

Annex 2d

Thai Rice Insurance Scheme: Recommended Actions on Innovative Climate Risk Finance for the Agricultural Sector in the ASEAN Region

GCF Funding Proposal

*Thai Rice:
Strengthening Climate-Smart Rice Farming*

April 2023

Version1

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
GmbH

Table of Contents

Table of Tables	3
Table of Figures	3
Abbreviations	1
Executive Summary	2
Chapter 1: Introduction.....	7
1.1 Rationale.....	7
1.2 Objectives	8
1.3 Methodology	8
Chapter 2: Overview and status quo: Thai rice insurance scheme	9
2.1 Institutional Setup and Operation of the Scheme	15
2.2 Government Compensation Process for Disaster-Affected Farmers and Claims Process for Farmers Buying Insurance.	18
2.3 Collaboration among Stakeholders	21
2.4 Overview of the Performance of the Rice Insurance Scheme.....	23
Chapter 3: SWOT analysis of the rice crop insurance scheme	28
Chapter 4: Way forward Thai rice insurance scheme: On-going and future collaborations and initiatives (2021 - 2025) (national and international), to support the improvement of the current scheme.	30
Chapter 5: Analysis and recommendations	33
5.1 Capacity Gaps (Including Technical Capacity) and Strength of Each Stakeholder (SWOT Analysis)	33
5.2 Recommended Areas of Improvement for Stakeholders' Capacity and Scheme Operation Considering Interests of Stakeholders.....	36
Chapter 6: Project design with recommendations	37
6.1 Possibilities of Adding Insurance Elements in Promoting Climate-Smart Practices	37
6.2 Recommendations on Thai Rice GCF Project: Scope and Activities Regarding Crop Insurance	38
6.3 Limitations of This Study and Recommendation for Future Works	41
References	43

Table of Tables

Table 1: Key informant interviews grouped into actors and organisations involved in the rice crop insurance	8
Table 2: The evolution of the crop insurance program during the crop year 2019-2022	11
Table 3: The performance of national rice insurance scheme for the main crop during 2011-2021	24

Table of Figures

Figure 1: Rice Insurance Scheme for the 2022 crop year	10
Figure 2: Crop insurance information linkage diagram with DoAE	16
Figure 3: Diagram of procedure for government compensation and insurance compensation	20
Figure 4: Procedure for Malison mobile application	21
Figure 5: Average input cost of rice cultivation and compensations in cases of natural disasters (baht/rai)	24
Figure 6: Number of farmers buying rice insurance (Million Person)	25
Figure 7: Rice planted area, insured rice planted area, and penetration ratio	26
Figure 8: Net premium, indemnity paid, and loss ratio	27

Abbreviations

BAAC	Bank for Agriculture and Agricultural Cooperatives
BoT	Bank of Thailand
DDPM	Department of Disaster Prevention and Mitigation
DoAE	Department of Agricultural Extension
DEPA	Digital Economy Promotion Agency
FPO	Fiscal Policy Office
GISTDA	Geo-Informatics and Space Technology Development Agency
GCF	Green Climate Fund
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
LD	Land Department
MoAC	Ministry of Agriculture and Cooperatives
MoF	Ministry of Finance
NAMA	Nationally Appropriate Mitigation Action
OAE	Office of Agricultural Economics
OIC	Office of the Insurance Commission
RD	Rice Department
TGIA	Thai General Insurance Association
TGO	Thailand Greenhouse Gas Management Organisation
PIER	Puey Ungphakorn Institute for Economic Research

Executive Summary

Objectives

The objectives of the assignment “Thai Rice Insurance Scheme: Recommended Actions for Green Climate Fund (GCF) Funding Proposal” are (1) to review the current Thai rice insurance scheme and (2) to provide recommendations for improvement of the current scheme and integrate insurance elements into the GCF project. The methodology is based on a literature review and key informant interviews. Stakeholder analysis is also conducted to identify stakeholders relating to the current rice insurance scheme, including a wide range of actors in the rice insurance scheme, including underwriters, regulators, intermediaries, policymakers, and experts from think-tank organisations, technology, and operational providers.

Overview of the Thai rice insurance scheme

The current Thai rice insurance scheme is based on calamity-based insurance for the main rice season, complementing the Government Disaster Relief Program. The rice insurance scheme is designed to link and top-up to a disaster relief program provided by the Thai government, using the loss assessment of the government compensation measure. Farmers buying rice insurance would receive extra insurance payouts in addition to the 1,340 Baht per rai (USD 252 per hectare) government compensation from the disaster relief fund. This is in cases where their rice planted areas for the main season were declared calamity areas and there was verified total loss under the loss assessment procedures for the disaster relief program.

The basic insurance coverage (Tier 1) for the 2022 production crop year is 1,190 baht per *rai* (USD 216 per Ha, with 1 ha = 6.25 *rai*) in the case of natural disasters and 595 baht per rai (USD 108 per Ha) in the case of pest and disease. The insurance premium, excluding VAT and stamp revenue, is 99 baht per rai for BAAC’s loan customers in all risk zone. The BAAC estimated the amount of insured planted area for each loaned client according to the value of outstanding debts. Every 4,000 Baht amount of loan will be eligible for BAAC subsidy contributions of 39.6 Baht per rai. For BAAC loaned customers who want to buy additional insured planted areas (without BAAC subsidy), BAAC’s non-loan customers, and general farmers who are not BAAC customers, Tier 1’s premium rates depend on the location risks of planted areas at the district level. The premium rates are set at 99 baht per rai for the low-risk zone, 199 baht per rai for the medium-risk zone, and 218 baht per rai for the high-risk zone.

The Thai government contributes 59.4 baht per *rai* of the insurance premium for all farmers participating in Tier 1 rice insurance coverage. The BAAC loaned customers receive an additional subsidy of 39.6 Baht per *rai* from BAAC. Hence, the government and BAAC co-subsidize 100% of insurance premiums for BAAC loaned customers (60% was subsidized by the government and 40% was subsidized by BAAC). The government subsidizes the insurance premiums for non-BAAC loaned farmers and general farmers at 59.4 baht per rai, accounting for 60% of the insurance premiums for the low-risk zone, 29.8 %, and 27.2% for the medium and high-risk zones respectively.

For Tier 2 add-on insurance coverage, premium rates are not subsidized and range by risk zone (27 baht per rai for the low-risk zone, 60 baht per rai for medium risk-zone, and 110 baht per rai for the high-risk zone).

The rice insurance scheme is a collaboration and cooperation with the public & private sectors under Public and Private Partnership (PPP).

- The Fiscal Policy Office (FPO) under the Ministry of Finance is responsible for proposing the annual rice crop insurance project for The Rice Policy and Management Committee and cabinet approvals. Government subsidy for the rice insurance project is derived from the annual government budget with cabinet approvals.
- Office of Insurance Commission (OIC) is responsible for regulating, promoting the operation of the insurance business, and protecting the customer's insurance benefits. OIC approves Rice Insurance Top Up policy wordings and premium prices.
- Department of Agricultural Extension (DoAE) under the Ministry of Agriculture plays a role in crop insurance as the agency to integrate the farmers' data. Farmers' registration is integrated with BAAC to support selling crop insurance. The DoAE officers report the data of actual damage for receiving insurance compensation and the DoAE officers at the district level also act as national loss adjustors.
- Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior is responsible for disaster declaration and risk mitigation.
- Bank for Agriculture and Agricultural Cooperatives (BAAC) acts as a distributor in selling rice insurance both to their loaned clients and non-loaned client rice farmers. BAAC provides insurance premium support for all loaned rice farmer clients. Loaned clients will get 40% of the insurance premium subsidized by the BAAC budget and the other 60% subsidized by the government budget. Every 4,000 Baht amount of loan will be eligible for BAAC subsidy contributions of 39.6 Baht per rai.
- Thai General Insurance Association (TGIA) is a rice insurance scheme administrator, managing the program on behalf of its participating TGIA Members. Several local insurers participate in the scheme with a specified share in the underlying risk pool. The pool of local insurance companies accepts 20% of insured risk and passes 80% of insured risks to reinsurance companies.

Challenges of the current rice insurance scheme

- The rice insurance heavily relies on government and BAAC full subsidies
- Low awareness of crop insurance by the farmers (the penetration of Tier 2 is very low)
- Farmers who buy add-on insurance (Tier 2) are in the high-risk zone (adverse selection problem)
- The innovative technology to support claims declaration & assessment is still in the early stage of the development
- Lack of microdata for agricultural statistics and meteorology data at the disaggregate level or plot level to offer risk-based pricing insurance products

Opportunities

Recommended areas of improvement for stakeholders' capacity and scheme operation considering interests of stakeholders

1. Promote insurance awareness

BAAC's loan clients in all risk zone and general farmers in the low-risk zone are automatically covered in Tier 1 and farmers do not have to pay premiums. The take-up rate of

Tier 2 insurance (voluntary insurance with no subsidy) is very low. This implies that without premium subsidies, farmers particularly in the low-risk zone are not willing to pay premiums to buy rice insurance. There is a need to focus more on creating awareness of the importance of agricultural insurance, which helps improve sustainability in the rice insurance scheme. Insurance awareness should be combined with the farmer's training program, including training on climate-smart practices offered by the rice department.

2. Data improvement

Agricultural statistics and meteorology data and historical damage and loss data should be collected at disaggregated levels (sub-district/village/plot level). Polygon plots (plot boundary drawing) should be extended throughout the country.

3. Promote big data analytics from satellite imagery, drone, and mobile technology to better detect damage and loss assessment. The use of big data from those technologies would provide better agricultural risk information to redesign more efficient agricultural insurance. Supporting start-up companies for investing in satellite, drone, and mobile technology and big data analytics is necessary.

4. In the medium term, the rice insurance be delinked with the loss assessment from disaster relief assistance and move towards parametric risk insurance or plot-specific risk-based insurance.

Possibilities of adding Insurance elements in promoting climate-smart practices

In the future, it may be possible to link crop insurance with climate-smart rice cultivation practices that reduce GHG emissions. However, it depends on national policy. In addition, the insurers are not interested in linking insurance with carbon emission reduction as it would not reduce the risks of disaster to occur. Hence, a significant discount on insurance premiums cannot be offered. Nevertheless, during the stakeholder consultation workshop, TGIA shared their view from the perspectives of insurers that insurance underwriters would be interested in designing pilot insurance products if there are at least 100,000 rai adopting climate-smart technologies. This is also to collect evidence at the plot level if the climate-smart technology can reduce GHG emissions and farmers' impact from climate risks.

Recommendations on Thai rice GCF project: scope and activities regarding crop insurance.

Possible technical support by GIZ under the Thai rice GCF project

The possible technical support is to support the development of plot-level assessment of risk, damage, and carbon emission and promote awareness of insurance climate-smart practices under the working committee of 5 key stakeholders: TGIA, BAAC, DoAE, Geo-Informatics and Space Technology Development Agency (GISTDA) and Puey Ungphakorn Institute for Economic Research (PIER), Rice Department (RD), technology providers, including start-up Technology Company, technology analytics such as technical experts from the university and Thailand, and Greenhouse Gas Management Organisation (TGO) should be included as new stakeholders in the working committee.

Objectives:

- (1) To provide technical proof whether farmers implementing climate-smart practices experienced low-climate risk profile, low level of damage, and low level of carbon emission
- (2) To improve the current rice insurance scheme, providing a faster process of loss assessment of disaster-affected rice planting areas at the plot level using satellite/drone/mobile technology. In addition, insurance premiums can be offered based on actual risks at the plot level
- (3) To promote knowledge and awareness of insurance and climate-smart practices to farmers in the Thai Rice GCF project areas and key stakeholders in rice insurance

Activities and stakeholders involved in the proposed activities are as follows.

Activities	Lead partners	Strategic partners	Challenges/barriers
Plot polygons (boundary drawing)	DoAE (Entry point)	GISTDA, NECTEC, and RD	DoAE has many mandates. GIZ might have to provide a budget to DoAE for commissioning the task of plot polygons
Support technology (Satellite, drone, and mobile) for better information on agricultural risk/GHG emissions at the plot level	GISTDA & TGIA (Entry point), Start-up companies, Technology providers such as ThaiCOM company	PIER, RD, Thailand Greenhouse Management Organisation (TGO) Kasetsart University	The limitation of satellite technology for GHG emission is still in an early stage of development.
Perform big data analytics from technology to detect damage & to map risks/GHG emissions at the plot level	TGIA & GISTDA (Entry point) University Technology analytic companies TGO	PIER TGIA RD	Needs independent agencies that have the expertise to perform big data analytics with transparency.
Validate the accuracy of technologies	TGIA & GISTDA (Entry points) Start-up companies, Technology providers	RD DoAE	Needs ground validation and yield/crop growth modelling

Activities	Lead partners	Strategic partners	Challenges/barriers
Verify claims and damages of loss assessment mapping at the plot level	TGIA (Entry point) DoAE BAAC	No strategic partners involved	Depends on the validation of the accuracy of plot-level assessment mapping
Promote insurance awareness (Adding activities to promote insurance awareness via field training on climate-smart practices to farmers and key stakeholders at the local level).	OIC TGIA (Entry point) BAAC RD (Entry point)	No strategic partners involved	Depends on technical proof whether farmers implementing climate-smart practices would experience a low-climate risk profile, low level of damage, and low level of carbon emissions

Rice Department (RD) should be the lead agency of the working committee as RD is the secretary of the national rice policy committee that can drive policies to promote both climate-smart practices and rice insurance to farmers. It is noted that the rice insurance project must be approved by the national rice policy committee before cabinet approval. In addition, RD can work, and coordinate with other public and private agencies relating to the rice sector. However, RD is less familiar with and is not expertise in rice insurance. TGIA can be the co-lead agency of the working committee for insurance development.

The sustainability of the project activities depends on financial support, stakeholder buy-in, and the capabilities of the executing agencies. In designing an exit strategy, a phasing-out approach can be considered. There is no further need for any other activities once activities to develop technology for better agricultural risk/GHG emission information at the plot levels are completed. Regarding Plot polygons or boundary drawing and crop insurance awareness promotion, there are under DoAE 's mandate and OIC's mandate respectively.

Chapter 1: Introduction

1.1 Rationale

Rice is the most important crop in Thailand's agricultural sector, securing the livelihood of roughly 25% of Thailand's population. However, rice farmers in Thailand are facing increasing pressure from climate change impacts, e. g. , increases in temperature and extreme weather events, and changing precipitation patterns caused by flooding or droughts. Thailand is considered one of the sixteen countries in the "extreme risk" category that are most vulnerable to future climate change impacts over the next thirty years (2015-2035)¹. Climate change induced extreme weather events (more frequent and higher intensity droughts and floods) reduce rice yields and grain quality already today, and increases income losses and fluctuations for farmers due to harvest losses. To strengthen the climate resilience of Thai smallholder rice farmers, promoting the adoption of climate-smart rice farming and making crop insurance affordable to Thai rice farmers are necessary.

The Thai Rice NAMA (Nationally Appropriate Mitigation Action) project (2018-2023) supports farmers to switch to low-emission sustainable farming practices that can at the same time benefit farmers economically through higher yields and better-quality rice and increase their resilience to climate risks. The project **"Thai Rice: strengthening climate-smart rice farming", hereafter "Thai Rice GCF"** (expected implementation period: mid 2023 – 2028 (5 Years)), presented to the Green Climate Fund (GCF) for funding will scale up the approach of the existing "Thai Rice NAMA" project as well as make use from experience and lesson learned from other GIZ projects including Market-Oriented Smallholder Value Chains (MSVC) (2018-2022), Mainstreaming Sustainable Rice through the Sustainable Rice Platform (SRP): Scaling the Production and Global Marketing of Sustainable Rice (2020-2023) among others that will aim for a paradigm shift in the rice sector. Expectedly, the project will expand the implementation covering three regions which are central plain (Chainat, Ang Thong, Pathum Thani, Singburi, Ayuthaya, Suphanburi, Uthai Thani, Nakhon Sawan, Lob Buri), northeastern (Ubon Ratchathani, Roi Et, Surin, Si SaKet, Kalasin) and northern (Chiang Rai) regions of Thailand.

The rice insurance scheme has been implemented in Thailand nationwide since 2011. The scheme is based on calamity-based insurance for the main rice season, complementing on top of the Government Disaster Relief Program. Insurance coverage is divided into two categories: natural disasters (flood or excessive rain, drought, frost, windstorm/typhoon, fire, and hail) and insect and disease infestation. The scheme is designed to link and top-up to a disaster relief program provided by the Thai government, using the loss assessment of the government compensation measure. Farmers buying rice insurance would receive extra insurance payouts in addition to the government compensation from the disaster relief fund if their rice planted areas for the main season were declared calamity areas and there was verified total loss under the loss assessment procedures for the disaster relief program. The insurance scheme is distributed via the Bank for Agriculture and Agricultural Cooperatives (BAAC).

The "Thai Rice GCF" proposed activities related to crop insurance that will increase the efficiency and customer value of the current scheme. The challenging issue is how to integrate insurance elements into the Green Climate Fund project as crop insurance provides climate risk transfer for rice farming.

¹Thailand's Intended Nationally Determined Contribution (INDC), (Office of Natural Resources and Environmental Policy and Planning, 2015).

Hence, this assignment “Thai Rice Insurance Scheme: Recommended Actions for Green Climate Fund (GCF) Funding Proposal and Innovative Climate Risk Finance for the Agricultural Sector in the ASEAN Region” is conducted, by reviewing the current Thai rice insurance scheme, providing recommendation on improvement of the current scheme and on possible integration of insurance elements into the GCF Funding Proposal.

1.2 Objectives

1. To review the current Thai rice insurance scheme
2. To provide recommendations on improvement of the current scheme and integrating insurance elements into the GCF project

1.3 Methodology

The methodology is based on desk research/literature review and key informant interviews. Desktop research/literature review is used to describe the institutional set-up and operation of the current rice insurance scheme. Key informant interviews range from representatives from relevant organisations (Table 1). Lists of interviewees and dates of the interviews are in Appendix 1.

TABLE 1: KEY INFORMANT INTERVIEWS GROUPED INTO ACTORS AND ORGANISATIONS INVOLVED IN THE RICE CROP INSURANCE

Actors	Organisations
Policymakers / experts / researchers	<ul style="list-style-type: none"> • Fiscal Policy Office (FPO), Ministry of Finance • Office of Agricultural Economics (OAE), Ministry of Agriculture and Cooperatives (MoAC) • Puey Ungphakorn Institute for Economic Research (PIER), Bank of Thailand • Thailand Development Research Institute (TDRI)
Underwriters / reinsurers	<ul style="list-style-type: none"> • Thai General Insurance Association (TGIA) • AXA company • SWISS RE and MUNICH RE
Regulator	<ul style="list-style-type: none"> • Office of Insurance Commission (OIC)
Operational /delivery channel	<ul style="list-style-type: none"> • Bank for Agriculture and Agricultural Cooperatives (BAAC)
Data / operation support	<ul style="list-style-type: none"> • Department of Agricultural Extension (DoAE), Ministry of Agriculture and Cooperatives • Rice Department, Ministry of Agriculture and Cooperatives • Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior
Technology providers	<ul style="list-style-type: none"> • Geo-Informatics and Space Technology Development Agency (GISTDA) • Infuse Company

Stakeholder analysis and mapping are also conducted to identify stakeholders relating to the current rice insurance scheme, including a wide range of actors in the rice insurance scheme, including underwriters, regulators, intermediaries, policymakers, and experts from think-tank organisations, technology, and operational providers. It is also used to investigate roles and organisational

mandates related to the rice insurance scheme, collaborations among stakeholders at all levels – (National, Provincial, and District levels), and how budget and financing sources are allocated in the rice scheme. Key performance indicators and SWOT analysis are also conducted to explore the performance of the scheme, strengths/ constraints/ implementation problems, and opportunities. The stakeholder analysis is also conducted to identify the need to improve the current crop insurance scheme, insurance elements, scope, and activities in GCF projects, including technical support by GIZ under GCF projects, the added value of GCF project for key stakeholders who are interested and engaged with GCF projects. The mapping will help understand their interests and views for stakeholder engagement.

Chapter 2: Overview and status quo: Thai rice insurance scheme

The Thai government has implemented a disaster relief program for farmers since 2005. The assistance is part of the compensation approved by the government, in accordance with the Ministry of Finance Regulation on Contingency Fund Advances for Emergency Relief Assistance. Rice growers eligible to receive financial aid from this disaster relief program would receive 1,340 Baht per rai (USD 252 per hectare) for their damaged paddy fields. Under the loss assessment procedures for the disaster relief program, rice growers are eligible to receive government compensation if their rice planted areas for the main season were declared calamity areas and there was verified total loss. However, the financial assistance provided through this disaster relief program is not sufficient to fully compensate for the costs of replanting incurred by rice farmers. The compensation from the government disaster fund contributes to approximately 41% of the average farm input cost per farmer and 34% of the average total production cost per farmer. In addition, the compensation is limited to 30 rai per household.

The Thai Rice Insurance Scheme (Top-up program), launched in 2011, provides a supplementary payment in addition to financial assistance via the disaster relief program. The rice insurance scheme is based on calamity-based insurance for the main rice season, complementing the Government Disaster Relief Program. The scheme is designed to link and top-up to a disaster relief program provided by the Thai government, using the loss assessment of the disaster relief program. The trigger of claims is the eligibility to receive financial support from the disaster relief fund: the farm must lie within an area declared as a disaster area by the local government and the entire farm or the proportion of it must be declared a total loss under the government loss assessment.

Insurance coverage is divided into two categories: natural disasters (Flood or excessive rain, Drought or delayed rainfall, Windstorm/typhoon, Cold weather/ frost/ Hail, Fire and Danger from wild elephants) and insect and disease infestation.

FIGURE 1: RICE INSURANCE SCHEME FOR THE 2022 CROP YEAR

Rice Insurance scheme for 2022 crop year



Tier 1 (Basic coverage) Sum insured 1,190 Baht/Rai for natural disasters, 595 Baht/Rai for pests & diseases premiums are subsidized

- **BAAC Loan farmers :** Target 28 Mil Rai
 - Premium is fixed at 99 Baht/Rai in all risk zones
 - 100% subsidized by BAAC (pays 39.6 baht/rai) & Gov. (pays 59.4 Baht/Rai), the effective date begins when the cabinet approves
- **BAAC non-loan farmers & general farmers (non BAAC) 500,000 Rai:**

Risk Zone	Premium (Baht/Rai)	Gov. Support	Paid by farmers
Low (green)	99	59.4 (60%)	39.6
Medium (yellow)	199	59.4 (29.8%)	139.6
High (red)	218	59.4 (27.2%)	158.6

Note: Premium does not include VAT and stamp revenue

Tier 2 (add-on coverage):
 Sum insured 240 Baht/Rai for natural disasters, 120 Baht/Rai for pests & diseases premiums are not subsidized
 Target: Not more than 500,000 Rai

Risk Zone	Premium (Baht/Rai)
Low	27
Medium	60
High	110

Source: Adapted from TGIA and BAAC

Figure 1 summarizes the rice insurance scheme for the 2022 crop year. There are two types of rice insurance policies: Basic Insurance Coverage (Tier 1) and Add-on Insurance Coverage (Tier 2). The government offers a subsidy on Tier 1 but not on Tier 2. Government contributes 59.4 baht per rai of the insurance premium for Tier 1. The targeted insured planted area is 28.5 Million Rai for Tier 1 coverage and 0.5 Million Rai for Tier 2 coverage.

The sum insured basic insurance coverage (Tier 1) for the 2022 crop year is 1,190 baht per rai (USD 216 per Ha, with 1 ha = 6.25 rai) in the case of natural disasters and 595 baht per rai (USD 108 per Ha) in the case of insect and disease infestation. The sum insured add-on insurance coverage (Tier 2) for the 2022 crop year is 240 baht per rai (USD 44 per Ha) in the case of natural disasters and 120 baht per rai (USD 22 per Ha) in the case of insect and disease infestation. In 2022, the farmers who purchase the basic insurance coverage (Tier 1) will receive 1,340 Baht per rai from the disaster relief fund with an additional 1,190 baht per rai from the Tier 1 insurance compensation. The compensation from crop insurance itself contributes to around 30% of farm input cost per farmer. The total compensation of 2,530 from both the disaster relief fund and Tier 1 insurance compensation accounts for 79% of the average variable input cost and 63% of the total production cost per farmer. Farmers who purchase both basic and add-on coverage (Tier 1 and Tier 2) will receive an additional 240 baht per rai from the Tier-2 insurance compensation.

The insurance premium, excluding VAT and stamp revenue, is 99 baht per rai for BAAC's loan customers in all risk zone. the BAAC estimated the amount of insured planted area for each loaned client according to the value of outstanding debts. Every 4,000 Baht amount of loan will be eligible for BAAC subsidy contributions of 39.6 Baht per rai. Tier 1's premium rates depend on the location risks of planted areas at the district level for BAAC loaned customers who want to buy additional insured planted areas (without BAAC subsidy), BAAC's non-loan customers, and general farmers who are not BAAC customers. The premium rates are set at 99 baht per rai for

the low-risk zone, 199 baht per rai for the medium-risk zone, and 218 baht per rai for the high-risk zone.

The Thai government contributes 59.4 baht per rai of the insurance premium for all farmers participating in Tier 1 rice insurance coverage. The BAAC loaned customers receive an additional subsidy of 39.6 Baht per rai from BAAC. Hence, the government and BAAC co-subsidize 100% of insurance premiums for BAAC loaned customers (60% was subsidized by the government and 40 % was subsidized by BAAC). The government subsidizes the insurance premiums for non-BAAC loaned farmers and general farmers at 59.4 baht per rai, accounting for 60% of the insurance premiums for the low-risk zone, 29.8 % , and 27.2% for the medium and high-risk zones respectively.

Budget allocation for the rice insurance scheme is reviewed and approved annually. The Thai cabinet approved the 2022 main crop rice insurance program on May 3, 2022, with a budget of 1,925 million baht (USD 56 million).

The insurance scheme is distributed via the Bank for Agriculture and Agricultural Cooperatives (BAAC) for those eligible farmers who must be registered with DoAE as rice farmers and who grow rice in the main season.

Thai General Insurance Association (TGIA) is a rice insurance scheme administrator, managing the program on behalf of its participating TGIA Members. Several local insurers participate in the scheme with a specified share in the underlying risk pool. It is important to note that rice insurance share is not equally distributed among national insurers.

The evolution of the crop insurance program during the crop year 2019-2022 can be summarized in Table 2. The number of insurance companies joining the insurance pool has gradually reduced. One of the reasons is that insurance companies got a negative financial impact from COVID-19. The targeted insured planted area in Tier 1 coverage has substantially declined from 45 million Rai in 2021 to 28.5 million Rai in 2022. This is in line with a reduction in the government budget allocated to the rice insurance scheme from 2,873 Million Baht in the 2021 crop year to 1,925 Million Baht in the 2022 crop year. The insurance premium for non-loan BAAC clients and general farmers whose rice planted areas are in the low-risk zone increased from 55 Baht per rai in 2021 to 99 Baht per rai in 2022. Those farmers in the low-risk zone did not have to pay for insurance premiums in 2021 as the rate of government subsidy equals the insurance premium rate and the rice insurance is applied automatically. Meanwhile, in the 2022 crop year, those farmers in the low-risk zone will pay 39.6 baht per rai for the insurance premium as the rate of government subsidy of 59.4 baht per rai cannot cover the increase in the insurance premium and they have to apply for buying rice insurance. The insurance premium for non-loan BAAC clients and general farmers whose rice planted areas are in the medium and high-risk zone in the 2022 crop year slightly declined from the 2011 crop year by 11-12 baht per rai. The number of sum-insured of basic insurance coverage (Tier 1) for the 2022 crop year declined from those in 2019-2021 by 70 baht per rai in the case of natural disasters and by 35 baht per rai in the case of insect and disease infestation.

TABLE 2: THE EVOLUTION OF THE CROP INSURANCE PROGRAM DURING THE CROP YEAR 2019-2022

Details	Crop year 2019	Crop year 2020	Crop year 2021	Crop year 2022
Insurers	<p>Pooled of 23 Companies</p> <p>-Krungthai Panich Insurance Public Co., Ltd.</p> <p>-Charan Insurance Public Co., Ltd.</p> <p>-JP Insurance Public Co., Ltd.</p> <p>-Sompo Insurance (Thailand) Public Co., Ltd.</p> <p>-The Dhipaya Insurance Public Co., Ltd.</p> <p>-The Deves Insurance Public Co., Ltd.</p> <p>-Thai Pattana Insurance Public Co., Ltd.</p> <p>-Thai Paiboon Insurance Public Co., Ltd.</p>	<p>Pooled of 17 companies</p> <p>-Krungthai Panich Insurance Public Co., Ltd.</p> <p>-JP Insurance Public Co., Ltd.</p> <p>-Sompo Insurance (Thailand) Public Co., Ltd.</p> <p>-The Dhipaya Insurance Public Co., Ltd.</p> <p>-Thai Paiboon Insurance Public Co., Ltd.</p> <p>-The Thai Setakij Insurance Public Co Ltd</p> <p>-The Navakij Insurance Public Co Ltd</p> <p>-Insurance Thaivivat Public Co Ltd</p>	<p>Pooled of 16 companies</p> <p>-Krungthai Panich Insurance Public Co., Ltd.</p> <p>-Sompo Insurance (Thailand) Public Co., Ltd.</p> <p>-The Dhipaya Insurance Public Co., Ltd.</p> <p>-Thai Paiboon Insurance Public Co., Ltd.</p> <p>-Thaisri Insurance Public Co., Ltd.</p> <p>-The Navakij Insurance Public Co Ltd</p> <p>-Insurance Thaivivat Public Co Ltd</p> <p>-The Falcon Insurance Public Co., Ltd.</p>	<p>Pooled of 13 companies</p> <p>-Krungthai Panich Insurance Public Co., Ltd.</p> <p>-Sompo Insurance (Thailand) Public Co., Ltd.</p> <p>-The Dhipaya Insurance Public Co., Ltd.</p> <p>-Namseng Insurance Public Co., Ltd.</p> <p>-Thaisri Insurance Public Co., Ltd.</p> <p>-The Navakij Insurance Public Co Ltd</p> <p>-Insurance Thaivivat Public Co Ltd</p> <p>-The Falcon Insurance Public Co., Ltd.</p>
Insurers (Continued)	<p>-Thaisri Insurance Public Co., Ltd.</p> <p>-Navakij Insurance Public Co., Ltd.</p> <p>-Namseng Insurance Public Co., Ltd.</p> <p>-Bangkok Union Insurance Public Co., Ltd.</p> <p>-Insurance Thaivivat Public Co., Ltd.</p>	<p>-The Falcon Insurance Public Co., Ltd.</p> <p>-Mitsui Sumitomo Insurance Public Co., Ltd .</p> <p>-Muangthai Insurance Public Co., Ltd.</p> <p>-The Viriyah Insurance Public Co., Ltd.</p> <p>-Syn Mun Kong Insurance Public Co Ltd</p>	<p>- Mitsui Sumitomo Insurance Public Co., Ltd.</p> <p>-Muangthai Insurance Public Co., Ltd.</p> <p>-The Viriyah Insurance Public Co., Ltd.</p> <p>-Syn Mun Kong Insurance Public Co Ltd</p> <p>-Southeast Insurance Public Co Ltd</p>	<p>- Mitsui Sumitomo Insurance Public Co., Ltd.</p> <p>-Muangthai Insurance Public Co., Ltd.</p> <p>-The Viriyah Insurance Public Co., Ltd.</p> <p>-Bangkok Insurance Public Co., Ltd.</p> <p>-AXA Insurance Public Co Ltd</p>

Details	Crop year 2019	Crop year 2020	Crop year 2021	Crop year 2022
	-The Falcon Insurance Public Co., Ltd. -MSIG Insurance Public Co., Ltd. -Muangthai Insurance Public Co., Ltd. -The Viriyah Insurance Public Co., Ltd. -Sri Ayudhya General Insurance Public Co Ltd -Siam City Insurance Public Co Ltd -Syn Mun Kong Insurance Public Co Ltd -Southeast Insurance Public Co Ltd -AXA Insurance Public Co Ltd	-Southeast Insurance Public Co Ltd -AXA Insurance Public Co Ltd -LMG Insurance Public Co Ltd	-AXA Insurance Public Co Ltd -LMG Insurance Public Co Ltd	
Target areas	Tier 1 (Basic insurance coverage): 30 million rai <ul style="list-style-type: none"> • BAAC loan farmers for 28 million rai • General farmers/BAAC non-loan farmers for 2 million rai 	Tier 1: 44.7 million rai <ul style="list-style-type: none"> • BAAC loan farmers for 28 million rai • General farmers in low risk zones for 15.7 million rai • General farmers in moderate and high risk zones for 1 million rai 	Tier 1: 45 million rai <ul style="list-style-type: none"> • BAAC loan farmers for 28 million rai • General farmers in low risk zones for 16 million rai and • General farmers in moderate and high risk zones for 1 million rai 	Tier 1: 28.5 million rai <ul style="list-style-type: none"> • BAAC loan farmers for 28 million rai • BAAC customers who buy extra and general farmers for 500,000 rai
	Tier 2: (Voluntary insurance or add-on insurance): 5 million rai	1 Million rai	1 Million rai	0.5 Million rai
Insurance premiums	Tier 1: premium was 85 baht/rai for the whole country Premiums were subsidized <ul style="list-style-type: none"> • BAAC loan customers received 100% subsidy (from Gov 51 	Tier 1: premiums were subsidized <ul style="list-style-type: none"> • BAAC loan customers: premium was fixed at 97 baht/rai, 100 % subsidized by BAAC (39 baht/rai) and 	Tier 1: premiums were subsidized <ul style="list-style-type: none"> • BAAC loan customers: premium was fixed at 96 baht/rai, 100 % subsidized by BAAC (38 	Tier 1: premiums were subsidized <ul style="list-style-type: none"> • BAAC loan customers: premium was fixed at 99 baht/rai,

Details	Crop year 2019	Crop year 2020	Crop year 2021	Crop year 2022
	<p>baht/rai & BAAC 34 baht/rai)</p> <ul style="list-style-type: none"> • BAAC non-loan customers/general farmers paid 34 baht/rai (government subsidized for 51 baht/rai) 	<p>government 58 baht/rai)</p> <ul style="list-style-type: none"> • BAAC non-loan customers and general farmers: premium was based by zone -For low risk areas, premium was 58 baht /rai (government subsidized 100%) • For medium risk areas, premium was 210 baht/ rai (government paid 58 baht/rai and farmers paid 152 baht/rai • For high risk areas, premium was 230 baht/rai (government paid 58 baht/rai and farmers paid 172 baht/rai 	<p>baht/rai) and government 58 baht/rai)</p> <ul style="list-style-type: none"> • BAAC non-loan customers and general farmers: premium was based by zone -For low risk areas, premium was 55 baht /rai (government subsidized 100%) • For medium risk areas, premium was 210 baht/ rai (government paid 55 baht/rai and farmers paid 155 baht/rai • For high risk areas, premium was 230 baht/rai (government paid 55 baht/rai and farmers paid 175 baht/rai 	<p>100 % subsidized by BAAC (39.6 baht/rai) and government 59.4 baht/rai)</p> <ul style="list-style-type: none"> • BAAC non-loan customers and general farmers: premium was based by zone -For low risk areas, premium was 99 baht /rai (government subsidized 59.4 baht/rai farmers paid 39.6 baht/rai) • For medium risk areas, premium was 199 baht/ rai (government paid 59.4 baht/rai and farmers paid 139.6 baht/rai • For high-risk areas, premium was 218 baht/rai (government paid 59.4 baht/rai and farmers paid 158.6 baht/rai

Details	Crop year 2019	Crop year 2020	Crop year 2021	Crop year 2022
Insurance premiums (Cont)	Tier 2: premiums were not subsidized <ul style="list-style-type: none"> • Low risk zone: 5 baht/rai • Medium risk zone: 15 baht/rai • High risk zone: 25 baht/rai 	Tier 2: premiums were not subsidized <ul style="list-style-type: none"> • Low risk zone: 24 baht/rai • Medium risk zone: 48 baht/rai • High risk zone: 101 baht/rai 	Tier 2: premiums were not subsidized <ul style="list-style-type: none"> • Low risk zone: 24 baht/rai • Medium risk zone: 48 baht/rai • High risk zone: 101 baht/rai 	Tier 2: premiums were not subsidized <ul style="list-style-type: none"> • Low risk zone: 27 baht/rai • Medium risk zone: 60 baht/rai • High risk zone: 110 baht/rai
Sum insured	Tier 1: 1,260 baht/rai for natural disasters, 630 baht/rai for pests and diseases			Tier 1: 1,190 baht/rai for natural disasters, 595 baht/rai for pests and diseases
	Tier 2: 240 baht/rai for natural disasters, 120 baht/rai for pests and disease			
Waiting period	7 days from the start date of the insurance			

Source: Ministry of finance, TGIA 2020-2022

2.1 Institutional Setup and Operation of the Scheme

The rice insurance scheme is a collaboration and cooperation with public & private sectors under Public and Private Partnership (PPP), including FPO, OIC, DoAE, DDPM, BAAC, and TGIA.

Fiscal Policy Office (FPO), Ministry of Finance is a government “Policymaker” agency that set up a crop insurance project, involving collaboration between public and private agencies, including MoAC, BAAC, OIC, and TGIA. The FPO is also responsible for proposing the annual rice crop insurance project for the Rice Policy and Management Committee and cabinet approval. Government subsidy for the rice insurance project is derived from the annual government budget. Generally, the Cabinet agrees that BAAC advances payment of subsidies for insurance premiums on behalf of the government and reimburses the amount actually paid with cost of money rate (BAAC fixed deposit rate+1) in the next fiscal year.

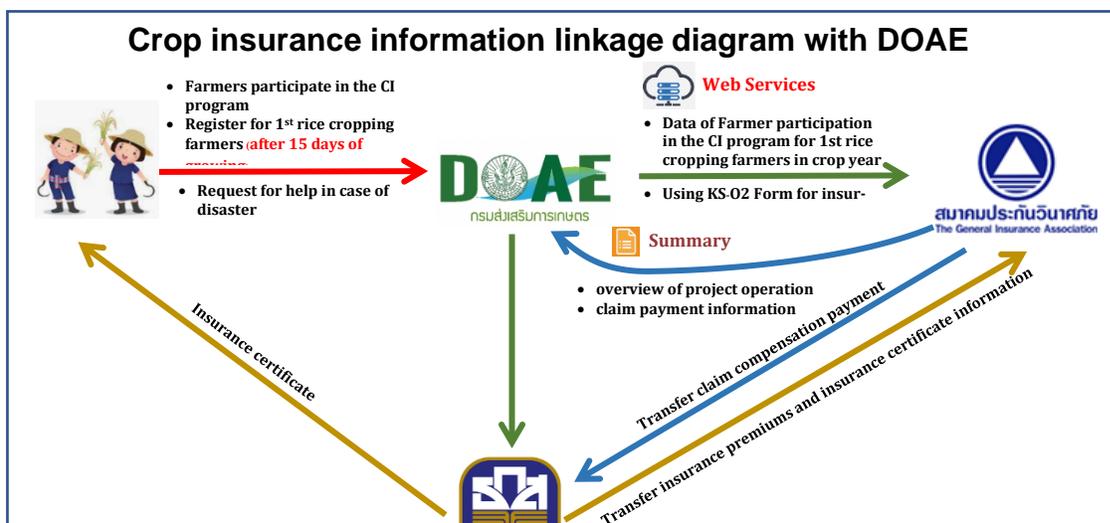
Office of Insurance Commission (OIC) is responsible for regulating, promoting the operation of the insurance business, and protecting the customer’s insurance benefits. OIC approves Rice Insurance Top Up policy wordings and premium prices. The OIC would systematically integrate data of declared calamity areas, linked with the DDPM. The OIC would quickly provide information with BAAC and TGIA, which facilitates the claim payment process. The OIC also provided “Insurance Knowledge Training for Trainers” in order to publicize the project and to provide knowledge and insurance awareness to officials of various government agencies at the provincial level and those works relating to farmers. Examples of trainers include District chiefs, District/Sub-district Agricultural Officers, Volunteer farmers, community leaders, BAAC officials at the provincial level, and Provincial public relations. Knowledge materials/lecture and speakers were from

OIC, TGIA, DDPM, DoAE, and BAAC on the topics of insurance principles and using insurance as a risk management tool, crop insurance policy condition, declaration of calamity areas, farmer registration, and crop insurance application respectively.

Department of Agricultural Extension (DoAE), Ministry of Agriculture plays a role in crop insurance as the agency to integrate the data (Figure 2). Farmers' registration is integrated with BAAC to support selling crop insurance. It is noted that farmer registration with DoAE is the standard requirement for all farmers to be eligible for all government policy participations such as minimum guarantee programs and for general government subsidies such as compensation for natural disasters and other welfare programs for farmers. Particularly, farmers are eligible to buy rice insurance if they registered growing in-season rice and updated rice planting information with DoAE. BAAC uses the integrated farmer's registration data from DoAE to check the eligibility of farmers for selling rice insurance. In addition, BAAC uses this integrated farmer's registration data to apply for rice insurance for BAAC loan clients. BAAC collects insurance premiums from farmers and transfers them to TGIA. BAAC also provides insurance certificates to farmers.

The DoAE officers at the district level also act as national loss adjustors. When a disaster occurs and the provincial governor declares the disaster province, affected farmers must submit requests for compensation by filling-in specified forms KS-01 to the district agricultural officer under DoAE. The district agricultural officer then checks the farmer's registration and inspects the actual damaged planted areas and then calculates the value of government compensation. The DoAE officers (District agricultural officer) then report the data of actual damage for receiving insurance compensation (KS-02 Form and KS-02 Form for insurance). DoAE also coordinates with BAAC and TGIA in integrating the data on farmer registration, KS 02, KS02 form for insurance (Figure 1). TGIA will check all relevant documents such as the effective date, insured planted area (according to the insurance policy), farmer registration, and KS-02 (from DoAE). After getting those documents, TGIA will pay insurance compensation to BAAC to transfer insurance compensation to farmer's banking account.

FIGURE 2: CROP INSURANCE INFORMATION LINKAGE DIAGRAM WITH DOAE



Source: Adapted from DoAE

Farmer registration

Farmers can register or update the farmer's registration 15 days after the crop has been planted until 60 days before the harvest date. There will be a process for inspecting the land area, in case of a new plot. If new farmers have no land rights, farmers must draw the boundary of the land plot. Once farmers complete the registration, they will receive a 'farm book'. Information in the 'farm book' includes farmer name, identification number and address, types of land holding and land tenure, planted area, type of rice (non-glutinous rice or glutinous rice), variety, planting date, expected harvesting date, and expected production in each field.

DoAE uses the following channels to get the registration of farmers:

- Walk-in registration (Most frequently used by farmers). In the Covid situation, most farmers filled in the paper registration form and asked the chief village to submit it to DoAE at the local office. 70% of farmers used paper registration forms.
- DoAE Farm-book mobile application for the same registered farmers with the same plots to update farming activities within the plots. This farm-book mobile application will also help farmers check their rights in receiving disaster-relief funds.
- Farm visit by agricultural district officers in the area to get the farmer registration.

Public hearing and verification proof of the registration is done to verify individual farmers and actual activities in land plots. For example, the DoAE officers must check the evidence of land rights, to be consistent with the number of farmlands registered and with the satellite image map (checking duplications of farming activities used in the land plot under the same land right). The computer program is also used to verify data from various government agencies such as the Department of Provincial Administration, Ministry of Interior, and Department of Lands (The land database system is available only for Title Deed: *Nor Sor 4*). After the validation of the program system, social verification is used by positing each farmer's registration and activities in the village/community for 3 days. Each farmer has done self-certified endorsement. A farmer will receive Farmer's registration book if there is no objection from community members.

It is noted that the government budget for DoAE farmer registration operation is approximately 70-80 million Baht (13 baht/head).

Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior is responsible for a disaster declaration and risk mitigation. The DDPM develops a system and mechanism for disaster risk management and provides assistance to victims.

Whenever a disaster occurs in its localities, local administrative organisations can help support the implementation of disaster relief and emergency assistance under their annual budget of local

administrative organisations, not to be allocated from the disaster relief fund². If the level of damage is beyond the capacity of the local administrative organisation, the disaster must be reported to the provincial government and declared as a calamity area. The provincial government is authorized to use contingency fund advances to alleviate and mitigate the facing hardship of disaster-affected people in conformity with the methods and criteria set forth in the relevant regulations.

Bank for Agriculture and Agricultural Cooperatives (BAAC) acts as a distributor in selling rice insurance both to their loaned clients and non-loaned client rice farmers. BAAC provides insurance premium support and provides insurance for all loaned rice farmer clients. The BAAC estimated the amount of insured planted area for each loaned client according to the value of outstanding debts. Every 4,000 Baht amount of loan will be eligible for BAAC subsidy contributions of 39.6 Baht per rai (40% of the insurance premium). Other 60% of the insurance premium is subsidized by the government budget.

Thai General Insurance Association (TGIA) is a rice insurance scheme administrator, managing the program on behalf of its participating TGIA Members. Several local insurers participate in the scheme with a specified share in the underlying risk pool. Insurers transfer most of the risk via quota share reinsurance. Currently, the pool of local insurance companies accepts 20% of insured risks and passes 80% of insured risks to reinsurance companies.

2.2 Government Compensation Process for Disaster-Affected Farmers and Claims Process for Farmers Buying Insurance.

Government Compensation Process for Disaster-Affected Farmers

Thailand's decentralized governmental structure gives the government compensation process a bottom-up approach. The process starts at the local level (village/sub-district) to the district level and to the province level. The Disaster Relief Committee is set up on 2 levels: district and province. The Disaster Relief Committee at the district level accredits the sub-committee at the village and sub-district levels to verify the damage resulting from the disaster. The process for providing compensation to disaster-affected farmers is as follows:

- (1) When a disaster occurs, a village chief must report the disaster to the district governor within 24 hours;
- (2) The district governor then must report to the Provincial Disaster Relief Committee within 24 hours. The report includes the disaster type, calamity areas, estimated size of damaged areas, and the number of affected people. The report is used to request the provincial governor to declare a disaster in the province;
- (3) The provincial governor must declare the disaster-affected province, within 30 days after the Provincial Disaster Relief Committee receives the report.
- (4) After the government declares the disaster province, affected farmers must submit requests for compensation (by filling-in specified forms KS-01).

² All types of local administrative organisation are required to set up annual budget needed for supporting the implementation of pre - disaster, during, and post - disaster programs and activities within their respective jurisdictions, especially the annual budget required for providing immediate and long-term disaster relief and emergency assistances. See detail in National Disaster Risk Management Plan 2015 (Department of Prevention and Mitigation, 2015)

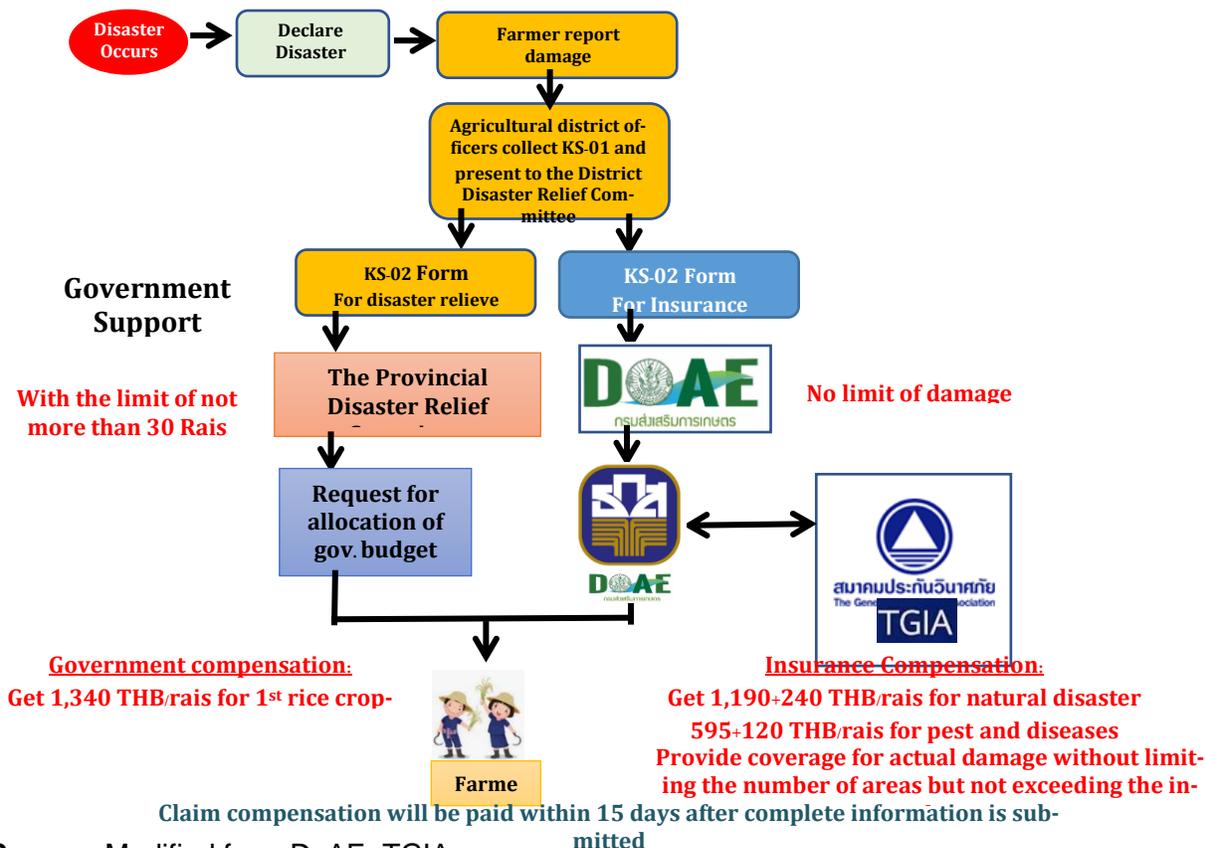
- (5) The Sub-Committee to Verify the Damage Resulting from Disaster is set up at the village level, comprising the village chief, and the chief officer of the *Tambon* (sub-district) Administrative Organisation (TAO). The Sub-Committee at the village level is obligated to investigate and survey the loss and damage of the paddy field. The estimated affected areas are reported to the Sub-Committee at the sub-district level and it then forward a consolidated report to the Disaster Relief Committee at the district level.
- (6) The district agricultural officer must then inspect the farmer's registration and the damage claims, summarize the actual damaged planted area, and then calculate the value of government compensation. Only farmers who suffered a total loss from the disaster are eligible for government disaster compensation. The total loss or 100% damaged planted area, is defined as the planted area that could not harvest rice or produces less than 10 percent of the normal rice crop. The damaged planted area must be at least 25 square yards in size for a single land plot, or at least 50 square yards for multiple plots of land.
- (7) The district agricultural officer then completes a KS-02 form summarizing the loss associated with the disaster and the government compensation for each village, and that form is then posted for at least 3 days for community verification.
- (8) The district agricultural officer then submits a report to the Disaster Relief Committee at the district level. If the budget lies within government advances at the district level, the Disaster Relief Committee can approve to use of government advances at the district level for cash compensations to farmers.
- (9) If the budget exceeds the government advances at the district level but lies within government advances at the provincial level (under the authority of the provincial governor), the provincial agricultural officer then submits the report to the Disaster Relief Committee at the province level for budget approval. However, if the compensation funds exceed the budget approved by the provincial governor, the provincial agricultural officer proposes to use advances of the government budget under the authority of the Permanent Secretary at MoAC. After the approval of the Permanent Secretary, the MoAC approves to use of the budget advances to DoAE at the provincial level. Cash compensation is transferred to the farmers via BAAC bank accounts.

Claims Process for farmers buying insurance

In stages (8) and (9) as described above, DoAE would submit the actual loss report, "KS-02 (for Insurance) Form" to TGIA after the use of budget advances for cash compensations to farmers is approved. TGIA will check all relevant documents such as the effective date, insured planted area according to the insurance policy, farmer registration, and "KS-02 Form". TGIA will pay for insurance compensation within 15 days after getting all documents. The date of receiving the KS-02 form depends on the DoAE process in inspecting the actual damage and the approval of government compensation to farmers. The approval of government compensation sometimes took almost 120 days from the day the areas are declared as calamity areas. The approval would take longer if the compensation funds exceeded the budget approved by the provincial governor as it needs the approval of the Permanent Secretary at MoAC.

A summary diagram for the government Compensation Process for Disaster-Affected Farmers and insurance compensation for farmers buying insurance is shown in figure 3.

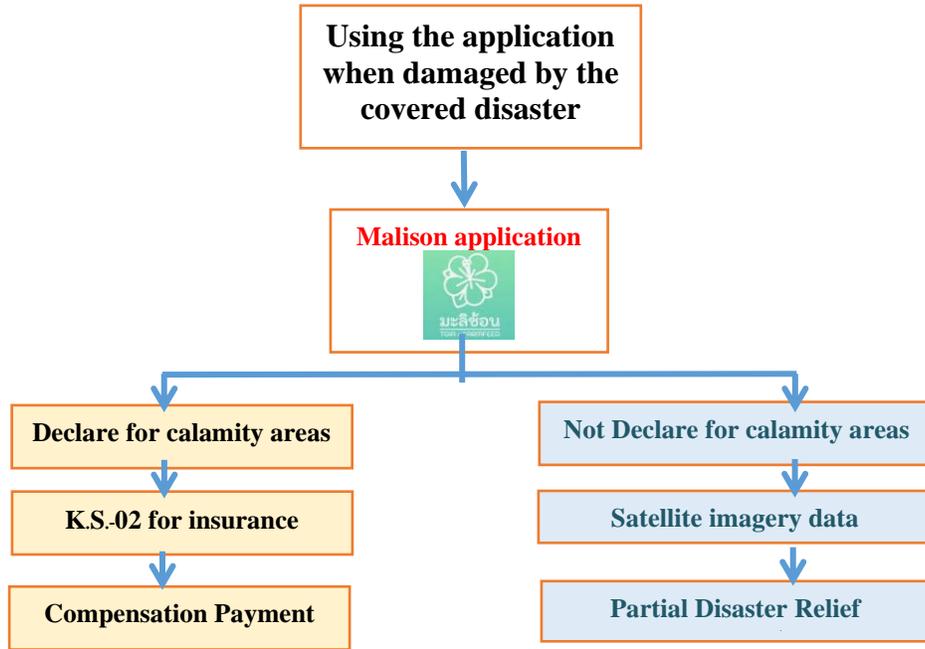
FIGURE 3: DIAGRAM OF PROCEDURE FOR GOVERNMENT COMPENSATION AND INSURANCE COMPENSATION



Source: Modified from DoAE, TGIA

Since the production year 2020, the Cabinet agrees that TGIA sets up loss assessment method using science and technology for rice farmers who are affected by natural disasters, but their planting areas are not declared as disaster areas. The “Malison” mobile application is developed, using satellite imagery technology to evaluate the damage from natural disasters of the rice fields under the collaboration among TGIA, PIER, BAAC, DoAE, GISTDA, DEPA, BAAC, FPO, and OIC. Farmers, both in declared or un-declared calamity areas have to register and draw their rice planted area in the normal situation in the application. When disaster occurs, farmers can report damage to their rice planted area via mobile phone by taking pictures of the damaged rice planting area. The system will check the satellite image by matching the damage from the satellite image and farmer’s image. This application helps paying partial insurance claims faster to assist farmers who have been affected by disasters, including the non-calamity area. The amount of partial assistance per rai is not more than half of sum insured (Figure 4). This application was also developed to reduce the burden of staff to evaluate farmer disaster areas and to help farmers who have suffered a disaster but are not in declared disaster areas.

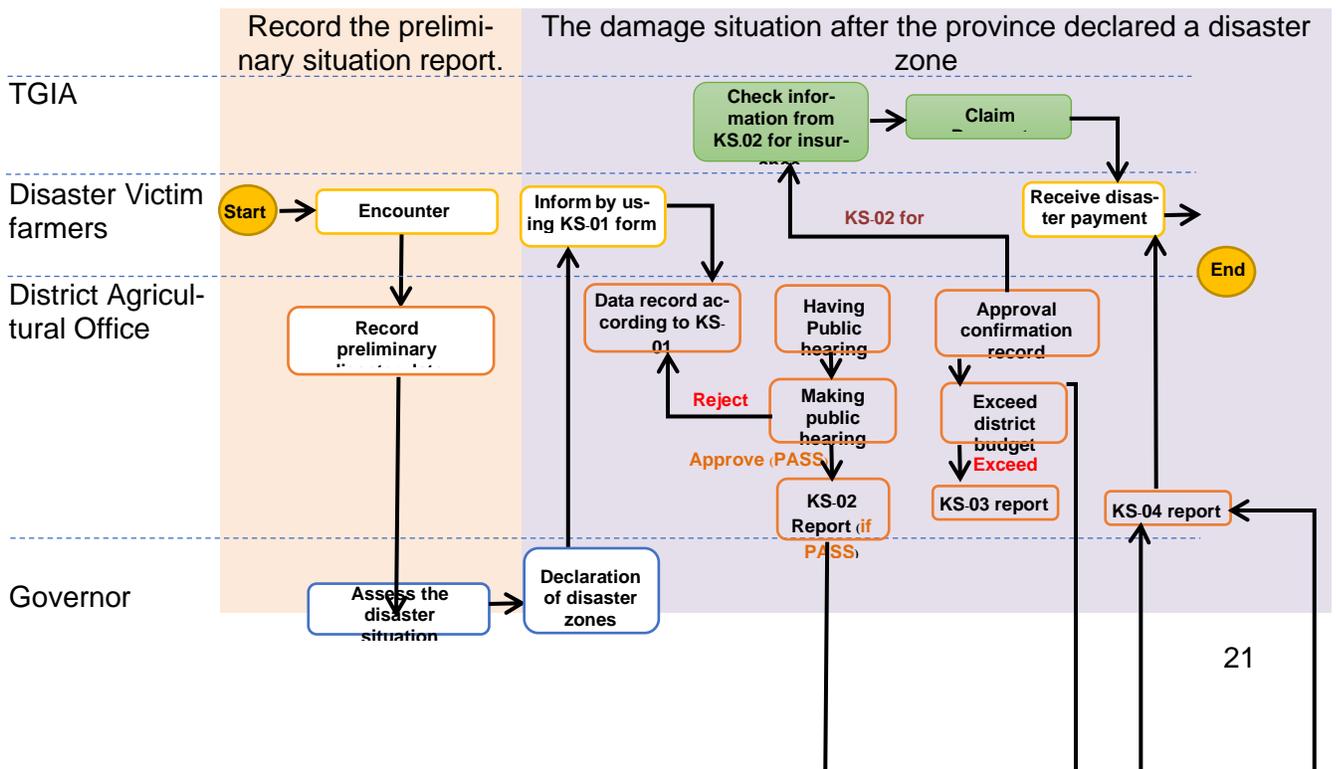
FIGURE 4: PROCEDURE FOR MALISON MOBILE APPLICATION

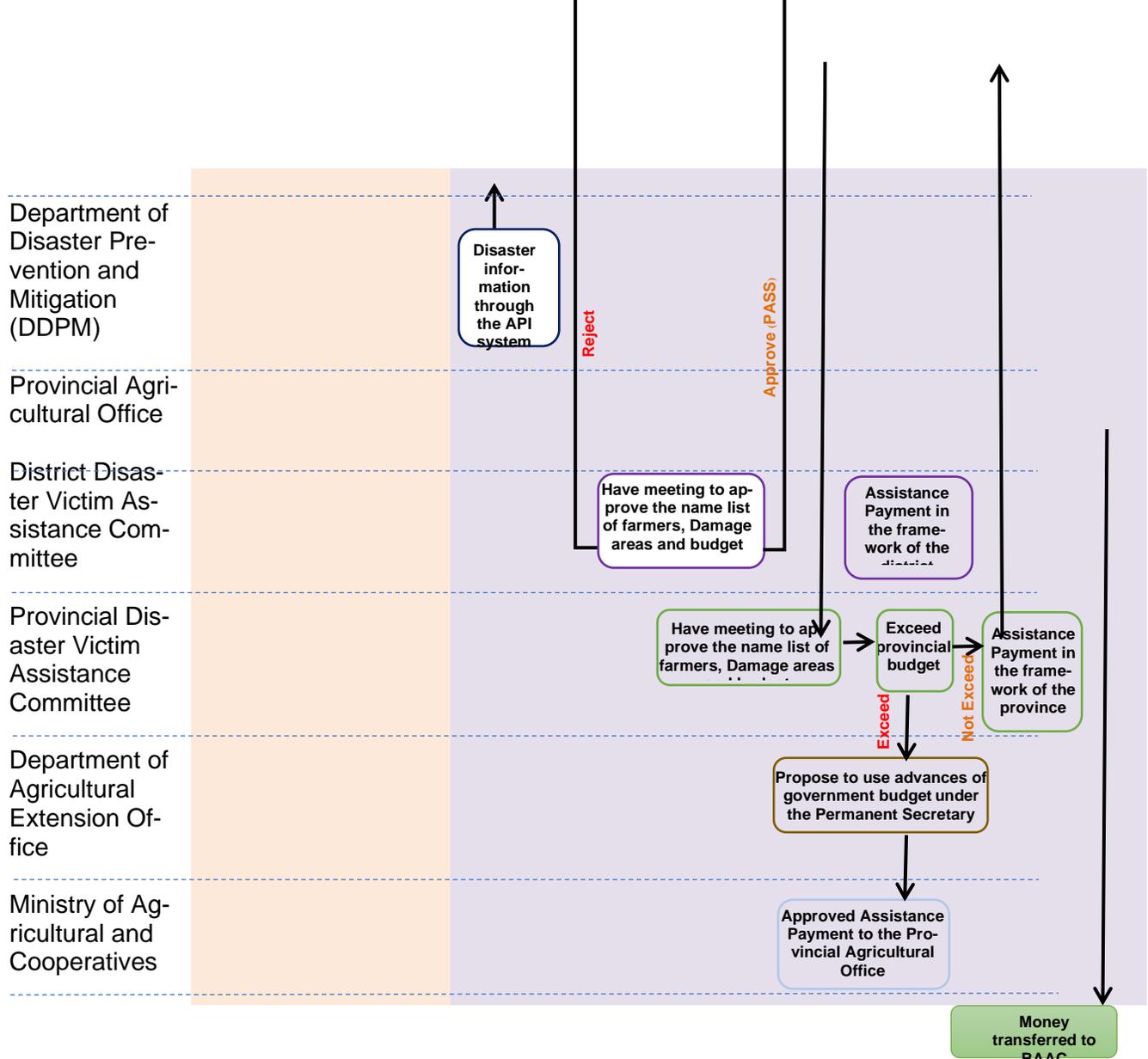


Source: Modified from DoAE, TGIA

2.3 Collaboration among Stakeholders

Collaboration among stakeholders involving procedures for government compensation for disaster relief and insurance compensation is structured as follows.





2.4 Overview of the Performance of the Rice Insurance Scheme

2.4.1. Farmer registration (by DoAE)

In 2020, about 7.38 million farming households registered with DOAE with a total cultivated area of 119.12 million Rai (Report on “Farmer Map”, DoAE 30 April 2021). Of those, 4.691 million farming households, accounting for 64 percent of total farming households, registered as growing rice in the main season. DoAE annually published a report on “Farmer Map” with data statistics on the website. The Farmer registration supports government policy projects, including the rice crop insurance programme, income guarantee programme, and government disaster relief fund. One of the major barriers for farmers to use technology for farmer registration is that most farmers are old-aged (approximately 60 years old and above), and some farmers do not have a smartphone. They have limited access to mobile technologies (Interview with DOAE officials, 2022).

2.4.2 Rice Insurance Top Up policy wordings and premiums (by OIC)

OIC approved 4 types of rice insurance policy wordings and premiums for the production year 2021.

1. Tier 1 rice insurance policy wordings in the production year 2021

The sum insured is 1,260 baht per rai in the case of natural disasters and 630 baht per rai in the case of pest and disease. Tier 1 comprises 3 types of policy wordings.

(1) Policy wordings for BAAC loan clients:

The insurance premium is 96 baht per rai, regardless of the risk zone. The Thai government supports 58 baht per rai and BAAC supports 38 baht per rai. The targeted insured rice planted area is 28 million rai.

(2) Policy wordings for general farmers in a low-risk zone:

The insurance premium is 55 baht per rai. The Thai government subsidizes a total insurance premium of 55 baht per rai. The targeted insured rice planted area is 6 million rai.

(3) Policy wordings for micro insurance:

The Insurance premium is 210 baht per rai for the medium-risk zones and 230 baht per rai for the high-risk zone. Thai government supports 58 Baht per rai and the policyholders (farmers) pay the rest of the premium (152 baht per rai for the medium-risk zone and 172 baht per rai for the high-risk zone). The insured rice planted area is limited to not more than 1 Million Rai.

2. Tier 2 rice insurance policy wordings in the production year 2021

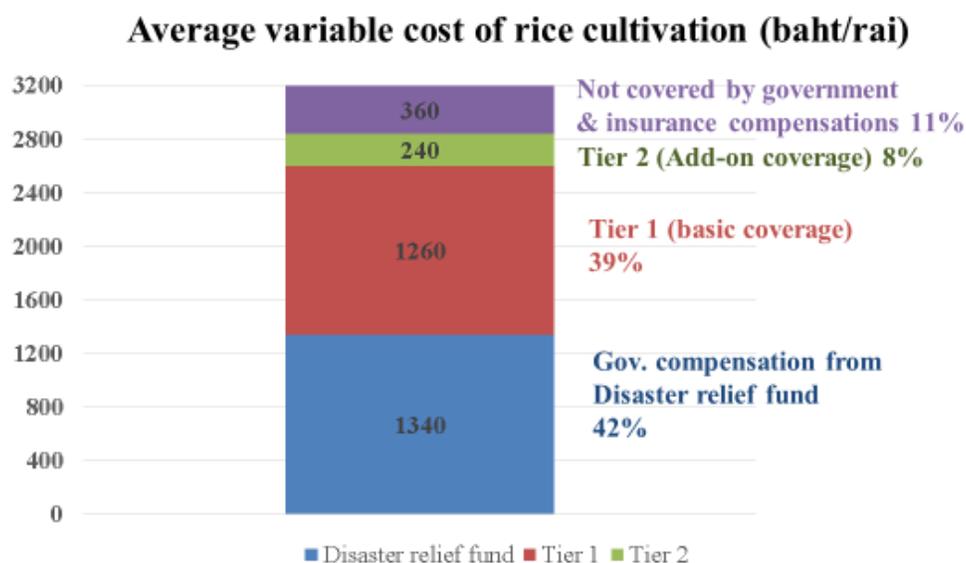
Add-on Policy wordings for micro insurance

The Sum insured is 240 baht per rai in the case of natural disasters and 120 baht per rai in the case of pest and disease. The Insurance premium is 24 Baht per rai for the low-risk zone, 48 Baht per rai for the medium-risk zone, and 101 Baht per rai for the high-risk zone. Policyholders (farmers) are responsible to pay for the total premium.

2.4.3 The amount of sum insured and production costs

In 2021, the sum insured of Tier 1 (basic coverage) and Tier 2 (add-on coverage) for natural disasters accounted for 39 percent and 8 percent of average variable costs and average total costs of rice production respectively (Figure 5). Those percentages are based on the average total cost of rice cultivation for the whole country (4,000 baht per rai in 2021). Generally, the average total cost of rice cultivation differs among different provinces and different varieties. For example, the average total cost is generally higher in Suphanburi province in the central region, a major area for white rice cultivation (5,659 baht per rai in 2021). The average total cost was lower in Ubon Ratchatani province in the north-eastern region, a major area for *Hommali* rice cultivation (3,514 baht per rai in 2021).

FIGURE 5: AVERAGE INPUT COST OF RICE CULTIVATION AND COMPENSATIONS IN CASES OF NATURAL DISASTERS (BAHT/RAI)



Source: Estimated by Consultants

Note: Average total cost of rice cultivation in 2021 was 4,000 Baht per rai (Official data for the whole kingdom, reported by OAE). Variable cost (input & labour cost) is approximately 80% of the total cost.

2.4.4 Crop Insurance Performance

Table 3 represents the performance of the national rice insurance scheme for the main season in Thailand. The penetration ratio increased substantially in 2016 and in 2019 due to the beginning of the full subsidy of BAAC's loan customers in 2016 and the full subsidy of the government in the low-risk zone in 2020 (Table 3 and Figure 6).

TABLE 3: THE PERFORMANCE OF NATIONAL RICE INSURANCE SCHEME FOR THE MAIN CROP DURING 2011-2021

Details	2011	2012	2014	2015	2016	2017	2018	2019	2020	2021
No. of Farmers buying rice insurance (1) (Mil. Person)	0.06	0.05	0.06	0.09	1.57	1.76	1.92	2.19 (Total) 2.04 (Tier1) 0.15 (Tier2)	3.463 (Total) 3.43 (Tier1) 0.033 (Tier2)	3.668 (Total) 3.66 (Tier1) 0.008 (Tier2)
Rice planted area (Mil. Rais) (1)	62.70	64.99	63.21	49.48	56.51	56.66	53.86	61.12	58.09	60.18
Insured rice planted area (Mil. Rai) (1)	1.06	0.87	0.83	1.51	27.18	26.12	27.60	30.86 (Total) 28.43 (Tier1)	44.38 (Total) 43.90 (Tier1)	43.50 (Total) 43.39 (Tier1)

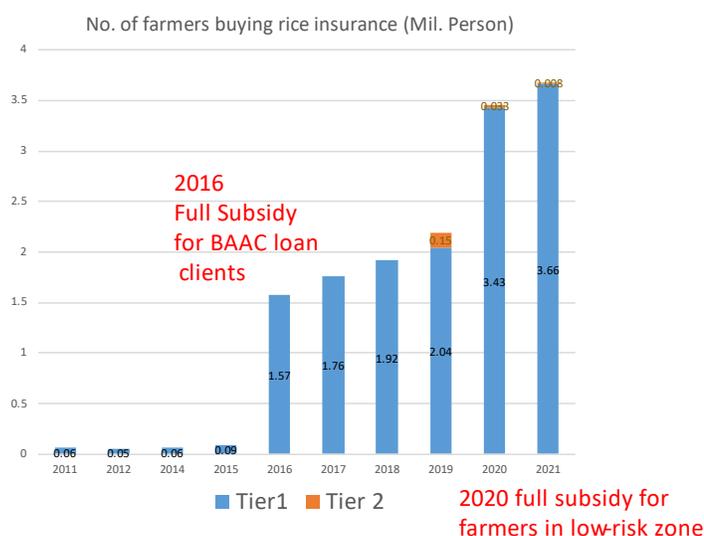
								2.43 (Tier2)	0.48 (Tier2)	0.12 (Tier2)
Penetration Ratio (%)	1.69	1.34	1.31	3.06	48.10	46.10	51.24	50.49	76.41	72.28
Net Premium (Mil. Baht) (2)	136.56	87.10	264.00	491.20	2286.60	2015.68	2177.11	2167.07	3297.82	3568.33
Indemnity Paid (Mil. Baht) (2)	760.55	256.64	128.07	152.79	822.45	2097.39	1796.89	4825.96	520.54	1522.50
Loss Ratio	556.93	294.64	48.51	31.10	35.97	104.05	82.54	222.70	15.78	42.67

Source: TGIA and FPO

(1) Data is as of 24 March 2022

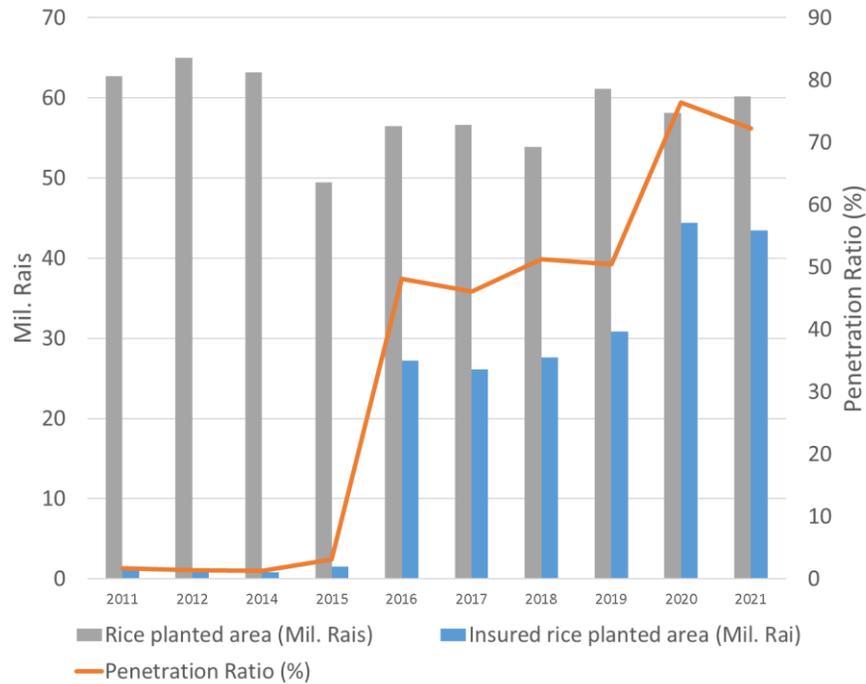
(2) Data is as of 9 March 2022

FIGURE 6: NUMBER OF FARMERS BUYING RICE INSURANCE (MILLION PERSON)



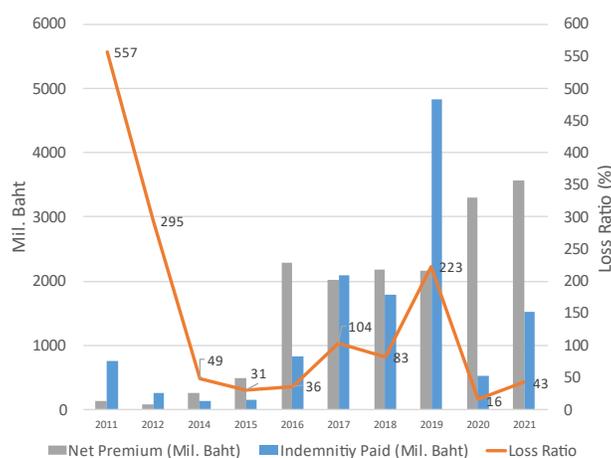
The number of farmers buying rice insurance also increased substantially in 2020 due to the full subsidy of BAAC for loan clients and to government subsidy in the low-risk zone. In 2021, about 3.7 million rice farmers, or 78% of rice farming households, participated in the rice insurance project. Almost 80% of farmers buying rice insurance are BAAC clients. The penetration ratio has also increased substantially in 2020 in line with the full subsidy of BAAC clients (Figure 7). About 70% of the insured planted area are BAAC loan clients, who received a full subsidy from BAAC and the government. In addition, general farmers (non-BAAC loan clients) received a full subsidy from the government in 2021. BAAC loaned rice farmers and general farmers in the low-risk zone automatically enrolled in the insurance scheme and do not have to pay for insurance premiums. It is noticed that the number of farmers buying Tier 2 rice insurance is relatively low (about 8,729 rice farmers in 2021), of which are in the medium and high-risk zone. The TGIA and BAAC shared the reasons for low participation in Tier 2 due to high insurance premium for low-risk farmers to buy insurance.

FIGURE 7: RICE PLANTED AREA, INSURED RICE PLANTED AREA, AND PENETRATION RATIO



The loss ratio (the ratio of claim to premium) was higher than 100 % during 2011-2012 and substantially declined to less than 50% in 2013-2015 due to better risk diversification with zoning. The loss ratio increased to more than 200% in 2019 as a high proportion of insured rice planted area got affected by flood and drought (Figure 8). In 2020 and 2021, the loss ratio significantly declined due to the substantial increase in insured planted area, particularly from the introduction of full subsidy of general farmers (non-BAAC loan clients) in the low-risk zone in 2021. General farmers in the low-risk zone are also automatically enrolled in the insurance scheme.

FIGURE 8: NET PREMIUM, INDEMNITY PAID, AND LOSS RATIO



2.4.5 Crop Insurance Mobile Applications

(1) OIC developed “*Kuru Prakan Khao*” (“Rice Insurance Guru” in English) mobile application to disseminate information on rice insurance including farmer registration, risk zones, the status of buying crop insurance, and insurance claims.

(2) BAAC developed “Insure mobile Application” for selling crop insurance and the farmers can buy crop insurance through this application. About 50,000 rice farmers bought insurance via BAAC “Insure mobile application”. From the interview with BAAC officials, the reason for the low usage of application is that some farmers cannot access smart mobile phones or have unstable internet networks.

(3) About 10,000 rice farmers used “*Malison Application*” in 2021 as they suffered from a disaster but their paddy fields were not in declared disaster areas. The limitation of using this application is that farmers are unable to access the application due to no network in some areas. The application is also used by DoAE district officers to facilitate loss assessment and reduce errors from inspecting the damage at the paddy fields. TGIA offers training to intermediary users including BAAC and DoAE officers. Those officers would then provide training to farmers.

Chapter 3: SWOT analysis of the rice crop insurance scheme

From the perspective of involved stakeholders, the SWOT analysis of the rice crop insurance scheme can be analysed as follows.

Strength (S)	Weakness (W)	Opportunities (O)	Threats (T)
<ol style="list-style-type: none"> 1. There are strong collaborations under public and private partnerships. The rice insurance project is relatively sustainable. It has been implemented for 11 years. It has been improving, making it more inclusive and effective. (Reinsurers) 2. There is wide-range involvement of insurers and reinsurers. (Reinsurers) 3. Insurance covers all the natural hazards at the farm level. (AXA) 4. Insurance covers 70% of the total rice-growing areas. (OIC) 5. The government and BAAC have subsidized insurance premiums, leading to higher numbers of farmers participating in the program. More than 70% of rice farming households participated in the rice insurance project. (Swiss Re) 6. Crop insurance is not complicated. Stakeholders 	<ol style="list-style-type: none"> 1. The project relies heavily on government and BAAC full subsidies. (FPO) 2. The cabinet approval of the annual crop insurance project is sometimes delayed and mismatched with the rice-planting season. (BAAC) 3. Rice farmers have low awareness of crop insurance. Farmers who are BAAC's loan clients and general farmers in low-risk zone did not have to apply for Tier 1 rice insurance. It is automatically covered and farmers did not have to pay premiums. The take-up rate of Tier 2 insurance (voluntary insurance with no subsidy) is very low. This implies that without government subsidy, farmers particularly in low and medium-risk zone are not willing to pay premiums to buy rice insurance. (All Stakeholders) 4. Adverse selection problem occurs. Farmers buying insurance, particularly in Tier 2, are in the high-risk zone. (PIER, TGIA, BAAC) 5. Sum insured falls short of the input costs of production. (Munich Re) 6. Data management is inefficient and unintegrated. (BAAC) 	<ol style="list-style-type: none"> 1. Development of digital technology and interests from Technology/Satellite companies provide opportunities for insurance development. (PIER, GISTDA, INFUSE) 2. Climate change and unfavourable weather create opportunities for crop insurance. (OIC) 3. Geospatial big data is growing rapidly, at least 20% per year, which helps support agricultural insurance. (GISTDA) 	<ol style="list-style-type: none"> 1. Covid 19 makes insurance company loss profit. There are fewer insurance companies joining as pooled insurers. (THAI GIA) 2. Government has a limited budget. Subsidizing insurance premiums create a fiscal burden, which is constrained by the Fiscal Discipline Act. (FPO) 3. Rice farmers have low knowledge of crop insurance (All stakeholders) 4. Rice policies are inconsistent with crop insurance. For example, the government provides cash support for rice harvesting. This generates a bias in the rice damage data as farmers harvest unripe paddy in the damaged rice fields. (PIER)

Strength (S)	Weakness (W)	Opportunities (O)	Threats (T)
<p>are more familiar with traditional crop insurance in which indemnity payments are linked to individual farmers' actual loss. (AXA)</p> <p>7. Satellite technology has been improved to conduct risk assessments and inspect damages at the plot level (PIER).</p>	<p>7. Risk-based pricing cannot be set due to a lack of microdata. (PIER, AXA)</p> <p>8. The crop insurance project needs to have cabinet approval every year. (OIC, AXA)</p> <p>9. There are delays in the declaration of the calamity areas and claiming process. (OAE, AXA)</p> <p>10. The loss assessment procedure is not totally based on quantitative indicators, depending on the judgment of DoAE officers. (DoAE)</p> <p>11. There are some limitations of satellite technology due to lots of clouds. The technology cannot distinguish the loss between drought or pests and diseases. (PIER, GISTDA)</p> <p>12. Loss ratio is high, at least 80% in some years. Insurance companies had to pay off claims of at least 80 baht for every hundred baht they got insurance premiums in cases of flood and drought. (AXA)</p>		

Chapter 4: Way forward Thai rice insurance scheme: On-going and future collaborations and initiatives (2021 - 2025) (national and international), to support the improvement of the current scheme.

1. Geo-Informatics and Space Technology Development Agency (GISTDA)

GISTDA is a public organisation under the supervision of the Ministry of Higher Education, Science, Research and Innovation. GISTDA's Role is to assume all responsibilities and activities for space technology and geo-informatics applications. Relating to the loss assessment, GISTDA applied satellite imagery data to assess affected areas from flood and drought with the mapping, overlaying with rice plantation areas, and other relevant data at the plot level. GISTDA has collaborated with the Rice Department (RD) to do a ground troupe survey and share knowledge on the depth and duration of the flood that negatively affects rice plantations. This helps identify plot-level damage of rice planted areas affected by flood and drought. In addition, GISTDA not only has a long series of flood data and damaged rice plantations for 10 years but also has ground sensor stations (now having 23 stations) at the large rice plantation plots to measure different parameters including relative humidity, soil moisture, rainfall, and temperature. This helps generate time series images to verify with Satellite data. The accuracy of satellite data is quite high.

GISTDA also monitors crop growth and crop health for rice, cassava, maize, and sugarcane every two weeks. Yield loss from disasters is estimated, in collaboration with RD, DoAE, and OAE. Crop water stress is also measured to detect drought, perform early warning systems and assess the impact of drought. In estimating yield, the satellite image can cover 30 m*30 m or (900 sq.m. or about ½ rai), which can be used to estimate yield at a farmer's plots within 1-5 rai. GISTDA, RID, and DoAE have worked together to build a drought index and flood index for the whole country.

GISTDA has limited numbers of data scientists, and agricultural knowledge, agricultural practices, and farmer behaviours. The agricultural knowledge must be gained from the collaboration with other agencies in the MoAC such as RD.

2. Puey Ungphakorn Institute for Economic Research (PIER)

PIER has conducted research into the development of plot-specific risk assessment. PIER works with experts from different fields, under the 3-year memorandum of understanding (MoU) (2018-2021) with 6 stakeholders, including PIER, TGIA, BAAC, DoAE, GISTDA, Digital Economy Promotion Agency (DEPA) where FPO, OIC, and Thailand Research Fund are project advisors. Under this MoU, 6 stakeholders agree to collaborate to study and develop an appropriate agricultural crop insurance system that covers most farmers across Thailand. The study includes the appropriate role of the public sector in driving the sustainable crop insurance market. The collaboration would bring the developed crop insurance system to a real trial in pilot areas. Such cooperation will bring knowledge and research to be released to the public and improve the insurance product to be suitable for practical use in a wide area throughout the country. One of the key activities under this MoU is the integration of agricultural and meteorology data using data science, remote sensing technology from satellite imagery, and mobile technology to collect plot-level data. This would help to improve the agricultural database and support sustainable crop insurance deployment, enhancing the efficiency of damage inspection and loss assessment from disasters.

PIER acts as a coordinator to integrate agricultural databases from both public and private agencies. Integrated databases include DOAE's database such as the Thai farmer registration data (with information on planting and harvesting date), history data of disaster damage provided by DoAE, insurance and claim history data provided by TGIA, and weather satellite imagery provided by GISTDA. PIER has also developed a plot-specific risk assessment, using a machine learning

model from big data such as (1) ground troop survey at plot level provided by DoAE (covering about 60% of the whole rice planted areas), (2) high-resolution satellite imagery from Sentinel 1, Sentinel2, and Landsat 8, NASA MODIS image at the plot level, combined with flood and drought index from GISTDA satellite imagery. Overall, the accuracy performance in detecting or predicting the damage is quite well (with low error) in the north-eastern zone, upper and lower central plain. This can improve faster process payouts. For example, In the plot where the accuracy performance is within the good confident level, claims can be paid. However, the lessons learned from this demonstration activity is that the technology alone for effective loss assessment in Thailand is not yet ready due to technology limitations, historical data availability, and cloud penetration.

PIER has also worked with ARV Company (Robotics Ventures Company Limited), a subsidiary of PTT Exploration and Production Public Company Limited (PTTEP) and an expert from Faculty of Engineering, Kasetsart University to test whether the drone image captures the actual damage. However, the drone technology is too costly, and the high-resolution image received from drone technology was still blurred to distinguish between the water dried up or the plants died.

Currently there are pilot areas for this plot-specific risk assessment in Nakorn Ratchasima, Nakorn Sawan, RoyEt, Khon Ken, Sakon Nakorn and Utai Tani provinces.

As the collaboration under the MoU was ended in 2021, PIER has shifted their role to be advisor instead. The collaboration is during the transition phase. PIER will transfer their knowledge and data generated from this collaboration so far to the potential stakeholder under the MoU (likely TGIA) to continue the work including the continued study on the use of technology for insurance underwriting/product development as well as GISTDA and Thai COM's technology comparison with pilot.

3. Thai COM Company

Thai COM, a private company, collaborates with TGIA in applying science and technology systems, particularly satellite technology to crop insurance. The TGIA will bring knowledge and expertise in insurance to help develop a model of analysis and processing system for crop insurance with Thai Com. The TGIA will provide big data such as insurance, claims and other supporting data from relevant agencies such as damage and perils in different areas to Thai Com for Artificial Intelligence analysing and processing the data with Thai Com data from observation satellite to analyse and report the data to TGIA for crop insurance development. Since Thai Com is a private company, TGIA needs to purchase data generated from their satellite. Their data quality is rather high. Thai Com expresses strong interest in collaborating with TGIA for insurance product development.

4. National Electronics and Computer Technology Centre (NECTEC)

In 2021, National Electronics and Computer Technology Center (NECTEC), a public organisation under the National Science and Technology Development Agency (NSTDA), Ministry of Higher Education, Science, Research and Innovation, collaborates with DoAE in developing "FAARM program", a program to facilitate the DoAE officers' task to register farmers. It is linked to the personal registration database of the Department of Provincial Administration and the land database of the Department of Lands. This application allows for drawing land boundaries according to land rights and draw plots for agricultural activities. This supports the verification process of registration whether farmers have land rights and the number of plots registered matched with actual plots.

5. Office of Agricultural Economics (OAE)

OAE acts as a policymaker to study, analyse and gives advice and recommendation for crop insurance. OAE commissioned Thammasat University during 2021-2022 to develop techniques or tools to detect damage from natural disasters in the agricultural sector and to suggest crop insurance development. Such a report has not been published yet. OAE also provides general agricultural information such as yield, production cost and whether related information. OAE also supports data and collaborate with BAAC and DoAE, in identifying risk zone for crop insurance. In 2021, OAE signed MoU with OIC for academic cooperation and agricultural insurance information exchange. Under this MoU, OIC and OAE would integrate and work together to find a solution for the development of the agricultural insurance system in 4 areas: academic cooperation, agricultural insurance information exchange, public relations and dissemination of agricultural insurance information, and activities to enhance insurance awareness to farmers.

6. Reinsurers (Swiss Re/ Munich Re)

Reinsurers play a role in crop insurance development as they can provide technical assistance and share experience of crop insurance development in the regions. For example, the global reinsurers can bring experience and capacity from other markets such as AI technology to the Thai market to help improve premium pricing. However, due to the data protection issue under the Thai Personal Data Protection Act, the Thai government cannot share detailed data such as the polygon of the land plot and farm details, which are very crucial for developing insurance products and calculate premium. Moving forward, it needs combination of both ground and remote data to validate the accuracy of the remote sensing technology. Communications to farmers are necessary to raise insurance awareness, educate them about the parameter index such as Satellite index and how to use mobile applications. Mobile applications should be developed to make more attractive to farmers, provide more detailed information such as damage and claims. Incentives for using a mobile application such as getting faster claims needs to be added. The effectiveness of the program training to trainers, to raise insurance awareness needs to be reviewed.

Chapter 5: Analysis and recommendations

5.1 Capacity Gaps (Including Technical Capacity) and Strength of Each Stakeholder (SWOT Analysis)

Capacity gaps (including technical capacity) and strength of each stakeholder (SWOT analysis) can be analysed as follows.

Stakeholders	Strength (S)	Weakness (W)	Opportunities (O)	Threat (T)	Capacity Gap	Area of Improvement
1. FPO	<ul style="list-style-type: none"> Understand and experience in crop insurance projects for many years. 	<ul style="list-style-type: none"> The crop insurance project has to be proposed for Cabinet approval every year. There were delays in some years. 			<ul style="list-style-type: none"> Human resource capacity (quantity) relating to the knowledge of actuaries and financial analysis 	<ul style="list-style-type: none"> Training relating to actuaries and financial analysts for understanding insurance premiums and negotiating with reinsurers.
2. DoAE	<ul style="list-style-type: none"> DoAE officers have experience in registration and loss assessment Good manual/training on farmer registration & loss assessment 	<ul style="list-style-type: none"> Limited budget and staff for farmer registration Loss assessment committees sometimes use judgment. For example, in some cases, it is difficult to assess whether planted areas are affected by drought or pests. It is sometimes not clear to see whether the planted areas could not harvest rice or produces less than 10 percent of the normal harvest 	<ul style="list-style-type: none"> Start-up is interested in satellite/drone technology. This creates opportunities for many start-ups to provide drone services to fly together at the same time in every district to inspect the damage. 	<ul style="list-style-type: none"> Main mandate activities are for agricultural extension. Farmers have limited access to technology Ministry of Finance Regulation on Contingency Fund Advances for Emergency Relief Assistance should be revised if using technology for loss assessment. 	<ul style="list-style-type: none"> Data Infrastructure/Data Integration 	<ul style="list-style-type: none"> Integration of all data related to agriculture such as planted area, crop yields, rainfall, perils, and damage under collaborations with different government agencies and private sectors that collect the data
3. Insurance company/TGIA	<ul style="list-style-type: none"> Involvement of insurance companies are active in im- 	<ul style="list-style-type: none"> Limited numbers of data scientists, actuaries and financial analysts 	<ul style="list-style-type: none"> Good collaboration with both public and private agencies 	<ul style="list-style-type: none"> Insurance companies got a negative financial impact 	<ul style="list-style-type: none"> Human resource capacity (quantity) relating to data analytics 	<ul style="list-style-type: none"> Training relating to Data Analytics for risk and loss assessment

Stakeholders	Strength (S)	Weakness (W)	Opportunities (O)	Threat (T)	Capacity Gap	Area of Improvement
	proving the insurance program, including using science and technology for the claim process	for estimating damage and calculating insurance premiums		from Covid 19. Fewer numbers of insurance companies have stable financial status.	for risk assessment and loss assessment mapping	
4. BAAC	<ul style="list-style-type: none"> Majority of the farmers are BAAC's clients Farmers have trust in BAAC as insurance distributors 	<ul style="list-style-type: none"> Limited access to "BAAC insure application" Limited period of crop insurance selling 			<ul style="list-style-type: none"> Human resource capacity (both quality and quantity) 	<ul style="list-style-type: none"> Staff trainings in promoting insurance awareness and outreach to farmers
5. GISTDA	<ul style="list-style-type: none"> Have ground monitoring stations Have expertise in using and analysing remote sensing and linking with meteorological data and data from ground monitoring stations to develop crop yield model to build a rice production monitoring system 	<ul style="list-style-type: none"> Limited staff who has specialization in agriculture 	Have cooperation with AIRBUS for Thai Earth-Observation development	-	-	-

Source: Findings from the interviews

5.2 Recommended Areas of Improvement for Stakeholders' Capacity and Scheme Operation Considering Interests of Stakeholders

1. Promote insurance awareness

BAAC's loan clients in all risk zone and general farmers in the low-risk zone are automatically covered in Tier 1 and farmers do not have to pay premiums. The take-up rate of Tier 2 insurance (voluntary insurance with no subsidy) is very low. This implies that without premium subsidies, farmers particularly in the low-risk zone are not willing to pay premiums to buy rice insurance. There is a need to focus more on creating awareness of the importance of agricultural insurance, which helps improve sustainability in the rice insurance scheme. Insurance awareness should be combined with the farmer's training program, including training on climate-smart practices offered by the rice department.

2. Data improvement

Agricultural statistics and meteorology data and historical damage and loss data should be collected at disaggregated levels (sub-district/village/plot level). Polygon plots (plot boundary drawing) should be extended throughout the country.

3. Promote big data analytics from technology development such as satellite, drone and mobile technology would provide better agricultural risk information to better detect damage and loss assessment and to redesign more efficient agricultural insurance. Technology development such as satellite, drone, and mobile technology is necessary due to the limitation of loss adjustors that are unable to travel to assess loss immediately during the flood occurred in many areas. There is a need for an independent institution that has data scientists to use big data analytics from this technology to detect damage and loss assessment. Supporting start-ups for investing in Satellite, drone, and mobile technology and big data analytics is necessary. With the increased availability and resolution of satellite data and big data analytics can also assess weather-related crop yield risk and estimate crop yield. This can help provide early warning systems for expected disasters.

4. Crop insurance mobile application should be integrated into one application, starting from buying insurance to the claim process and receiving insurance payments. This can be done by integrating "BAAC insure application" with the "*Malison application*". This should be improved by providing incentives such as faster insurance payouts. In the areas where there is a high accuracy rate of the damage report from the *Malison Application*, claims can be made promptly. In the areas with moderate accuracy, it needs human inspection at the plot level to verify.

5. In the medium to long term, the rice insurance be delinked with the loss assessment from disaster relief assistance and move towards parametric risk insurance or plot-specific risk-based insurance.

Parametric insurance covers triggered by specified meteorological events which are ideal for providing rapid relief in disaster situations. They are particularly well-suited to floods and droughts because they can be precisely tailored to specific risks in each region. For example, water level and extreme precipitation can be set at two triggers. The payment is paid automatically if the cover is triggered. In addition, farmers do not have to file a claim with insurance companies. The bottom line is that any parameter or index that is used as the basis for a parametric solution must be objective, transparent, and consistent with actual loss. Satellite technology and other appropriated technologies can help. For example, a remotely sensed index or an area yield index insurance from satellite image can be developed. However, this

may require few more years for developing effective parameters or indexes that is consistent with actual loss.

It is challenging to develop risk hazard maps at the plot level to price insurance effectively. Risk-based insurance premiums can reduce the government budget in subsidizing insurance and increase the effectiveness of crop insurance program.

Chapter 6: Project design with recommendations

6.1 Possibilities of Adding Insurance Elements in Promoting Climate-Smart Practices

Climate-smart practices can help farmers reduce vulnerability from moderate weather shocks, but not for extreme shocks. If insurance covers only losses from extreme weather shocks but not those from shocks that farmers can mitigate by adopting climate-smart technologies, insurance premiums can remain low. Views of key direct stakeholders relating to the possibilities of adding insurance elements in promoting climate-smart practices are summarized as follows.

Stakeholders	Views on possibilities of adding insurance elements
OIC	OIC is now commissioning Chulalongkorn University to study and propose guidelines for drafting the Agricultural Insurance Act. There is a possibility to add a section of rice insurance integrated with good agricultural practices. It is also possible to add insurance premium discounts for farmers who adopt farming practices that reduce greenhouse gas emissions. The premium discounts would be an incentive to support environmentally friendly agricultural practices.
TGIA	In the future, it may be possible to link crop insurance with rice cultivation practices that reduce GHG emissions. However, it depends on national policy. Moreover, changing from traditional to climate-smart practices would not reduce the risks of disaster to occur. Hence, significant discounts on insurance premiums cannot be offered. The insurers are not interested in linking insurance with carbon emission reduction. Nevertheless, during the stakeholder consultation workshop, TGIA shared their view from the perspectives of insurers that insurance underwriters would be interested in designing pilot insurance products if there are at least 100,000 rai of insured planted areas that were implemented climate-smart technologies. This is also to collect samplings and evidence at the plot level to prove whether climate-smart technology contributes to relatively less climate-risk profiles.
BAAC	The BAAC has provided green credits to farmers/farmer groups/community enterprises to support safe food production or energy saving production or environmentally friendly production. However, the interviewees from the insurance Bureau at BAAC have no information regarding loans given to farmers for investment in climate-smart technology.
AXA	AXA Global has insurance segments relating to climate change. AXA Global Agriculture team has promoted a parametric insurance program for smallholder farmers in many countries. The parametric insurance is based on criteria such as rainfall levels and drought durations. For example, insurance payments can be triggered if the rainfall were to exceed the threshold by 200 mm. AXA group also has a policy to support green products. Premium discounts could be offered to policyholders investing in technology to reduce carbon emissions such as solar technology. For linking crop insurance with climate-smart practices such as rice NAMA, it is needed to have evidence proving that the practices can reduce carbon emissions (as opposed to traditional practices). This can be linked with the

Stakeholders	Views on possibilities of adding insurance elements
	current crop insurance program by offering discounts on the insurance premium as an incentive mechanism.
GISTDA	GISTDA is now using Green House Gases Observing Satellite, Orbiting Carbon Observatory 2-3 and flux tower measurements (collaborates with Kasetsart University) at the farmer plots for monitoring the earth's carbon, water and energy cycles. GISTDA also conducted rice crop monitoring from earth observation satellite and ground observation data. The rice growth condition can be linked to farming practices, rice growth condition, and damage from natural disasters, particularly flood.
Swiss Re	The concept of integrating crop insurance with climate-smart practice is an interesting concept. Overall, it depends on national climate policy. What is the target level of carbon emission level?
Munich Re	Farmers have immediate concerns with market price and higher cost of production. The environment is a relatively longer concern from the viewpoint of farmers. The promotion of climate-smart practices should be driven by National policy.

Source: From key informant interviews and the consultation workshop

Two important questions were also asked at the consultation workshop. The first question is about the possibility to incentivise Tier 2 insurance for farmers who adopt climate-smart practices with subsidies. Key stakeholders agree that the Tier 2 insurance premium should not be subsidised as it is voluntary. Otherwise, farmers will not be unaware of crop insurance. The second question is regarding the possibility to extend the coverage of the rice insurance to the dry season. Key stakeholders agree that the rice insurance should not be extended to the dry season as it contradicts government policy to support not growing rice in the dry season farmers as the country braced for a dry spell amid low water levels in main reservoirs.

6.2 Recommendations on Thai Rice GCF Project: Scope and Activities Regarding Crop Insurance

The possible technical supports under the Thai rice GCF project are to support development of plot-level assessment of risk, damage, and carbon emission.

6.2.1 Supporting development of plot-level assessment of risk, damage, and carbon emission

Objectives:

- (1) To provide technical proof whether farmers implementing climate-smart practices experienced low-climate risk profile, low level of damage, and low level of carbon emissions
- (2) To improve the current rice insurance scheme from a faster process of loss assessment of disaster-affected rice planting areas at the plot level using satellite/drone/mobile technology.
- (3) To promote knowledge and awareness of insurance and climate-smart practices to farmers in the Thai Rice GCF project areas and key stakeholders in rice insurance

Proposed activities, Stakeholder involvement and entry points

Activities	Lead partners	Strategic partners	Challenges/barriers
Plot polygons (boundary drawing)	DoAE (Entry point)	GISTDA, NECTEC, RD	DoAE has many mandates. GIZ might have to provide a budget to DoAE for commissioning the task of plot polygons
Support technology (Satellite, drone, and mobile) for better information on agricultural risk / GHG emissions at the plot level	GISTDA&TGIA (Entry point), Start-up companies, Technology providers such as ThaiCOM company	PIER, RD, Thailand Greenhouse Management Organisation (TGO) Kasetsart University	The limitation of satellite technology for GHG emission is still in an early stage of development.

Activities	Lead partners	Strategic partners	Challenges/barriers
Perform big data analytics from technology to detect damage & to map risks/GHG emissions at the plot level	TGIA &GISTDA (Entry point) University Technology analytic companies TGO	PIER TGIA RD	Needs independent agencies that have the expertise to perform big data analytics with transparency.
Validate the accuracy of technologies	TGIA &GISTDA (Entry points) Start-up companies, Technology providers	RD DoAE	Needs ground validation and yield/crop growth modelling
Verify claims and damages of loss assessment mapping at the plot level	TGIA (Entry point) DoAE BAAC	No strategic partners involved	Depends on the validation of the accuracy of plot-level assessment mapping
Promote insurance awareness (Adding activities to promote insurance awareness via field training on climate-smart practices to farmers and key stakeholders at the local level).	OIC TGIA (Entry point) BAAC RD (Entry point)	No strategic partners involved	Depends on technical proof whether farmers implementing climate-smart practices would experience a low-climate risk profile, low level of damage, and low level of carbon emissions

Scope: Select the pilot areas in the rice NAMA target area where the satellite technology, including internet infrastructure, is ready and farmers have financial literacy/insurance awareness. On the insurer side, the pilot areas should have at least 10,000 Rai for a sufficient amount of planted areas covered so the statistical predictions about claim frequency are more accurate and risks can be pooled.

Management: work under the working committee of MOU with 6 stakeholders: TGIA, BAAC, DoAE, GISTDA, DEPA, and PIER.

Any other new stakeholders should be introduced and involved in the current scheme RD, technology providers, including start-up technology companies, and technology analytics such as technical experts from the university and from TGO should be included in the working committee. The important is to have independent agencies, such as technical experts from the university for analysing satellite technology and inspecting the damage.

RD should be the lead agency of the working committee as RD is the secretary of the national rice policy committee that can drive policies to promote both climate-smart practices and rice insurance to farmers. It is noted that the rice insurance project has to be approved by the national rice policy committee before cabinet approval. RD can work, and coordinate with other public and private agencies relating to the rice sector. However, RD is less familiar with and is not expertise in rice insurance. TGIA can be the co-lead agency of the working committee for insurance development.

6.2.2 Added value of GCF project for key stakeholders and new stakeholders

DoAE

Developing a plot-level assessment of damage would facilitate and shorten the process, and save resources and time for damage assessment. Particularly in cases of flood, it is very difficult for traveling to inspect the damage at the field.

TGIA / Insurers

The technology development (satellite technology, drone, and mobile) would increase transparency and save the time of insurance operations, particularly claims and payout verification. The insurance compensations can be paid to farmers faster. In addition, the plot-level assessment will enhance crop insurance product development. The premium of the current insurance system is based on the history data for risk and damage assessments at the district level. The crop insurance system can be improved as it generates “risk mapping” at specific plots. The risk mapping can be used for pricing, which is based on actual risks. The farmers associated with low-risk plots would face low insurance premiums than those with high-risk plots. This can reduce the adverse selection problem. It can also reduce moral hazard problems as moral hazard behaviour will be seen in the risk mapping. Farmers who do not take care of farms would experience higher damage and have to pay higher premiums. So finally, the moral hazard behaviour will be reduced. In addition, farmers who adopted good farming practices, particularly those linked with climate-smart practices would have a relatively low-risk profile, compared to non-adopters. The risk mapping at specific plots can help the insurer to differentiate premiums. A farmer with climate-smart practices will have a relatively low-risk profile and will pay less premium.

BAAC

The plot-level risk assessment can help improve risk profiles of the credit portfolio of BAAC’s clients. The crop insurance system can be extended further to develop BAAC products such as credit insurance in cases of disaster. Instead of insurance compensation paid to farmers, the insurance compensation would be directly paid to the BAAC as loan repayment.

Rice Department (RD)

With the plot-level risk and damage assessment, RD can monitor paddy growth practically at the plot level. This can also be linked with farmers' adoption of climate-smart practices that RD promoted. RD can use this assessment to confirm whether farmers who adopted climate-smart practices have relatively better paddy growth conditions, lower risk, and less damage from natural disasters. This information should be given to farmers when making decisions to adopt climate-smart practices.

Thailand Greenhouse Management Organisation (TGO)

TGO can have data evidence of carbon emission at the plot level to support the Ministry of Natural Resources for international negotiations to reduce greenhouse gas emissions.

Start-up Technology Companies

Start-up technology companies involved in drone technology and satellite technology analytics can strengthen their capacities.

6.2.3 Sustainability of the project activities

1. Financial support

The availability of financial support is an important factor for the sustainability of the project activities. The regular budget of each government agency allocated for activities aligned with the organisation's mandate can increase financial sustainability. For example, the DoAE has a regular budget to support farmer registration and collaborates with NECTEC and GISTDA for polygon plot boundaries. This can increase the sustainability of the project.

2. Stakeholder buy-in

Strong stakeholders buy-in will be a key factor in facilitating progress. With strong collaborations under public and private partnerships, the rice insurance project is relatively sustainable, implemented for 11 years. This is evidence of gaining strong stakeholder buy-in to support crop insurance development in Thailand.

3. Capacities of the executing agencies

Capacities of executive agencies for developing and analysing satellite technology combined with all integrated data to inspect the damage are crucial. GISTDA has high capacities but has limited staff. Some large technology provider companies have high capacities but need to be independent for transparency in assessing risk and inspecting the damage.

6.2.4 Exit strategy of the GCF project on insurance activities

In designing an exit strategy, a phasing-out approach can be considered. There is no further need for any other activities once activities to develop technology for better agricultural risk/GHG emission information at the plot levels are completed. Regarding Plot polygon boundary and crop insurance awareness promotion, there are under DoAE's mandate and OIC's mandate respectively.

6.3 Limitations of This Study and Recommendation for Future Works

According to the Term of references of conducting this study, the methodology is based on desk research and interviews of key stakeholders relating to the improvement of the current rice insurance. This did not consider specific issues relating to the target provinces in the Thai rice GCF and the use of rice insurance as an incentive mechanism to support the Thai rice GCF. The constraints of the interview approach are the capability of the interviewees. In addition, the answers relating to the performance, challenges, capacity gaps, and improvement to the rice insurance scheme given could only be in broad and qualitative terms.

To better respond to the activity design, recommendations for future works to be explored for GIZ and other relevant consultants are as follows.

1. The performance of rice insurance, specific to target provinces in the Thai rice GCF
2. The percentage of farmers under Thai rice GCF in different risk zones
3. The performance of the national rice insurance scheme for the main crop during 2011-2021 breakdown by GCF project target provinces
4. The percentage of farmers under the Thai rice GCF classified by BAAC loan clients and non-BAAC loan clients
5. The average annual income of farmers under the Thai rice GCF

References

- Bank for Agriculture and Agricultural Cooperatives. (2022). *โครงการประกันภัยข้าวนาปี ปีการผลิต 2565 (Rice Insurance Programme: Crop year 2022)*. Retrieved from Bank for Agriculture and Agricultural Cooperatives Website: https://www.baac.or.th/th/content-news.php?content_id=16402&content_group_sub=0001&content_group=0003&insid e=1
- Department of Agricultural Extension. (2020). Guidelines for Finer Practices Regarding Giving Agricultural Assistance to Disaster Victims in Emergency Cases BE 2564 (2020) (in Thai). Bangkok, Thailand. Retrieved from <http://www.plan.doae.go.th/ndrc/work/%E0%B8%AB%E0%B8%A5%E0%B8%B1%E0%B8%81%E0%B9%80%E0%B8%81%E0%B8%93%E0%B8%91%E0%B9%8C%E0%B8%9B%E0%B8%A5%E0%B8%B5%E0%B8%81%E0%B8%A2%E0%B9%88%E0%B8%AD%E0%B8%A2%E0%B8%AF%20%E0%B8%9E.%E0%B8%A8.%202564.pdf>
- Department of Agricultural Extension. (2021, September). Farmer Map BE 2563 (2020) (in Thai). Bangkok, Thailand: Information Technology & Communication center, Department of Agricultural Extension. Retrieved 2022, from <http://www.aiu.doae.go.th/Farmermap/farmermapbook63-202104-watermark.pdf>
- Department of Prevention and Mitigation. (2015). National disaster Risk Management Plan. Retrieved from https://www.disaster.go.th/upload/download/file_attach/584115d64fcee.pdf
- Ministry of Finance. (2022). *Press Release*. Retrieved from Ministry of Finance Website: <https://www.mof.go.th/en/files/2019-07-31-16-27-57>
- Office of Agricultural Economics. (2022). *Final Report of the Research Project "Promotion of Agricultural insurance development" (in Thai)*. Bangkok.
- Office of Natural Resources and Environmental Policy and Planning. (2015, October 1). Thailand's Intended Nationally Determined Contribution (INDC). Bangkok, Thailand. Retrieved from <http://extwprlegs1.fao.org/docs/pdf/tha190475.pdf>
- Thai General Insurance Association. (2022). *Crop Insurance Programmes*. Retrieved from Thai General Insurance Association Website: https://www.tgia.org/crop-ins/index-TH_9
- Thai General Insurance Association. (2022). *Crop Insurance Programmes - Documents download*. Retrieved from Thai General Insurance Association Website: https://www.tgia.org/crop-ins/download-TH_8
- Thai General Insurance Association. (2022). *รายละเอียดโครงการประกันภัยข้าวนาปี 2565 (Thai Rice Insurance Programme 2022)*. Retrieved from Thai General Insurance Association Website: <https://rice.tgia.org/pdf/rice2022.pdf>