282	56.999	-1.005	
	DID	Nearest neighbor	62	28	-10.839	26.161	-0.414	
		Radius	57	71	18.465	12.419	1.487	+
		Stratification	62	71	-16.457	20.091	-0.819	
		Kernel	62	71	-14.264	28.854	-0.494	
Household Agricultural income	PSM	Nearest neighbor	62	28	-2.498	33.644	-0.074	
		Radius	57	71	32.344	22.525	1.436	+
		Stratification	62	71	-26.882	37.388	-0.719	
		Kernel	62	71	-25.286	34.217	-0.739	
	DID	Nearest neighbor	62	28	35.284	34.054	1.036	

Outcome		Method	n. treated	n. control	ATT	SE	t	Outcome changed
		Radius	57	71	18.588	15.872	1.171	
		Stratification	62	71	30.711	26.344	1.166	
		Kernel	62	71	28.22	15.555	1.814	+

Source: CAP research team (2016).

Result from Table 25 show that AI has have positive impacts on household profit from livestock and profit over revenue ratio using PSM methods. All matching methods of PSM model shows some positive impacts of NAIPP, when the program helped increase farmers' livestock profit by 17.6 million VND (USD777) (stratification method) up to 32.82 million VND (USD1,450) (radius method). The program also helped increase the profitability of farmers where the profit over revenue ratio increased about 13-14% (in PSM model). However, the results of DID models do not show a significant change, which means that the different might be because of the difference in economic status before participating in NAIPP.

Table 25. Impacts of NAIPP on Households' Livestock Profit

Outcome		Method	n. treated	n. control	ATT	SE	t	Outcome changed
Profit from livestock production	PSM	Nearest neighbor	62	24	23.928	10.914	2.192	+
		Radius	33	61	32.824	12.612	2.603	+
		Stratification	62	71	17.564	13.559	1.295	+
		Kernel	62	71	20.715	14.696	1.41	+
	DID	Nearest neighbor	62	23	2.056	6.597	0.312	
		Radius	28	35	3.1825	4.895	0.634	
		Stratification	62	71	1.907	4.526	0.421	
		Kernel	62	71	4.458	5.264	0.847	
Profit over revenue ratio (%)	PSM	Nearest neighbor	62	24	14.264	7.964	1.791	+
		Radius	30	61	0.695	4.35	0.16	
		Stratification	62	71	13.413	2.974	4.509	+
		Kernel	62	71	13.694	4.909	2.789	+
	DID	Nearest neighbor	62	23	-1.435	3.527	-0.407	
		Radius	28	33	4.532	3.799	1.193	
		Stratification	62	71	-0.053	3.463	-0.015	
		Kernel	62	71	-0.869	2.317	-0.375	

Source: CAP research team (2016).

The increase of households' profit not only came from an increase in revenue and production but also in the reduction of their production cost, as shown in Table 26. All models and matching methods show a significant decrease in production cost by at least 31.26 million VND (USD1,381) per households.

Table 26. Impacts of NAIPP on households' livestock production cost

Outcome		Method	n. treated	n. control	ATT	SE	t	Outcome changed
Profit from livestock production cost	PSM	Nearest neighbor	62	24	-100.04	71.436	-1.4	-
		Radius	33	61	28.316	40.239	0.704	
		Stratification	62	71	-111.05	65.468	-1.696	-
		Kernel	62	71	-103.98	63.959	-1.626	-
	DID	Nearest neighbor	62	23	-42.172	28.313	-1.49	-
		Radius	28	33	-31.264	16.69	-1.873	-
		Stratification	62	71	-45.289	26.848	-1.687	-
		Kernel	62	71	-38.248	38.943	-0.982	

Source: CAP research team (2016).

Result from Table 27 re-confirm judgments from the descriptive statistic, where farmers who participated in NAIPP are more specialize, thus their contribution of livestock production in total household income is higher than other households. The difference is 6-9% in PSM method and 14-22% in DID method.

Table 27. Impacts of AI on agricultural income proportion

Outcome		Method	n. treated	n. control	ATT	SE	t	Outcome changed
Contribution of agricultural income	PSM	Nearest neighbor	62	28	5.494	7.278	0.755	
		Radius	57	71	9.254	5.971	1.55	+
		Stratification	62	71	6.061	4.546	1.333	+
		Kernel	62	71	6.091	5.827	1.045	
	DID	Nearest neighbor	62	28	17.493	7.317	2.391	+
		Radius	57	71	14.361	6.947	2.067	+
		Stratification	62	71	22.645	5.059	4.476	+
		Kernel	62	71	21.741	6.356	3.421	+

Source: CAP research team (2016).

Overall, the result of the models shows an undeniable role of NAIPP in the further development of livestock production in Vinh Phuc province, supporting it to become more profitable for farmers taking up AI. The program helped increase their revenue, reduce production costs, thus increase their profit and profit over revenue ratio.

6. CONCLUSIONS AND LESSONS LEARNED

6.1. Conclusions

In general, AI is considered as a form of risk management used to hedge against a contingent loss and widely implemented in the world. AI has appeared since the 18th century and widely develop since the beginning of 20th century and most success cases of AI is in developed countries, such as Germany, USA, Canada, Spain, Japan… Countries apply different management type of AI, but one common point in all countries is government subsidy at different level (13-70% of premium). In ASEAN, AI has been developed in Malaysia, Philippines, Thailand and Vietnam since the late 70s and early 80s. Most of the AI scheme in these countries are sponsored by the government and some of them have achieved certain success, yet not any country has established a fully market based agricultural insurance system.

In Vietnam, AI has been implemented quite early since 1982. However, until 2011, AI market in Vietnam was underdeveloped and accounts for a very small proportion of insurance market, there are some successful models but only in a very small scale with specific conditions. The role of AI in this period had not been recognized by Vietnamese government when after nearly 30 years of implementation in Vietnam, there had not been any specific policy to operate AI, there was no coordination mechanism between insurance companies, re-insurance companies and the government.

In the context of climate change and international integration, Vietnamese government has recognized the importance of AI as a risk financing tool and issued Decision 315/QD-TTg to implement NAIPP and there is a controversy on the success of this program. In general, the NAIPP had nearly established a legal and institutional framework, operational mechanism for AI operation in Vietnam. This showed great efforts of the government in promoting of AI to become a key solution to address increasing risks in the agricultural sector in the context of climate change and economic integration. In term of objectives, this program had quite ambitious objectives which aimed at both poor farmers (maintain social security) and commercial farmers (promote agricultural production). On one hand, the broad objectives allowed Vietnamese government to access the impacts of AI on different types of households and commodities, on the other hand, the broad objective caused lot of difficulties in developing AI products and monitoring farmers' production procedure. The selected provinces and commodities of the program were representative of agricultural production in Vietnam to some extent. Among, 6 ecological regions of Vietnam, 4 regions were selected to participated in NAIPP, Northern Mountainous and Central Highland were not included in the program and these are also 2 poorest regions of the country. This was a surprise as the main objective of the program is to ensure social security.

With the main purpose of supporting the poor, the NAIPP provided farmers with a high supporting level in AI when they participated in insurance. The government subsidy rate is 100% for poor households, 90% for near poor household and 60% for regular households, this is considered high comparing to other countries (40-60%) and also led to some limitation of the program. On the one hand, this policy helped farmers to access better with AI by reducing their financial burden. On the other hand, this program had not selected the farmers who have a real demand for AI. In addition, not paying for the fees or paying for a low rate of insurance fee, leads to the problem that the farmers are less responsible for possible risk management during production. In other words, the program has not encouraged people to join the insurance with the reason of starting AI, coming from the real market demand.

As the nature of a pilot insurance program, only few insurance products were introduced to each sector which allow little choice to farmers. The insurance products were designed by MARD, MoF and the people committees of the piloted provinces, the role of insurance and re-insurance companies were limited. The insurance products were designed based on historical data of production and risks in the last 5 years, therefore insurance cover most of the production risks of farmers. However, the accuracy of risks data is not adequate, which made insurance premium not suitable for some commodities. In most of the cases, farmers can only choose whether to buy insurance or not, there are not many insurance packages with different risks, premium and compensation. This was one of the reason that made the program un-attractive to many farmers.

In terms of implementation process, NAIPP mobilized the participation of government organizations and private sector. MARD and MoF are two main ministries that were in charge of leading the program while province, district and commune governments implemented the program at each area. Bao Viet Insurance company, Bao Minh insurance company and Vietnam Reinsurance companies are 3 representatives from the private sector. Steering Committee is established from central, provincial to district level with the participation of the above mention stakeholders. As a pilot program, the implementation process required the participation of different stakeholders and therefore, it was complicated and sluggish in some steps (e.g. adjustment of insurance products, investigating claims and paying compensation).

During the implementation, government agencies co-operated with insurance companies to organized training courses and communication campaigns with the support from civil organizations such as Farmers' Union and Women Union. Survey results shows that farmers in different regions use different channels to obtain information, and because these courses and campaigns aim at poor households, some households did not participate in NAIPP because they did not know about the program. For participant households, most of them were aware of the role insurance and the enjoying government subsidy.

With regard to participants, the program successfully attracted more than 300.000 participants. Most of the participants are poor, and rice participant accounts for the vast majority of the program. Livestock insurance have the highest percentage of poor participants, follow by rice insurance and aquaculture insurance. However, in term of number, most of poor participants are rice producer households. Despite that rice insurance accounted for nearly 80% of the participants, the insured value of rice insurance was the lowest among 3 sectors and aquaculture insurance have the highest insured value.

The claim ratio and value of compensation in rice insurance and livestock insurance is quite low. However, the claim ratio in aquaculture production is extremely high, together with the high insured value, aquaculture insurance had caused the overall losses of the NAIPP. The compensated amount was adequate and most farmers use compensation to to buy in inputs to recover from risks. However, as the program is a pilot and rice insurance is yield index insurance, most farmers had to wait about 1-2 months to receive their compensation.

The survey showed a significant impacts of livestock insurance and insignificant impact of rice insurance. Livestock farmers enjoyed higher profit from livestock production, their production is also more effective (reflecting in the higher profit/revenue ratio and lower production cost). Livestock farmers are also more specialize on livestock production (refereeing to percentage of livestock income in total household income).

6.2. Lessons for Vietnam

6.2.1. Viewpoints on Agricultural Insurance

The Vietnamese government needs to reconsider the objectives of an AI development program and their role in AI development. Excessively ambitious goals will make the program be less focused and thus, reduce its feasibility, impacts and cause larger burden to state budget. With the current tight state budget, the Vietnamese government should consider AI as a marketed product which needs to be operated under market mechanism; and the government would play a supporting role to facilitate the establishment and operation of the market (establish a suitable legal framework, support communication campaign, support in technical issue, provide data and etc.).

Moreover, the Vietnamese government should be not too hurried to develop AI nationwide. International experiences show that it took countries decades to develop a successful AI system. Forcing development of AI when both farmers and insurers are not ready might bring negative impacts.

6.2.2. Insured Commodities and Insured Events

Following the above comments, insured commodities and insured events should be selected based on the mutual benefit of both farmers and insurance companies. The program should begin with some agricultural commodities and insured events which have the risk level acceptable for both demand side (farmers, agricultural enterprises) and supply side (insurance companies). In other words, certain conditions for insurable risks need to be met:

- *Symmetric information*: the insurer and the insured have the same information concerning with the probability of a bad outcome;
- *Risk should be independent across insured individuals*: if risk is systematic (dependent), special measures have to be taken in order to make insurance solution viable;
- *Calculable*: in order to fix the premium rates, the insurance company must be able to calculate the chance of loss so, the average frequency and the average severity of loss. Actual losses occurring must be determined and measurable; and
- *Affordable premium:* From this perspective, some products with very high frequency of insurance events (diseases) such as shrimp production should be excluded in the AI or only applied in a very small scale for better monitoring.

Specific recommendations for insurance covers are:

- *Crop insurance*: the authors suggest not to expand NAIPP to all crops, but to focus on the main commercial crops in Vietnam (rice, coffee, pepper and cash crops). Indemnity based insurance may be suitable for large-scale farmers. With the small scale of crop production, classical claim-based insurance for individual farmers will be infeasible without government support because of the high transaction and monitoring cost; thus, index insurance may be suitable.

- *Livestock insurance*: Livestock insurance should focus on high value animals (pig, dairy cow, beef cow etc.). Developing insurance should also link with other programs to encourage young and educated labor to stay in rural areas and communication strategies to raise farmers' awareness on livestock diseases prevention. For dairy cows, the insurance fund in Moc Chau model is quite effective and needs to be studied further and expanded if possible.

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- *Aquaculture insurance*: With the enormous claims ratio for aquaculture households in NAIPP, aquaculture insurance is not suggested for the next phase of NAIPP. Only when Vietnamese aquaculture can manage its internal (production process) and external (water source, quality of inputs) risks, then aquaculture insurance should be reconsidered.

6.2.3. Target Clients and Government Subsidies

In future IA programs, the government should continue to subsidize poor, near-poor and non-poor farmers, but with lower premium subsidy rates. Extensive premium subsidies have proved to be not effective and created a false incentive for farmers to participate in NAIPP. Less subsidies might lead to fewer clients, but as they have to pay more for the insurance, they would likely pay attention to the program. A subsidy from 50% - 70% to the insurance premium for farmers who buy insurance should be suitable.

Apart from providing a floor subsidy rate, the Vietnamese government should provide more preferential subsidy rates to farmers who have farming contract with enterprises to create large-scale production zones and improve value chains. Government subsidies for AI development should also be associated with other government supporting programs for farmers and enterprises to avoid overlapping, including but not limited to: government direct support for production loss (Decision 142/2009/QĐ-TTg); government support to preserve rice land (Decree 35/2015/NĐ-CP); government credit for agricultural and rural development (Decree 55/2015/NĐ-CP); government support to reduce post-harvest losses (Decision 68/2013/QĐ-TTg) and government support to develop large scale rice model (Decision 62/2013/QĐ-TTg).

6.2.4. Implementation of the Program

In order to develop a market oriented AI system, the Vietnamese government should welcome the participation and competition of all capable insurance companies. These companies will have to play a leading role and government would provide possible supports. International experience shows that an appropriate number of insurers operating in AI may be from 5 to 10 companies. A steering committee should also be established.

Cautious preparations are needed before the implementation of the program, including:

- *Designing insurance products*: This will be done by insurance companies with the support of MoF, MARD and MONRE. The companies will have to conduct market analysis to design suitable insurance products for each region, MARD would support in providing production, diseases, disaster loss data as well as standard production process, MONRE will provide weather related data, while MoF provides a suitable legal framework, guiding documents and monitors the operation of these insurance companies.

- *Staff training:* In practices, most insurance staff do not have a background in agriculture production, therefore, insurance companies will need to have strategy to train their staff and step by step, becomes less dependent from technical support of MARD. In the case of a pilot program, government should also provide suitable training and allowance for supporting government staff.

- *Communication strategy:* Before selling AI, the Vietnamese government should organize suitable communication strategy, including but not limited to advertisement, meetings, workshops, training courses, TV programs and news stories. It is also

indispensable to have the participation of local civil organizations (Farmers Union, Women Union, Veteran Union, and Youth Union).

During the implementation of the next NAIPP, insurance companies should establish an alliance/association to raise their voice. Government, especially MoF, should work closely with these companies via this alliance/association to have timely adjustments.

6.2.5. Risk Database

The government should assign a specific office/unit to provide risk and production data to insurance companies (Statistical Department or DARD). A lack and inaccurate data is the main reason to the failure of aquaculture insurance of NAIPP, therefore, the role of an adequate database is compulsory. In the scope of NAIPP, insurance companies have to gather information from different offices (Statistical, Agricultural and Rural Development, Environment and Resource) at different levels (province, district, and commune). It was not only time and labor consuming but also, sometimes, the data was not similar between these offices and levels. Via AI alliance/association, insurance companies will discuss with the assigned office/unit to collect information, and if possible, include the risk and production losses questions to periodic national household survey (VHLSS, Enterprises Census).

6.2.6. Application of Advanced Technology

The Vietnamese government should support insurance companies in the pilot application of advanced technologies in AI monitoring assessment such as remote sensing, online data transmission, use of mobile phone systems, etc. The role of government is to create an enabling environment to establish a good inter-connected database and provide suitable infrastructure/facilities. With a better database and adequate infrastructure, insurance companies will be able to design suitable insurance products.

6.3. Lessons for ASEAN Countries

6.3.1. Viewpoint on Agricultural Insurance Development

Depending on the role of agriculture, characteristics of agricultural production and economic status, each country need to develop a clear viewpoint on AI before implementing, including:

- *The objectives of AI*: Governments should consider the main objectives of AI, is it to stabilize social welfare in rural areas or to promote agricultural production. If the purpose of AI is to stabilize social welfare and support for farmers to overcome and compensate for impacts of natural disaster and disease, each government should compare AI to other disaster risk financing instruments (budget contingencies, donor assistance, budget reallocation, debt, tax increase, reserve fund, contingent loan) and choose the most suitable instruments for their country. If the purpose of AI is to promote agricultural production, they can also compare it with other investment policies (land, capacity building, market development, consultation, research and development and etc.). The principle is: the broader the purpose, the larger the burden to the state budget and the more research work is needed to design insurance products.

- *The role of government*: It is important to consider, whether government plays the key role or rather a supporting role in the development of AI. In most successful cases of AI, AI is a marketed product and operates under market mechanism. In other words, both farmers and insurance enterprise have benefits, the government

only plays a supporting role. With some special commodities, for example dairy cow, countries can help encouraging enterprises and farmers to establish an insurance fund, which is managed by farmers and support by enterprises (see Section 3.1.2 for more detail).

6.3.2. Scope of AI Programs

International experience shows that the development of AI might take a great deal of time and pushing the progress might bring negative impacts. Lots of preparation is needed before AI can be implemented, including developing of: policy framework, infrastructure, human resources, technical capacity and institutional arrangement. At smaller scale, it is easier to monitor and make timely adjustments. In Vietnam, because of the large scale of the pilot program, a decision/dispatch from MoF in order to adjust the contents of the program was required. The larger the scope of an AI program, the more preparation is needed and the implementation will be more complicated.

6.3.3. What to Insure

Depending on the viewpoint of each country about AI, it needs to focus on some specific types of production and risks before expanding the pilot. Each country should do a cost benefit analysis of each risk financing option to find the financing gap for AI programs, thus design suitable insurance products.

If an AI program focuses on poor households, AI products should be design toward cereal crops to ensure food security. If the AI program focuses on developing agriculture, it should develop AI for key agricultural products which have the risk level acceptable for both demand side (farmers, agricultural enterprises) and supply side (insurance companies).

Governments should also encourage insurers to diversify the insurance products to meet the needs of each group of farmers, in accordance with the conditions of production and the natural conditions

6.3.4. Government Subsidies

Government should not provide premium subsidy extensively. This helps AI attract more participants, but also leads to cases that farmers just sign in the contract without knowing about the AI. The adequate subsidy rate depends on each country, but should not exceed 90% of the premium.

6.3.5. Monitoring and Evaluation

Because the government supported 100% of the premium, local government staff might fake farmer signatures to register for insurance and get their compensation when disaster happens. No cases were witnessed in Vietnam, but this can happen. Therefore, monitoring and evaluation systems must be developed and implemented by a third-party agency.

6.3.6. Risks Database

Finally, an adequate database is the key input for a feasible AI program, which is also one of the largest constrains to develop AI. Therefore, governments of ASEAN countries should support insurance companies to gather data from different sources, including official data and household survey data. Even when countries are not going to implement AI immediately, they should prepare this data.

7. REFERENCES

Association Insurance Vietnam, 2010. *Vietnamese AI facing troubles, more solutions needed to increase farmer accessibility*, Bao Minh Insurance, Hanoi.

Bielza, C. C., Dittmann, C., Gallego, J. & Stroblmair, J., 2008. Agroinsurance Schemes, Italy: JRC Scientific and Technical Report.

Bora, B., 2010. 'Subsidized agricultural insurance in Turkey (TARSIM)'. *Trebol magazine* (12): 12-19.

Celia, R. M. & Sonny, D. N., 2009. 'Crop Insurance: Security for Farmers and Agricultural Stakeholders in the Face of Seasonal Climate Variability', Discussion Paper no 2009-12 to the Philippine Institute for Development Studies, Manila

CIA, 2011. The World Factbook, https://www.cia.gov/library/publications/the-world-factbook/index.html (Accessed 27/12/2016).

Định, P. T., 2013. 'Situation of AI implementation in Vietnam according to Decision 315/QĐ-TTg and some policy recommendation', *The Journal of Economics and Development* (193):54-57 (in Vietnamese).

Duangmanee, K. & Freansen, E., 2013. Adaptation of Thai Insurance in Light of Natural Disasters: An Investigation of Developments in Major Rice Crop Insurance Applying the Area-Yield Approach. *Research Journal of Finance and Accounting*, 4(13):20-40.

Charles, S. 2011. Agricultural Insurance in Asia and the Pacific Region, Report to Food and Agriculture Organization of the United Nations, Bangkok: RAP Publication

FAO, 2016. FAOSTAT. http://faostat.fao.org/site/339/default.aspx (Accessed 27/12/2016).

FAO, 2016. Aquaculture insurance in Viet Nam: Experiences from the pilot programme, by Kim Anh Thi Nguyen and Tipparat Pongthanapanich. FAO Fisheries and Aquaculture Circular No. 1133. Rome, Italy.

General Statistical Office (GSO), 2015. Statistical yearbook of Vietnam 2014, Hanoi: Statistical Publishing House.

GlobalAgRisk, 2009. Designing agricultural index insurance in developing countries: a GlobalAgRisk market development model handbook for policy and decision makers. Lexington, KY, GlobalAgRisk.

Indonesia Investment, 2016. Investment Indonesia, http://www.indonesia-investments.com/ (Accessed 27/12/2016).

Institute of Strategy and Policy of Natural Resources and Environment (ISPONRE), 2009. *Viet Nam assessment report on climate change*, Van hoa - Thong tin Publishing House, Ha Noi (in Vietnamese).

Iturrioz, R., 2009. *Agricultural insurance, Primer series on Insurance*, The World Bank, Washington.

Jeerachaipaisarn, T., 2012. 'Recent Developments of Crop Insurance in Thailand', Presentation to OECD, Bangkok.

Kreft, S., Eckstein, D. & Melchior, I., 2016. 'Global climate risk index 2017', Report to the German Federal Ministry for Economic Cooperation and Development (BMZ), Germanwatch Publisher, Bonn, Germany.

Leeuw, J. d. et al., 2014. 'The Potential and Uptake of Remote Sensing in Insurance: A Review', *Remote Sensing Journal* (6):12-16.

Mahul, O. & Stutley, C. J., 2010. 'Government Support to Agricultural Insurance: Challenges and Options for Developing Countries', Report to The International Bank for Reconstruction and Development/The World Bank, Washington DC

Mahul, O., Verma, N. & Clarke, D. J., 2012. 'Improving Farmers' Access of agricultural insurance in India', Report to The World Bank, Washington DC

Ministry of Agricultural and Rural Development (MARD), 2016. 'Ministry of Agricultural and Rural Development internal meeting on coping drought and salinity intrusion in Mekong River Delta. Soc Trang', Ministry report.

Ministry of Finance (MoF), 2011. Results of agro insurance from 2006 – 2010, Ha Noi.

MoF, 2014. 'Result of NAIPP according to Decision 315/QĐ-TTg dated 01/3/2011 of Prime Minister', Ha Noi.

Nowak, A. et al., 2016. 'Multi-stakeholder prioritization approaches for climate smart agriculture planning and investment: a case study from Vietnam', Working paper.

Pro, M. J. et al., 2015. 'Report on analyzing the current situation of agro-insurance in Vietnam, reviewing international experiences on agro-insurance and lessons learnt for Vietnam', Madrid: AECID-Cooperation Programme.

Sahat M. P. 2016, Implementation of Indemnity-Based Rice Crop Insurance in Indonesia, Food and Fertilizer Technology Center for the Asean and Pacific Region – Agricultural Policy Platform, http://ap.fftc.agnet.org/ap_db.php?id=650 (Accessed 10/4/2017)

Trung, B., 2009. 'Contract farming from game theory perspective', Working paper.

Vân, B. H., 2014. 'Agroinsurance in Vietnam, situation and solutions'. *Journal of Vietnam's Social Science* (8): 81-90 (in Vietnamese).

Vietnamese Communist Party, 2011. Agriculture Insurance in Vietnam, issues raised, Vietnamese Communist Party Portal, http://dangcongsan.vn/kinh-te/bao-hiem-nong-nghiep-o-viet-nam-va-van-de-dat-ra-91221.html (Accessed 11/10/2016).

World Bank, 2016. World Bank Open Data. http://data.worldbank.org/ (Accessed 27/12/2016).

Yamane T., 1976. 'Elementary Sampling Theory', Prentice-Hall Publisher, New Jersey, USA

8. APPENDICES

Appendix A: List of AI policies

Date	Agency	Name	Content
April 2011	MARD	Decision 739/QD-BNN-KTHT	Establishment of the steering committee of MARD that are responsible for the implementation of NAIPP's activities that have been assigned by the Prime Minister.
June 2011	MARD	Circular No 47/TT-BNNPTNT	Guiding the implementation of NAIPP for cultivation, livestock and fishery sectors. Issued regulating criteria for production scale, production processes, types of disaster, disease and assessment of losses for paddy rice; buffalos and cow (for meat, breeding or plough) and dairy cow; pig (fattening pig, sow, boar); chicken, ducks (broiler, eggs); fisheries (Shutchi catfish, tiger shrimp, white leg shrimp), initially shaped insurance products.
July 2011	MoF	Decree 1653/QD-BTC	Establishment of the steering committee of MoF
Aug 2011	MoF	Circular 121/2011/TT-BTC	Guiding the implementation of AI pilot program, regulating rules on Registration, decided implementing companies in NAIPP; approving regulations, insurance premium table; commissions insured responsibility; financial mechanism and supporting policies for implementing insurance companies and implementing of the support; profiles, procedures and support process to implement AI.
Sept 2011	MoF	Decisions 2174/QD-BTC, 2175/QD-BTC	Approving for the participation of two insurance companies to participate in NAIPP, which are Bao Minh and Bao Viet.
Dec 2011	MoF	Decision 3035/QD-BTC	Approving regulations, insurance premium table; losses assessment method and responsible of stakeholders in implementing NAIPP.
Feb 2012	MoF	Decision 305/QD-BTC	Publishing administrative procedure on the implementation of NAIPP period 2011-2013 on insurance within mandates of MoF, guided registration procedures to buy AI; procedures allowing implementing enterprises of NAIPP; procedures for adjusting implementing areas; procedure to approve stage budget estimates and settlement.
Jun 2012	MoF	Circular 101/2012/TT-BTC	Regulating on financial issues for insurance and re-insurance companies who were implementing NAIPP. Regulations on AI premium invoices of insurance companies, costs of insurance companies, management expenses and sales expenses for the operation of reinsurance companies to implement NAIPP.
Aug 2012	MARD	Circular 43/TT-BNNPTNT	Adjust some articles in Circular 47. Expanded implementing area of some products (Dairy cow in Vinh Phuc, shrimp in Tra Vinh, added some disasters (cyclone) and some diseases on all insurance products, suppressed some regulations on rice cultivation region and allowed extending of AI within provinces; Local provincial People's Committee issued standard production process for their area.
Aug 2012	MoF	Decision 2114/QD-BTC	Adjust Decision 3035 on the detailed regulations of detail premium table, losses assessment method and responsible of stakeholders in implementing NAIPP. In

Date	Agency	Name	Content
			particular, identify clearly price of feed, breeding; determine the level of damage is 80% on the shrimp, pangasius fish; regulated clearer about cases where insurance companies had the right to deny insuring; reduced insurance rates for shrimp, fish; increased insurance premium on shrimp, fish regardless of types of production.
Feb 2013	Prime Minister	Decision 358/QD-TTg	Adjust and add some articles to Decision 315/QD-TTg. Adjusting the level of support for beneficiaries, remaining support mechanism for insured households when disasters and diseases happened according to regulated decree, adding assessment activities in the program.
May 2013	MoF	Circular 57/2013/TT-BTC	Adjust Circular 121 and Decision 1042/QD-BTC adjust Decision 3035/QD-BTC, to change the level of support and remain support mechanism excluding participating in insurance.
Jul 2013	MoF	Circular 96/2013/TT-BTC	Adjust circular 121 to be appropriate with Decree 358 on costs for selling, management and commissions for insurance companies.
Oct 2013	MARD	Procedure 1846/BVTV-TV 28/9/2012; Decision 653/QD-TY-DT; Decision 619/QD-TY-TS	Issue the procedure of identification and announce of diseases on rice, livestock and fishery.

Appendix B: List of people participating in in-depth interviews and focus group discussions

No.	Name of Organization	Number of people
Central level		
1	Ministry of Agricultural and Rural Development	1
2	MoF	0
3	Bao Viet Insurance Company	1
4	VinaRe/SwissRe	2
5	Bao Minh Insurance Company	1
6	ABIC	
7	Insurance Expert	2
Ben Tre province		
8	Department of Agricultural and Rural Development	2
9	Branch of Bao Minh Insurance	1
10	Thanh Phu Division of Agriculture	1
11	Giao Thanh Commune (Thanh Phu) People's Committee	2
12	NAIPP participant households	5
13	NAIPP non-participant households	5
Dong Thap province		
14	Department of Agricultural and Rural Development	2
15	Branch of Bao Viet Insurance	1
16	Department of Finance	1
17	Tan Hong Division of Agriculture	2
18	Tan Hong Branch of Bao Viet Insurance	1
19	Binh Phu Commune (Tan Hong) People's Committee	2
20	Tan Cong Chi Commune (Tan Hong) People's Committee	1
21	Tan Thanh B (Tan Hong) People's Committee	1
22	NAIPP participant households	5
23	NAIPP non-participant households	5
Dong Thap province		
24	Department of Agricultural and Rural Development	1
25	Branch of Bao Viet Insurance	3
26	Department of Finance	0
27	Lap Thach District Division of Economics	1
28	Vinh Tuong District Division of Economics	1
29	Tuan Chinh Commune (Vinh Tuong) People's Committee	1
30	Thai Hoa Commune (Tan Hong) People's Committee	1
31	NAIPP participant households	10
32	NAIPP non-participant households	10

Appendix C: Typology of AI

Based on types of risks covered, international experience shows that AI agreements could be categorized into diversified groups: single-peril insurance, multiple-peril insurance, yield insurance, price insurance, revenue insurance, whole-farm insurance, income insurance, and index insurance (including area yield insurance, area revenue index insurance, indirect index insurance like weather indexes, etc.). Single-peril insurance covers one or a few hazards and can be provided by private companies for non-systemic risks such as hail, but systemic risks are usually not covered. Multiple-peril insurance can refer either to insurance covering from most risks or to yield insurance which covers any risk affecting crop yield. In this case, also traditional non-insurable risks, such as drought, are covered. Public support is usually necessary to provide this kind of insurance, because it would result in extremely high premiums due to the high cost of reinsurance. Thus, it only exists in countries where there is government involvement in the insurance system. This can be provided usually by private companies for non-systemic risks, such as hail, but systemic risks are more difficult to cover.

Index insurance has been developed in many countries in recent years. This type of insurance is not based on actual on-farm losses but on the losses indicated by an index. The simplest type is yield area index, so indemnities are due if the average area yield is lower than a guaranteed area yield. The fact that it does not depend on individual farm losses avoids the cost of loss-assessment on field and asymmetric information problems[15]. But the disadvantage is that it can present basis risk: the possibility of having a loss and not getting and indemnity and of getting an indemnity without having had a loss. Other types of index insurance are weather index insurance, agro-meteorological index insurance and satellite imagery insurance. In developing countries weather index insurance is being developed because it avoids expensive loss assessment in small, badly communicated farms. In some developed countries, satellite imagery insurance has been developed for pastures given the complexity of loss assessment in this kind of agricultural production.
There are other types of AI which do not attempt to cover agricultural production but (also) market risks. Examples of these products, which exist in very few countries (mainly USA) are: revenue insurance, which guarantees a revenue (yield x price); area revenue, based on area yield x price; margin insurance, guaranteeing a unitary margin (the difference between market price and input costs) in animal production; etc.

[15] Asymetric information problems are derived from the diference in information between the insurer and the insuree. The most common ones are moral hazard (change of insureee behaviour which results in a higher risk exposure due to the fact of being insured), and adverse selection (the insuree group is composed by those whose risks are higher than the average of the population for which premiums have been rated).

Table 28. Insurance products and loss assessment methods in some countries

Nation	Insurance products	Loss assessment method
Canada	Single-peril for hail in crops; accidents death for livestock; price for cattle and hog; aquaculture; forestry; greenhouse	Index
China	Multi-peril for arable crops; accidents, epidemic diseases for livestock; aquaculture; forestry; greenhouses	Indemnity, Index
India	Single-peril insurance for crops; livestock; aquaculture	Area-yield index, weather index
Japan	Multi-peril insurance for crops; accidents and epidemic diseases for livestock; aquaculture; forestry; greenhouse	Indemnity
Philippines	Multi-peril insurance for crops; accidental death, epidemic diseases for livestock; forestry; greenhouse	Index
South Korea	Named-peril, yield for crops; accidental death, emergency slaughter, epidemic diseases for livestock	
Spain	Single-peril, multi-peril (adverse weather, epidemic diseases) for crop, livestock, aquaculture, forest	Indemnity, index
USA	Single peril for hail in crops; accident death and disease for livestock, aquaculture; forestry; greenhouse; gross margin, price	Indemnity, Index

Source: Adapted from (FAO, 2011), (Mahul, et al., 2012), (Mahul & Stutley, 2010).

Appendix D: Regulations related to rice insurance in the NAIPP

The conditions for rice insurance under the pilot program was set based on Circular 47/TT-BNNPTNT and the Supplement to Circular 43/TT-BNNPTNT, and the premiums and AI liability based on Decision 3035/QD-BTC and in the amendments to Decision 2114/QD-BTC and Decision 1042/QD-BTC issued by the MoF.

Implemented area and insurance events

The NAIPP applied to rice insurance was implemented in 7 provinces located in the main rice-production regions of Vietnam, including Red River Delta, North Central Coast, South Central Coast and the Mekong River Delta. However, not any provinces in difficult areas such as Northern Uplands and Central Highlands were selected in the program, which might cause some difficulties in expanding the scope after the pilot phase for these regions.

Table 29. Specific risks insured for rice

Content	Insured diseases
Diseases Risk	Rice Grassy Stunt Virus, Rice Ragged Stunt, Black Streaked Dwarf, Brown Plant hopper *Rice Blast, Blight of rice, Stem borer **
Disasters Risk	Storm, flood, drought, extreme cold weather, damaging cold, frost, salinity intrusion, tsunami, storm, cyclone

*Source: Circular 47/TT-BNNPTNT and * Supplement to Circular 43/TT-BNNPTNT*

Regarding natural disasters and diseases, the insured risks were limited to a number of main natural disasters and diseases (See Table 29). Therefore, risks outside of this list will not be insured. Insurance companies could refuse to pay compensation or part of compensation if losses were occurred because insurance buyers did not follow given rice production standard process. It could be seen that these risks have not covered some common risks in rice such as Channeled Apple snail, Rats; risks in storage (rice germination, mold, flooding, theft, polluted, and etc.), and especially market risks (low price, cannot sell rice, price pressure).

Insurance Premium

Unlike livestock and aquaculture insurance, rice insurance was Index Based Insurance, calculated based on rice productivity. Accordingly, the rate of premiums was calculated for all rice seasons within the province, calculated by the percentage of total insurance amount. The rate of premiums was based on risk assessment in each province, especially the risks of common disasters in Vietnam such as storms, floods and droughts.

Table 30. Rate of insurance premium determined for provinces

Province	Rate of insurance (%) Decision 3035/QD-BTC 16/12/2011	Rate of insurance (%) Decision 2114/QD-BTC 24/8/2012
Nam Dinh	5.23	4.97
Thai Binh	5.23	4.97
Binh Thuan	5.38	4.53
Nghe An	4.77	4.53
Ha Tinh	5.08	4.53
An Giang	2.31	2.19
Dong Thap	2.77	2.19

Source: Decision 3035/QD-BTC, Decision 2114/QD-BTC

In Decision 3035/QD-BTC, the contents related to the implementation of AI in rice was clearly defined, including: total insurance amount, insurance scope, insurance period, conditions, obligations and responsibilities of insured stakeholders, rights and obligations of the insurance companies, premiums, compensations, termination of the contracts and insurance dispute resolution. These were basis for implementation of NAIPP on rice products in piloted provinces.

Assessments of rice insurance

The INDEX INSURANCE method for rice insurance in NAIPP might not be suitable without proper farmers' understanding. This method based on large-scale losses and did not focus on one individual. With the nature of this method, sometimes farmers would not get compensation when they suffered from production losses or some farmers still get compensation when they did not suffer from any loss[16]. Despite government effort to disseminate information about index insurance, this method still caused much controversy in the pilot participating regions.

Besides, there are some other constrains of rice insurance product, including:

- The compensation procedure was complicated and time-consuming, which reduced belief of insured farmers because when damage occurred, farmers often had to wait until the end of the crop seasons when the statistics were announced, to be compensated.
- Compensation ratios were not specified for each season.
- Disaster or disease risks would not be insured it they were not announced by provincial government or confirmed by commune government. However, provincial government only has formal announcement in cases of severe disaster or disease epidemic outbreak.
- In addition, some popular production risks, such as unusual heavy rain, high tides causing flooding, channeled applesnail, rats, were not included in the insured list.
- The standard cultivation process introduced by the MARD or by provincial People's Committee were difficult to be implemented. In fact, the application of new production process requires a long time to verify the result, develop the model, train and mobilize to the farmers. Therefore, the farmers could hardly change their production process in a short term to participate in NAIPP.

In general, it is in need of developing rice insurance based on value chain; in reality, only when the products deliver high returns for farmer, are the voluntary participations of the farmers attracted. Therefore, developing rice insurance should be directed to the intensive rice production areas. Besides, it is also useful to consider the rice insurance for market risks to diversify the insurance products.

[16] Some rice producers had lower productivity, or complete loss, however, the actual average productivity of the commune was still higher than 90%, so these farmers were not compensated. Conversely, when it came to disasters or diseases, the actual average productivity of the commune is lower than 90% (comparing to the average of 3 previous years), but some rice producers who have productivity higher than 90%, were still compensated

Appendix E: Regulations related to livestock insurance in the NAIPP

Pilot geographical areas and insurance events

Similar to rice insurance, livestock insurance also provided the insurance for disaster risks and diseases (see Table 31). However, livestock insurance was regular insurance for individual households, not index based.

Table 31. Products, Locations and specific risks insured

Type of Insurance	Location	Insured risk
Pig (meat, sow, sire)	Ha Noi, Vinh Phuc, Hai Phong, Bac Ninh, Thanh Hoa, Nghe An, Binh Dinh, Binh Duong, Dong Nai	Blue ear disease, foot and mouth disease Stamp, paratyphoid, hemorrhagic septicemia, cholera *
Chicken (meat, lay)	Bac Ninh, Hai Phong, Vinh Phuc, Dong Nai	Bird influenza Newcastle, Gumboro*
Duck (meat, lay)	Bac Ninh, Hai Phong, Dong Nai	Bird influenza Newcastle, Gumboro, cholera*
Beef Cow (meat, plowing, breeding)	Vinh Phuc, Thanh Hoa, Nghe An, Binh Dinh, Dong Nai	Foot and mouth disease Hemorrhagic septicemia, thermal spread*
Dairy Cow	Ha Noi, Binh Dinh, Binh Duong, Dong Nai Vinh Phuc*	Foot and mouth disease Hemorrhagic septicemia, thermal spread*
Buffalo (meat, plowing, breeding)	Vinh Phuc, Thanh Hoa, Nghe An	Foot and mouth disease Hemorrhagic septicemia, thermal spread*

*Source: Circular 47/TT-BNNPTNT and *Supplement to Circular 43/TT-BNNPTNT.*

It can be seen that pilot livestock and regions highly represented livestock products and production regions in Vietnam. However, similar to rice insurance, the Northern Mountainous and Central Highlands regions - where livestock production was an effective method for ending hunger and poverty reduction - were not included in the program.
Regarding the insured risks, the insured risks were relatively wide and suitable. Nevertheless, there are still some problems need to be considered, especially in large cattle, including:

- Foot and mouth disease usually not fatal the cattle, therefore, it is difficult to identify the losses.
- Anthrax were included in the insured list but rarely happened in the recent years.
- Pasteurella diseases could be fatal but the testing and inspection were struggling due to the limitation of equipment, manpower and budget.
- A group of diseases with higher risk have not been covered, such as Streptococcus suis or reproductive diseases.

In fact, if the insured households applied properly the given production process, diseases covered in the insurance would hardly occurred.

Regarding the insurance value, the insurance amount was agreed upon the insured and the insurer, based on the actual cost but not exceeding the amount prescribed. After one year of implementation, MoF had made some positive change to the ceiling insurance price for dairy cow, which close to the real production (Table 32).

Table 32. Ceiling value for livestock insurance

Insurance products	Insurance amount/head		Insurance amount BH/head	
	Thousand VND	USD	Thousand VND	USD
Dairy cow	35,000	1546	60,000	2650
Buffalo, Cow (plowing, meat)	15,000	663	15,000	663
Pig (sow, sire)	8,000	353	8,000	353
Pig (meat)	6,000	265	6,000	265
Chicken, duck	150	7	150	7

Source: Decision 3035/QD-BTC 16/12/2011; Decision 2114/QD-BTC 24/8/2012.

Insurance premium

Premiums were identified according to different types of livestock and was amended during the implementation, which insurance rate were decreased sharply in all livestock groups. This is highly appreciated by the farmers, however, insurance companies experienced some losses due to those changes by the MoF.

Table 33. Insurance fee for livestock insurance

Insurance Products	Insurance Duration	Rate of insurance (%)	
		Decision 3035	Decision 2114
Dairy cow, Buffalo, Beef cow (plowing, meat)	1 year	4	3.6
Pig (sow, boar)	1 year	5	4
Pig (fattening)	1 production cycle	5	2.5
Chicken, duck for meat	1 production cycle	6	3
Chicken, duck for egg	1 year	6	4

Source: Decision 3035/QD-BTC, Decision 2114/QD-BTC.

In addition, MoF also issued decisions provided detailed regulations regarding the livestock insurance were issued and detailed guidelines on the size, conditions, scope, premiums.

Loss assessment

The success of livestock insurance came from a diversified risk coverage (dairy cow: 80%, beef cattle: 90%, pig: 100% and poultry: 100%)[17], which were attractive to farmers when there was a high support from the government.

Dairy insurance was highly appreciated by farmers as the value of each dairy cow were high, the compensation was relative reasonable which helped the farmers promptly re-herd. In Vinh Phuc, dairy insurance was still continued after NAIPP had ended.

Nonetheless, some regulations, especially regulations related to production infrastructure and production process were difficult to execute for the farmers, especially for poor and near poor households.

Premiums were not appropriate, for example, farmers had to pay on average 120,000 VND(USD5) for insurance premium of 1 fattening pig (already enjoyed 60% premium reduction), which is sometime higher than farmers'' profit from that pig.

[17] Results from group discussions in Vinh Phuc province conducted by CAP research team, 2016.

Insurance companies also required farmers to buy insurance for all their herd, however, some farmers might raise both piglets and some pigs which were about to be slaughtered. If they buy insurance, that mean they had to pay full premium for only 10-20 days of insurance. For dairy cows, this also caused insurance fraud where farmers buy insurance for under-quality cows or cows which are about to be discarded.

Appendix F: Regulations related to aquaculture insurance in the NAIPP

Pilot geographical areas and insurance events

Aquaculture insurance shared the same type of risk with rice insurance and livestock insurance (Table 34). In reality, the intensive production areas for pilot program are often not suffered severe damage from hurricanes, floods, damaging cold weather, but strongly influenced from salinity intrusion.

Table 34. Products, locations and risk specific for insurance

Insurance types	Location	Insured Risks
Pangasius	Ben Tre, Tra Vinh	Enteric Septicaemia
Tiger shrimp	Ben Tre, Bac Lieu, Ca Mau, Soc Trang Tra Vinh*	White Spot Disease, Yellow Head Disease, Acute Hepatopancreatic Necrosis Syndrome *Necrosis Disease**
White-leg shrimp	Ben Tre, Bac Lieu, Ca Mau, Soc Trang Tra Vinh*	White Spot Disease, Yellow Head Disease, Taura syndrome, and Acute Hepatopancreatic Necrosis Syndrome *Necrosis Disease*, *Infectious Myonecrosis Disease*

*Source: Circular 47/TT-BNNPTNT and * Supplement to Circular 43/TT-BNNPTNT*

Only three aquaculture products were piloted, including pangasius, tiger shrimp and white-leg shrimp. These products mainly for export and were suffering high production risks. Its production process might be influenced by many factors, especially the quality of water. Therefore, the coverage of NAIPP on aquaculture is limited (5 major production provinces in Mekong River Delta; 1 insured diseases for pangasius and few insured diseases for shrimp).

The insurance amount for aquaculture insurance was determined clearly under the regulations (Table 35).

Table 35. Insurance amount for aquaculture insurance

Shrimp **STBH = (DT x MD x HS x GT) + CG**	Fish **STBH = (TT x MD x HS x GT) + CG**
In which: STBH: Insurance Amount (VND) DT: Aquaculture Area (m2) MD: Aquaculture Density (con/m2) HS: Average volume of shrimp feed. In which, tiger shrimp consumes 0.03kg/shrimp, white-leg shrimp eats 0.02kg/shrimp GT: Average Food Price (VND/kg). CG: Purchasing Price for Breeding (VND).	In which: STBH: Insurance Amount (VND) TT: Aquaculture Volume (m3) MĐ: Aquaculture Density (fish/m3) HS: Average volume of fish feed. In which, pangasius eats 1.8kg/fish and Basa fish eats 2.3kg/fish. GT: Average Food Price (VND/kg). CG: Purchasing Price for Breeding (VND).

Source: Decision 3035/QD-BTC

Insurance premium

Premiums for aquaculture was classified according to forms of aquaculture of each product and its risks. During the implementation, MoF had to adjust the premiums for aquaculture insurance because of high risks, accordingly, the Ministry increased the rate, regardless the forms of aquaculture for insured aquaculture products (Table 36).

Table 36. Regulations on gross premiums for aquaculture insurance

Insurance Types	Rate of premiums based on the forms of livestock Decision 3035			Rate of premiums Decision 1042
	Intensive (%)	Semi - Intensive (%)	Extensive improvements (%)	No distinction in the forms of farming
Shrimp	7.42	8.02	9.72	9.72
Fish	3.82	4.08	4.82	4.82

Source: Decision 3035/QD-BTC, Decision 1042/QD-BTC.

Losses assessment

Although the regulations are very strict and detailed, the assessment of aquaculture risks encountered lot of difficulties due to the lack of losses evaluation facilities. Especially Acute Hepatopancreatic Necrosis Syndrome were really difficult to identify exactly, therefore, most risks were identified as because of this disease and the insurer have to compensate. Currently, pilot provinces of NAIPP had not had a proper testing and diagnosis procedure and facilities for Acute Hepatopancreatic Necrosis Syndrome, the diagnostics were mostly done IAV observation and had low accuracy. Therefore, insurance fraud in aquaculture were more likely to happen than livestock or rice.

Standard production procedure in aquaculture also had some problems. There wasn't any regulation on the production density for tiger shrimp and white-leg shrimp. Therefore, despite being more exposure to risks, farmers still raised shrimp with a very high density, they will enjoy profit from the production if risks did not happen, and insurance companies would have to pay compensation when risk happened.

The regulations in damaging rates and the compensation for pangasius were not strict; compensation was 1.2 to 1.5 times higher than the actual investment value; which led some farmers pay less attention to their production, and only targeted to benefit from the insurance.

In addition, there had not been sanction in the insurance implementation and the supervising activities. The loss assessment activities of insurance companies face many difficulties because the insured objects were under water, which could not be based on the normal observation to evaluate. And above all, the perception of the people about the insurance were still limited (did not have production diary, inputs invoices, breeding certificate…).

Appendix G: Matching of rice households

After eliminating observations falling outside of the common support interval, we obtain 116 households whose propensity score fall into [.12494512,.95925885]. This common support is going to be divided into blocks. In each block, there are participants and nonparticipants having an equal propensity score.

Table 37. Description of the estimated propensity score in region of common support

Estimated propensity score				
	Percentiles	Smallest		
1%	0.13	0.12		
5%	0.15	0.13		
10%	0.18	0.13	Obs.	116
25%	0.23	0.14	Sum of Wgt.	116
50%	0.40		Mean	0.42
		Largest	Std. Dev.	0.21
75%	0.55	0.81		
90%	0.70	0.93	Variance	0.04
95%	0.81	0.93	Skewness	0.59
99%	0.93	0.96	Kurtosis	2.47

The final number of blocks is 5. This number of blocks ensures that the mean propensity score is not different for treated and controls in each block. That means the balancing property is satisfied.

Table 38. The inferior bound for each block

	Whether or not household has participated in the AI?		
Inferior of block of pscore	No	Yes	Total
0.12	12	4	16
0.20	28	13	41
0.40	18	18	36
0.60	5	12	17
0.80	2	4	6
Total	65	51	116

In the first block, there are four participated individuals and 12 nonparticipants having the same propensity score of 0.12; these two groups' outcomes are going to be compared at the following matching stage. The procedure for each other group is similar.

Appendix H: Matching propensity score and comparisons of outcomes

Outcome	Method	n. treat.	n. control.	ATT	SE	t
n1_pcrice13	Nearest neighbor	51	28	-6.311	9.649	-0.654
	Radius	51	65	-2.071	10.983	-0.189
	Stratification	51	65	-0.318	8.146	-0.039
	Kernel	51	65	-1.836	15.63	-0.117
n1_pcincDF	Nearest neighbor	51	28	-1.337	3.827	-0.349
	Radius	51	65	1.301	1.157	1.125
	Stratification	51	65	0.19	1.53	0.124
	Kernel	51	65	0.366	2.639	0.139
n1_plinc13	Nearest neighbor	51	28	23.353	19.118	1.222
	Radius	51	65	12.318	11.985	1.028
	Stratification	51	65	22.284	21.653	1.029
	Kernel	51	65	19.38	19.718	0.983
n1_plincDF	Nearest neighbor	51	28	0.224	4.232	0.053
	Radius	51	65	3.07	2.403	1.278
	Stratification	51	65	2.034	3.437	0.592
	Kernel	51	65	2.138	2.56	0.835
n1_yield13	Nearest neighbor	51	28	-0.164	0.446	-0.368
	Radius	51	65	-0.342	0.401	-0.854
	Stratification	51	65	-0.163	0.232	-0.702
	Kernel	51	65	-0.242	0.235	-1.033
n1_yieldDF	Nearest neighbor	51	28	-0.161	0.109	-1.487
	Radius	51	65	-0.144	0.131	-1.102
	Stratification	51	65	-0.217	0.26	-0.833
	Kernel	51	65	-0.204	0.246	-0.83
n4_rice13	Nearest neighbor	51	28	0.765	35.444	0.022
	Radius	51	65	-1.261	14.727	-0.086
	Stratification	51	65	1.43	20.618	0.069
	Kernel	51	65	2.559	23.434	0.109
n4_riceDF	Nearest neighbor	51	28	1.706	3.997	0.427

Outcome	Method	n. treat.	n. control.	ATT	SE	t
	Radius	51	65	5.965	7.161	0.833
	Stratification	51	65	3.037	6.095	0.498
	Kernel	51	65	3.669	10.729	0.342
n4_agri13	Nearest neighbor	51	28	13.078	62.637	0.209
	Radius	51	65	7.407	31.358	0.236
	Stratification	51	65	12.983	37.69	0.344
	Kernel	51	65	11.528	34.34	0.336
n4_agriDF	Nearest neighbor	51	28	1.627	11.264	0.144
	Radius	51	65	5.282	8.002	0.66
	Stratification	51	65	2.435	9.738	0.25
	Kernel	51	65	3.097	10.14	0.305
n4_total13	Nearest neighbor	51	28	-6.804	42.18	-0.161
	Radius	51	65	-0.981	35.162	-0.028
	Stratification	51	65	7.53	41.095	0.183
	Kernel	51	65	4.773	46.72	0.102
n4_totalDF	Nearest neighbor	51	28	-8.216	7.363	-1.116
	Radius	51	65	2.321	10.2	0.228
	Stratification	51	65	-2.158	8.788	-0.246
	Kernel	51	65	-1.445	9.701	-0.149
n5_cost13	Nearest neighbor	51	28	12.956	34.365	0.377
	Radius	51	65	13.642	17.132	0.796
	Stratification	51	65	21.826	28.098	0.777
	Kernel	51	65	21.208	21.742	0.975
n5_costDF	Nearest neighbor	51	28	13.870	10.174	1.363
	Radius	51	65	12.440	6.710	1.854
	Stratification	51	65	12.202	11.482	1.063
	Kernel	51	65	12.495	11.780	1.061
n5_production13	Nearest neighbor	51	28	3.002	11.465	0.262
	Radius	51	65	-0.658	7.164	-0.092
	Stratification	51	65	3.655	7.860	0.465

Outcome	Method	n. treat.	n. control.	ATT	SE	t
	Kernel	51	65	3.366	5.632	0.598
n5_productionDF	Nearest neighbor	51	28	1.571	2.495	0.630
	Radius	51	65	3.300	2.292	1.440
	Stratification	51	65	2.042	2.170	0.941
	Kernel	51	65	2.283	1.459	1.565
n5_rentarea13	Nearest neighbor	51	28	0.173	0.643	0.268
	Radius	51	65	0.401	0.484	0.829
	Stratification	51	65	0.495	0.526	0.943
	Kernel	51	65	0.475	1.025	0.463
n5_rentareaDF	Nearest neighbor	51	28	0.368	0.339	1.084
	Radius	51	65	0.368	0.267	1.378
	Stratification	51	65	0.361	0.211	1.712
	Kernel	51	65	0.368	0.208	1.766