FSW-17: Feasibility Study with Dry Run for Agricultural Input Insurance in Cambodia

FSW – 17 conducted by

Syngenta Foundation for Sustainable Agriculture

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Contract	SCBF FSW-17
Project Title	Feasibility Study with Dry Run for Agricultural Input Insurance in Cambodia
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Main Activities	Feasibility Study, Dry Run Data Collection

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List of Abbreviations

AIS	Agricultural Insurance Solutions
ADB	Asian Development Bank
AWS	Automatic Weather Station
CI	Crop Insurance
CIMMYT	International Centre for the Improvement of Maize and Wheat
DAE	Department of Agricultural Extension
DoA	Department of Agriculture
DOWRAM	Department of Water Resources and Meteorology
IBRB	Insurance Business Regulatory Board
IDRA	Insurance Development and Regulatory Authority
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
JICA	Japan International Cooperation Agency
MAFF	Ministry of Agriculture, Forestry and Fisheries
MPCI	Multi-Peril Crop Insurance
RIICE	Remote sensing-based Information and Insurance for Crops in emerging Economies
SCBF	Swiss Capacity Building Facility
SDC	Swiss Agency for Development and Cooperation
SFSA	Syngenta Foundation for Sustainable Agriculture
UCSB	University of California Santa Barbara
WII	Weather Index Insurance
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries

1. Executive Summary

Approximately 4.5 million Cambodians remain close to the poverty line and are likely to fall back into poverty when exposed to economic and other shocks[1]. As nearly 80% of Cambodia's 15.7 million population lives in rural areas, strengthening agriculture is probably the most effective way for increasing household incomes and reducing vulnerability to economic shocks. They are either directly engaged in agriculture or allied activities. Almost 31% of the country's land area is under agricultural production.

Farming is a risky business as it highly exposed to unpredictable and extreme weather. This risk dissuades farmers from additional investment, such as improved (but more expensive) seeds, agri-equipment and crop management chemicals. Similarly rural lending institutions are afraid to provide crop loans at a mass scale as crop-loss shocks can adversely affect their profitability. A functional crop insurance programmes is essential for unlocking the potential of Cambodia's agricultural ecosystem.

Many different organisations have undertaken various crop insurance initiatives during the last decade. While these initiatives did not scale to a mass-level, they were very important in raising awareness about crop insurance with the government, regulators, micro-finance institutions (MFIs) and the insurance sector as a whole. At this stage the relevant stakeholders have shown high interest in expanded crop insurance programmes. The government has already announced agricultural insurance as a part of their policy for supporting and promoting the growth of Cambodian agriculture.

This study was conceived to determine the feasibility of crop insurance in Cambodia, by evaluating the insurance landscape, data availability, and the potential to develop and distribute crop insurance products throughout Cambodia. The study was co-funded by the Swiss Capacity Building Facility (SCBF) and the Syngenta Foundation for Sustainable Agriculture (SFSA) along with Forte Insurance (Cambodia) Plc. (Forte), AMK Microfinance Institution Plc. (AMK) and an agri-input distributor, Rohat Agrotech Co. Ltd (Rohat) as the Partner Financial Institutions (PFIs). The study focused on the rice, maize and cassava crop value chains in the Pursat, Battambang and Pailin provinces of Cambodia. This project was implemented by SFSA in collaboration with the PFIs.

The Feasibility Study (FS) strongly indicates that while there is a demand for crop insurance in the country, the lack of institutional capacities is slowing down the adaptation. The primary challenges are (A) lack of technical capacity in designing crop insurance products; (B) the need for training on crop insurance underwriting and distribution; (C) low insurance awareness among farmers; and (D) sparse weather monitoring infrastructure. One of the key challenges to scaling-up crop insurance in Cambodia is that crop yields, even at village-level, are extremely uneven. This is because each

1 https://www.worldbank.org/en/country/cambodia/overview

farmer has different levels of intensity and efficiency of input use and water availability. The yield differences make it very difficult to implement Area Yield Insurance, especially the ones based on farm-level crop yield samples. A subsequent intervention should consider creating a set of pre-designed product templates, pricing tools, and underwriting guidelines. This will enable fostering innovation in the ecosystem.

The study proposes multiple solutions to hasten the crop insurance ecosystem in Cambodia. There should be a strong focus on improving the in-county product design and underwriting capabilities, so as to unshackle innovation and experimentation. Lack of data for underwriting and loss assessment is a major challenge. Hence, the project proposes building data partnerships within the country. Scaling-up innovative programmes like Remote sensing-based Information and Insurance for Crops in emerging Economies (RIICE) and the use of satellite-based data products should be encouraged. Strong partnerships will be essential for scaling-up crop insurance in Cambodia especially to lower the distribution costs, ease loss assessment and efficient claims settlement.

Under this study simple Weather Index Insurance (WII) products for rice, maize and cassava were developed. The focus of these products is to cover the risks of excess and deficit rainfall. All stakeholders including farmers, expressed their confidence about both WII for maize and cassava crops and AYI for rice crop. It is relatively easier to design WII products and scale it up. WII products are also flexible and can be quickly deployed as compared with other methods. Any subsequent scale-up should consider this fact.

This study proposes to implement product upscaling (PU) programmes during the 2022 and 2023 crop seasons to scale-up the Area Yield and Weather Index insurances. During this feasibility study, we also realized the importance of product awareness, training and capacity building for all stakeholders. Hence, we already started Financial Education (FE) programmes in 2020 to develop educational materials and videos on financial literacy, awareness about insurance and good agronomical and farm management practices. These materials are going to be used for the training-of-trainers for the different stakeholders and publicized through social media for wider outreach.

2. Introduction

Despite three decades of devastating civil conflict, Cambodia has achieved remarkable progress in reducing poverty, and boosting economic growth and shared prosperity. Growth averaged 7.9 percent over the period of 1997 to 2017, while Cambodia's open borders to international trade and investment helped attract foreign direct investment to support manufacturing, construction and tourism. As a result of this sustained high growth and poverty reduction efforts, the percentage of Cambodians living under the national poverty line fell from 47.8 percent in 2007 to 13.5 percent in 2014[2]. However, despite the fast growth and development, poverty and food security remain issues of concern within Cambodia.

Approximately 4.5 million people still live close to the poverty line and are likely to fall back into poverty if exposed to economic or climate shocks. Key reforms are needed for Cambodia to sustain pro-poor growth, foster competitiveness, sustainably manage natural resources, and improve equitable access to and quality of public services. Cambodia continues to have a serious infrastructure gap and would benefit from greater connectivity and investments in rural and urban infrastructure. Further diversification of the economy will require fostering entrepreneurship, expanding the use of technology and building new skills to address emerging labour market and agricultural needs[3].

Figure 1: Map of Cambodia

Agri-sector growth is the fastest way to increase the income of Cambodia's rural population. Nearly 80 percent of Cambodians live in rural areas, and most of them are farmers, with nearly 31 percent of the country's territory under agricultural production. But agriculture is substantially risky and

2 https://www.worldbank.org/en/results/2019/10/30/cambodia-reducing-poverty-and-sharing-prosperity
3 https://www.worldbank.org/en/country/cambodia/overview

sensitive to several stresses, particularly extreme weather events. The fear of crop yield losses prevents farmers from taking risks such as investing in better seeds or agricultural equipment. Agricultural insurance can be a useful tool to protect farmers from these risks, but it is a new concept that has not yet been widely accepted in Cambodia.

This "***Feasibility Study with Dry Run for Agricultural Input Insurance in Cambodia (SCBF FSW-17)***", a project co-funded by SCBF and SFSA in collaboration with the Partner Financial Institutions (PFIs) was launched in September 2018. It primarily aimed to understand the insurance and micro-insurance landscape, and to determine the potential to develop and distribute agricultural insurance products in Cambodia. During this period, the study collected data on the local characteristics of farming, main risks, and the impact of these risks on the crops that would be insured. The study focused on rice, maize, and cassava, which are important crops in Cambodia; in the Pursat, Battambang, and Pailin provinces of Northwest Cambodia (Figure 1).

The key questions this study sought to answer were:

- What is the current agricultural finance and insurance landscape and are there micro-insurance products already being offered?
- What are the key constraints that micro-insurance delivery could face during implementation?
- What are the most important agricultural value chains and associated input distribution systems and which ones could be prioritized for agricultural input insurance?
- Identify potential aggregators and partner organisations (NGOs, MFIs, Insurers, local government stakeholders, farmers groups).
- What is the state of the enabling environment and who are the key agencies or relevant stakeholders involved in the agricultural and financial sectors, and insurance regulation?
- What data is available in targeted areas? What weather data or yield data is available and could be valuable to design the index insurance products?
- Undertake financial analysis and business model projections for potential implementation of agricultural input insurance in Cambodia.

This study was implemented by SFSA in close collaboration with key local partners, in particular, Forte Insurance (Cambodia) Plc. (Forte), AMK Microfinance Institution Plc. (AMK) and an agri-input distributor, Rohat Agrotech Co. Ltd (Rohat). This study was also supported by partners under the RIICE technology consortium[4] to enable a rice crop Area Yield Index (AYI) insurance dry test. A detailed note about the project partners is provided in Annex i – Project Partners.

4 Core RIICE project partners include Swiss Agency for Development and Cooperation (SDC), sarmap, and International Rice Research Institute (IRRI). In Cambodia the project was supported by Ministry of Agriculture, Forestry and Fisheries (MAFF), Syngenta Foundation for Sustainable Agriculture (SFSA), SCOR RE, and Forte Insurance Plc

3. Overview of the feasibility study and methodology

The goal of the feasibility study was to estimate the potential for developing commercially viable crop insurance in Cambodia and to identify implementing partners. Recognizing the diversity of the agricultural sector, the team conducting the study investigated the viability of three major value chains, to establish whether crop insurance would be beneficial for the farmers and the stakeholders. Analysis was done on the rice, maize, and cassava crop value chains. The study was conducted in four phases. An overview of our methodology is illustrated in **Figure 2** and described in **Table 1: Description of the Feasibility Study**.

Figure 2: Phases of the Feasibility Study

Table 1: Description of the Feasibility Study

Phase 1: Data Collection	**Methodology**	• Group discussions and personal interviews
	Stakeholders	• Government departments and agencies • Development partners • Private lenders • Agribusinesses (processors, and input companies) • Agronomists and agricultural institutions
	Output	• Data collection on agricultural practices, crop information, weather information, sector overview and in-depth discussions, challenges and potential
Phase 2: Discussions and Field Visits	**Methodology**	• Field Visits, group discussions and personal interviews
	Stakeholders	• Farmers • Farmer groups and organisations • Agribusinesses • Local members of the agricultural value chain
	Output	• Assessing risks • Understanding input usage • Validating the market research data • Detailed understanding of agronomic practices
Phase 3: Weather and Yield Data Collection	**Methodology**	• Field visits, group discussions and personal interviews
	Stakeholders	• Ministry of Agriculture, Forestry and Fisheries (MAFF) • Department of Meteorology and Water Resources • Sources of reliable daily weather data • Local administrative units • RIICE project
	Output	• Weather fata • Data with adequate historical time series • Crop yield fata • Identification of data sources (rain gauges or automated weather stations)
Phase 4: Identification of Commercially Viable Products and Pilots	**Methodology**	• Referring to existing products and creating new customized products
	Stakeholders	• Insurance companies • MAFF • Banking and Microfinance Organizations • SFSA global team
	Output	• SFSA product portfolio

After analysing the data collected in the first three phases, value chains and specific aggregators were identified to distribute the crop insurance policies.

A dry run of the crop insurance products important crops was carried out in the project areas:

1. Rice in the Pursat and Battambang provinces; and
2. Maize and cassava in the Pailin province

The rationale behind the selection of products and areas is provided below:

1. To cover the main communes with agricultural potential after conducting an agro-ecological zoning exercise;
2. To develop products in communes that can easily be replicated in other communes and geographies; and
3. The areas covered by partner aggregators' current reach.

4. Review of Crop Insurance Initiatives in Cambodia

Despite a growing interest, agriculture insurance is a relatively new concept in Cambodia. Over the last few years, several initiatives supported by international donors have explored opportunities to promote crop insurance in Cambodia. These attempts have been successful in generating a strong interest amongst the Government of Cambodia and relevant local stakeholders to trial agricultural insurance as a risk mitigation mechanism for farmers. The government has already announced agricultural insurance as a part of their policy for supporting and promoting the growth of Cambodian agriculture.

Some of the crop insurance-associated projects are listed below:

- **2014 to 2016**: FORTE has piloted Weather Index Insurance (WII) in the Pursat and Battambang provinces with Swiss Re technical and reinsurance support.
- **2015**: FORTE with support from Swiss Re and VanderSat has piloted Weather (WICI) and Soil Moisture (SMICI) Indexed Crop Insurance in the north-western provinces of Pursat and Battambang.
- **2015 to 2018**: CEDAC, a local NGO, piloted an AYI crop insurance with farmers in the provinces of Kampong Speu, Takeo, and Kampong Chhnang.
- **2018 to 2020**: SFSA conducted a feasibility study with support from Forte and AMK to collect data to design rice, maize and cassava weather index insurance products.
- **2020 to 2021**: SFSA partnered with Forte and AMK to organize a financial literacy and insurance awareness campaign among all potential stakeholders.
- **2020**: AGRIBEE (Cambodia) Plc. in a partnership with Arbol Inc., a US-based weather contracts company, decided to provide crop coverage for 2,000 paddy producers from July to December 2020.
- **2019 to 2021**: RIICE III partnered with MAFF, FORTE, SCOR, IRRI, and SFSA is trialling an Area Yield Index Crop Insurance (AYICI) project using RIICE technology in the Takeo, Prey Veng, Pursat, and Battambang provinces.

4.1. Lessons Learned from the Pilots

While the potential for crop insurance in Cambodia is huge, there are many challenges for successful scale up. Traditional individual indemnity-based insurance has proved to be unsustainable and unmanageable in the smallholder ecosystem[5]. Therefore, smallholder crop insurance, such as Area Yield Index (AYI) with the help of remote sensing satellite-based insurance or weather index-based insurance or a combination of both, are the most viable products.

5 India's PMFBY crop insurance scheme is moving away from field crop sampling based yield estimation to remote sensing based crop yield estimation, precisely due to the unmanageability of CCEs (or Crop cutting experiments)

Some of the familiar demand-side and distribution challenges are listed hereunder:

- **Demand-side challenges**
  - Lack of awareness about crop insurance (and insurance in general) amongst farmers.
  - Low willingness to pay resulting from low incomes and lack of awareness.
- **Distribution challenges**
  - The penetration of MFIs in Cambodia is growing but farmer-level insurance distribution has been difficult to bundle with loans. Pilots in other countries have faced similar problems because MFIs are often reluctant to bundle insurance with the loans as non-payout can negatively impact their reputation.
  - Lack of ICT penetration makes it difficult to reach farmers.
  - Excessive paperwork required for registering farmers is a challenge.
  - Ambiguous insurance regulations around crop insurance distribution and agent/broker commission are potential challenges. Annex xvii – Insurance Regulation in Cambodia, provides more details of the insurance landscape.

Financial institutions, insurance companies and the Government of Cambodia have been slow in investing in crop insurance despite growing interest due to several supply-side challenges unique to Cambodia:

- **Lack of historical data**: Meteorological infrastructure in Cambodia is relatively sparse. Moreover, most of the historical weather and yield data was lost during the war. This makes it difficult to model historical losses essential for insurance pricing.
- **Limited technical capacity to design and implement crop insurance programmes**: There is poor understanding and appreciation of the complexity of risk and lack of adequate risk-modelling technology to understand the impact of agricultural risks on crop yields.
- The farming community and potential stakeholders have a generally limited understanding of crop insurance.
- There is an absence of agent or aggregator-level distribution models.

5. Data Availability for Crop Insurance

5.1. Crop statistics

Crop statistics, including production areas, yields, and crop prices, are collected by the Provincial Department of Agriculture, Forestry and Fisheries (PDAFF) in every province across the country. Each PDAFF then sends all crop statistics to the General Directorate of Agriculture (GDA) for storage.

1. **Commune-level yield data** is available, but the quality remains poor. Analysis done through the RIICE project indicate unexplainable yield differences between commune and MAFF yield data.
2. **MAFF yield data**, on preliminary analysis, seems to be best yield dataset available for Cambodia, but there are few challenges. Data is available only for 10 years (2007-2010 and 2013 to 2019) making it difficult to undertake an in-depth analysis. Yield data is available at a district-level, and we can assume that the yield data at a commune-level will show high variability.

5.2. Hydrometeorological data

The Department of Meteorology (DOM) under The Ministry of Water Resources and Meteorology (MoWRAM) is the primary agency responsible for managing the weather monitoring infrastructure in Cambodia. The Department of Hydrology and River Works (DHRW), which also falls under the MoWRAM, manages the hydrological station network across the country. Other climatological data sources include the MAFF and agriculture universities which manage agro-meteorological stations.

The weather monitoring infrastructure includes (A) manual rain gauges, (B) automated weather stations (AWS), and (C) weather observatories. The website of Department of Meteorology indicates that there are approximately 20 working AWSs available to them. There are a few reports on the increasing the number of AWS thanks to funding from the Asian Development Bank (ADB), Japan International Cooperation Agency (JICA), United Nations Development Programme (UNDP) and other organisations, but these are not reflected in numbers indicated by the DOM. We believe the website might not have been updated recently. According to a report[6] by the United Nations Office for Disaster Risk Reduction (UNISDR), Cambodia managed a network of 200+ manual rain gauges nationally, but we believe there are only 50 rain gauges (based on anecdotal data) with most provinces having historical records up to or around 15 years. Apart from the hand recorded data, the Ministry of Water Resources and Meteorology (MoWRAM) together with its provincial departments (DOWRAMs) have installed several AWSs across the country. As there were no weather stations available in the locations covered by this FS, SFSA installed three AWSs (one in each province) to fill the gap and ensure the data is available for product development and claims monitoring (Figure 3).

6 https://www.unisdr.org/files/33988_countryassessmentreportcambodia%5B1%5D.pdf

Figure 3: Automatic Weather Station installed in Battambang Province

5.3. CHIRPS data

The Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) is a quasi-global rainfall dataset. It combines data from real-time observations of meteorological stations with infra-red data to estimate precipitation. The dataset runs from 1981 to the present time.

CHIRPS incorporates 0.05° resolution satellite imagery with in-situ station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring. Since 1999, U.S. Geological Survey (USGS) and Climate Hazard Group (CHG) scientists, supported by funding from the U.S. Agency for International Development (USAID), the National Aeronautics and Space Administration (NASA), and the National Oceanic and Atmospheric Administration (NOAA) have been developing techniques for producing rainfall maps, especially where surface data is sparse.

Table 2: Data Available with the Study Partners

Date Set	Data	Time Series
MAFF yield data	MWS yields	2007-2019 (2011 and 2012 are missing)
Commune database	Wet season rice	2002-2017 (2006 missing)
RIICE yields	MWS yields	2016 onwards
CHIRPS rainfall data	Daily rainfall data	1981-2020

6. Crop Data Collection for Dry Run

6.1. Data Collection Methodology

Household surveys and regular crop monitoring were conducted in the provinces of Battambang, Pursat and Pailin. These locations were selected as Battambang and Pursat are the largest rice producing provinces in Northwest Cambodia, and Forte and AMK have been already working in these areas; and because the Pailin province is one of the largest maize-growing provinces in the country (Figure 4).

- Three growing cycles of wet season paddy were monitored in Battambang and Pursat
- Two growing cycles of wet season maize were conducted in Pailin
- About 376 maize and paddy household representatives were surveyed
- Around 242 paddy fields and 134 maize fields were regularly monitored

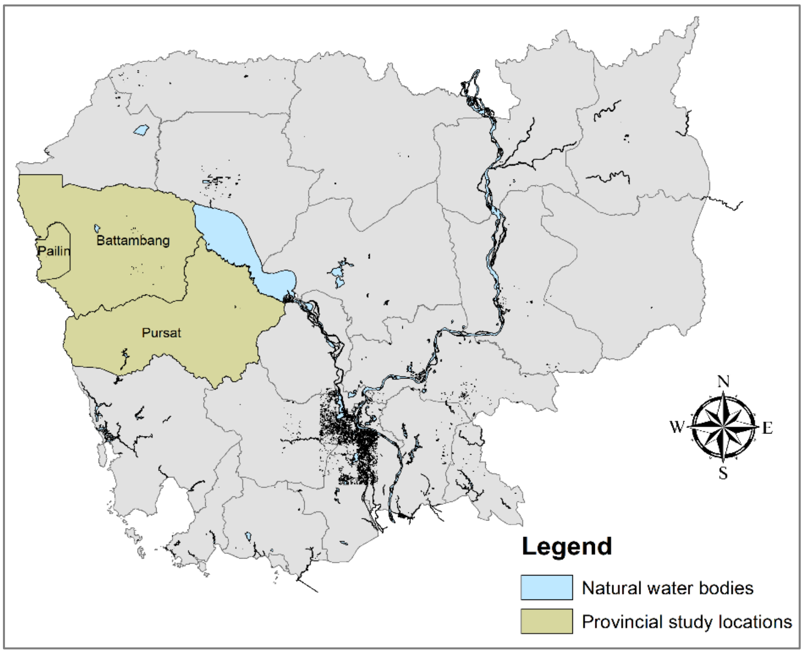


Figure 4: Study locations presented at the provincial level

The sampling process was to establish contact with the commune and village leaders to introduce the project and seek their permission before interviewing the farmers. The village leaders were asked to help with identifying villagers to join the study; and when additional interviewees were required, the project team walked through the villages and approached more families for inclusion in the study. Once each household representative was interviewed, he/she was asked to nominate fields to be monitored from the land preparation stage to the harvest. The household survey and field benchmarking were carried out using the CommCare mobile platform which enables digital questionnaires to deliver through Android devices. This method allowed to transmit collected data to a secure central server in real time.

6.2. Climate in Cambodia

Rainfall distribution within in the north-western region and across Cambodia comprises a five-month dry season (December-May) and a wet season (June to November) from the onset of the Southeast Asian Monsoon (Figure 5). The rainy season is slightly bimodal with a dry spell that usually occurs in July or August. This is locally called Kuon Rodow Prang (meaning a child dry season). More than 80 percent of the rainfall normally falls within the main wet season (August-October). The mean, maximum, and minimum temperatures are between 32.8 and 23.3°C, respectively. The hottest months (average temperature 35.7°C) of the year are March and April, and the coolest (average minimum temperature 21.4°C) are December and January.

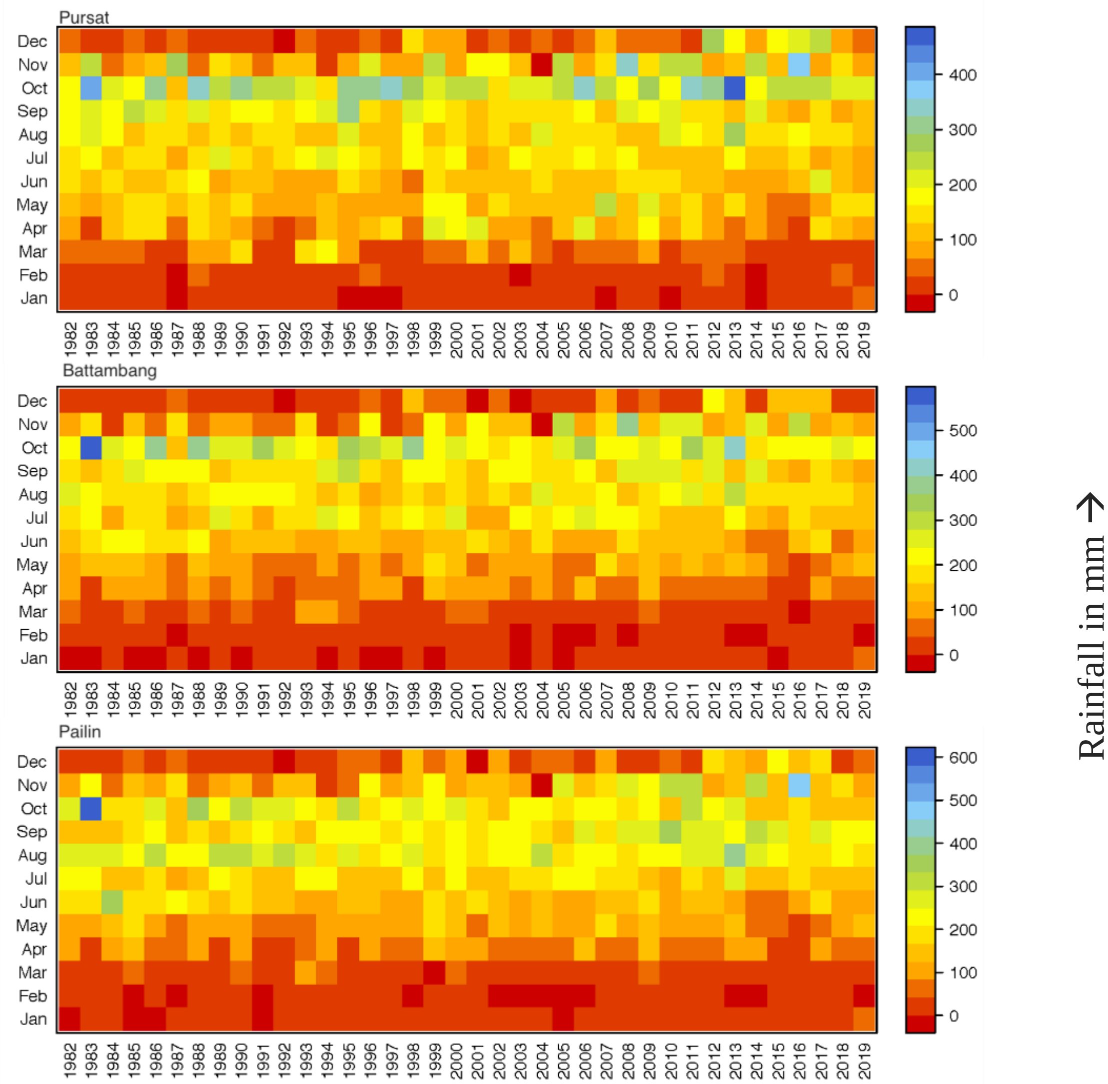


Figure 5: Heatmap for historical monthly rainfall in mm for the Pursat, Battambang and Pailin provinces.

6.3. Key findings

The agriculture ecosystem of Cambodia was pushed back many decades during the civil war and the country is still being rebuilt. Essential components of the agri-ecosystem, such as agri-extension services and agricultural research are virtually missing. As a result, farmers often follow very unoptimized farming practices lowering their revenue and increasing their production risk.

- The study noted that farmers are hand broadcasting paddy seeds, which is very inefficient.
- Field observations showed a machine planter was used to plant maize seed on poor seedbeds (prepared using a disk plough). As a result, the sowing depth was uneven and sometimes seeds were placed on the soil surface. This adversely affects seed germination, and ultimately impacts the overall plant density and distribution.
- Labour shortages, especially during peak agricultural seasons, seem to be a constant challenge. The rising cost of labour increases its demand. The study also noted that weeds are a major problem, but due to high labour charges farmers often choose not to do anything about it.

Crop yields even at village-level are extremely uneven. This was due to each farmer having different levels of intensity and efficiency of input and water availability and use. The study found that the top 10% of rice farmers achieved yields of 5 t/ha; while the next 10% received very poor yield as low as 0.75 t/ha. Besides these, we found that 2.5% of the farmers had a complete crop failure due to lack of water. **The yield differences make it very difficult to implement Area Yield Index Insurance, especially the ones based of farm-level crop yield samples.**

7. Capacity-building and Awareness Creation

7.1. National level

A national-level workshop was held on "Crop insurance: A potential tool for financial risk mitigation for smallholder farmers in Cambodia" in October 2019 in Phnom Penh with potential stakeholders. The purpose of this workshop was to create awareness and give an overview of the current landscape of crop insurance in Cambodia. This included laying out the challenges and opportunities for crop insurance companies, the benefits of obtaining crop insurance for smallholder farmers, and setting a sector-wide agenda to align with government policies. Another objective was to bring different stakeholders together and facilitate discussion on experiences, potential opportunities and ways forward for promoting crop insurance for agriculture in Cambodia. The main topics covered were:

- Crop insurance introduction, types, benefits and limitations
- Introduction to agriculture climate risk insurance solutions and product development
- Concept of re-insurance and global perspectives
- Bundling of credit, inputs and services
- Cross-country learnings from Asia and Africa, with India as a case study
- Products suitable and applicable to the Cambodian context, including the RIICE technology
- Initial experiences in Cambodia, current status and way forward

Fifty-four participants from thirty-one organisations attended the workshop. This included government officials from the Ministry of Agriculture, Forestry and Fisheries (MAFF), General Directorate of Agriculture (GDA), development partners, insurance companies, MFIs, NGOs, international developmental organisations, and projects, as well as other private-sector players.

Feedback from participants highlighted that they had learned and had a better understanding of crop insurance, different types of insurance products, actors involved in the crop insurance value chains, and lessons learned on crop insurance implementation within and outside Cambodia.

Figure 6: National workshop on “Crop Insurance: A potential tool for financial risk mitigation for smallholder farmers in Cambodia” in Phnom Penh 17th October 2019

7.2. Commune-level

A series of community awareness training workshops were designed and conducted during 2019 and 2020 at the commune-level to help farmers gain a better understanding on:

- Running farming as a business;
- Keeping good farming operational records;
- Identifying potential risks and risk management options; and
- Crop insurance as a risk management option.

It is worth mentioning that 533 farmers (including 261 female smallholder farmers) joined these commune-level training workshops. We observed that smallholder farmers generally do not perceive their farming as a business. Therefore, helping change their perceptions and the ways they operate farming are critically important. Like any other business, farmers should prioritise maximizing the returns from their activities and investments, as well as sustainability. Farming provides huge employment opportunities and livelihoods for farmers and many other people; however, it must be profitable and sustainable. Farmers, therefore, must be clear on what is required to get started; how the farming business is operated; expected returns on investment; and well-managed risk mitigation mechanisms.

The community training workshops were divided into three sessions:

1. Farming as a business
2. Production risk identification and management
3. Introduction to crop insurance as a risk management option

At the end of the training, farmers were excited about the awareness training programmes. Their perception was changed towards farming as a business rather than a subsistence activity. Additional training on the below topics was requested:

- Financial planning and management
- Cropping practices that maximise crop yields, revenues and minimise the use of farming inputs.
- Knowledge on different crop insurance products.

Most of the training participants showed high interest in participating in the future dry-run and commercial crop insurance programmes.

Figure 7: Focus group discussion with farmers in Battambang

Figure 8: Workshop to create insurance awareness among farmers and provincial government officials

8. Crop Insurance Product Development

One of the goals of the study was to collect data, test the acceptability and feasibility of various crop insurance products. There are different types of methodologies for crop insurance, which can be divided into the following three broad categories:

1. **Remote sensing-based area yield index crop insurance:** A multi-peril crop insurance where loss assessment is based on yield estimation using satellite imagery (both optical and synthetic aperture radar [SAR]).

2. **Ground crop sampling-based area yield index crop insurance**: A multi-peril crop insurance where loss assessment is based on crop yield statistics at the commune-level. The losses are measured by comparing the current year production published by the government against the average of the preceding five years to check if there was a shortfall in production.

3. **Weather index-based crop insurance:** Insurance is based on a weather-related index (e.g. rainfall, temperature, relative humidity) with which deviations are expected to cause crop losses. Loss assessment is based on remotely sensed data from sources such as weather stations, satellites, river gauges, etc. The data is coupled with a crop agronomic formula to model the required weather conditions.

Each of these technologies has their advantages and limitations:

Methodology	**Remote sensing-based area yield index crop insurance**	**Crop sampling-based area yield index insurance**	**Weather index-based crop insurance**
Advantages	• High resolution • Highest accuracy when modelled properly • Easily accepted by regulators and policy makers • Very high acceptability amongst the insurance sector	• Lower basis risk • Simple and easy to understand • Easily acceptable by regulators and policy makers	• Quick product development • Easier to build capacities • Underwriting is moderately easier • Scaling-up is easier • High to moderate acceptability amongst insurance sector
Limitations	• Crop health estimation can be challenging • Data processing can become challenging • Scale-up is difficult without automated processing • Moderate to high basis risk • Not suitable for many crops	• Operations heavy • Time consuming process • Prone to fraud and political coercion • Slow and dispute prone • Low acceptability amongst insurance sector	• Weather yield relationship is difficult to establish • Included only loses due to recordable weather parameters • Upfront investment in weather infrastructure • High basis risk especially for covers for events with high frequency

8.1. Weather Index-based Crop Insurance

The study indicates that Weather Index Insurance (WII) has the potential to scale much faster, as product development is easier when compared to other methodologies. WII contract is a contingent claim contract for which payment is based on specific objective weather parameters that are closely correlated with crop yield loss. The underlying index is easily and objectively measurable, transparent and based on random variables. A detailed note on WII is provided in 0 for further reading. A few potential concepts on insurance products are as follows:

- **Flexi Season Cover:** This represents the standard model that is to build phenophase-wise insurance cover dependent on the crop. Each phase has its own risks, and an index is prepared to assess the risk. Some approaches of flexi season cover are explained in Table 3.
- **Replanting/Transplanting Cover**: This is a short-term type of cover that looks to cover losses in the early part of the season due to delayed or excessive rainfall that would necessitate replanting for maize/cassava and re-transplanting for rice. This will enable farmers to salvage the season.
- **End of season cover**: This is a short duration cover for losses due to excessive or un-seasonal rainfall during the crop maturity phase. Unseasonal heavy rainfall at the end of the season can lead to extreme losses.

Table 3: Approach for Flexi Season Cover

Technique	**Risk assessed**
Absolute Total Rainfall	Checks the total amount of rainfall received over a period against the recommended.
Consecutive Day Count	Checks for spells of certain events such as dry days, rain days, cold days, hot days, river water level above, river water level below etc. With these we can tell when the crop was affected. It helps check for distribution of the parameter in consideration.
Overlapping Block of Days	Under this we check for both the distribution and total amount of the parameter in consideration (e.g., rainfall) over a given number of days.

Table 4: Overview on weather index insurance product portfolio developed for Cambodia

Product	Risks Covered	Value Chains	Data Necessary
Deficit Rainfall Index	Drought	Rice, Maize	Rainfall data (min. 15 years) from both satellite (CHIRPS) and AWS
Excess Rainfall Index	Excess rainfall	Rice, Maize, Cassava	Rainfall data (min. 15 years) both satellite (CHIRPS) and AWS
Cumulative Dry Days Index	Drought	Rice	Rainfall data (min. 15 years) from both satellite (CHIRPS) and AWS
Cumulative Wet Days Index	Excess rainfall	Maize, Cassava	Rainfall data (min. 15 years) from both satellite (CHIRPS) and AWS
Flood Index	River flooding	Rice, Maize	Satellite data derived under RIICE programmes, spatial analysis of farm proximity to river

Detailed prototype weather index insurance (WII) products are discussed as under:

- *0 Annex vii: WII – Rice*, Pursat Province
- *0 Annex viii: WII – Rice*, Battambang Province
- *0 Annex ix:* WII – Maize*, Pailing Province*
- *0 Annex x: WII – Cassava*, Pailin Province

Product Design Philosophy for the WII Dry Run Products:

- The design of the product template was kept as simple and consistent as possible so that it could be understood by both the operations team and farmers.
- The crop periods were demarcated into different growth phases (i.e., phenophases) based on crop agronomy. This demarcation was kept simple for the benefit of the field team and farmers.
- The phase-wise maximum payout for an index was determined based on possible losses due to the weather phenomenon. These numbers were determined through interaction with scientists, internet search and anecdotal information.
- The payout structures were kept simple (single trigger) with linear payout since this was just a pilot. Additional complexity can be added in the next phase.
- Regarding the premium rate and farmers' Willingness To Pay (WTP) for insurance: We tweaked the triggers and trigger payouts to accommodate the maximum WTP which was 5% of total maximum payout (or sum insured).
- The total maximum payout (or sum insured) was determined based on following the approach:

Sum Insured = Min (1.2* Cost of Cultivation, Maximum Crop Damage due to weather events)

Potential payouts for these mock products were calculated for 2020. There are significantly higher payouts for 2020 when compared with 2019, which somewhat reflects the ground situation as there were crop losses in 2020 due to flood and water stagnation. The results are discussed in detail in *0 Annex xi: Pay-outs for Dry Run* WII Products for 2020.

In the study we also developed a simple methodology to analyse the **Basis Risk** for rice. At first glance, the basis risk with any more available techniques for crop insurance is high. This is somewhat expected because of low homogeneity of cultivation practices. Basis risk is also a function of the limitations of crop loss estimating methodologies and can be presumably lowered if multiple methodologies are used to estimate crop loss simultaneously, for example by combining the RIICE and Weather indices where RIICE is used to estimate crop health and weather index is used to estimate crop losses due to freak weather events. The basis risk analysis is discussed in detail in *0 Annex xii:* Basis Risk Analysis.

Table 5: Basis Risk Analysis

Basis Risk as % of Expected Yield		
Methodology	**Pursat**	**Battambang**
RIICE – Area Yield Index Insurance	32.0%	30.4%
Crop Sampling – Area Yield Index Insurance	15.7%	23.6%
Weather Index Insurance	15.5%	28.6%

8.2. Area Yield Index Cover from RIICE Technology

In addition to WII products, the study also had access to the SDC funded RIICE Project, which is being carried out by MAFF, SCOR, Forte, and SFSA under the RIICE programme. Under this, all the fields in the commune are monitored every six days via satellite technology where pictures of the rice fields are taken and s continuous yield monitoring via satellite is carried out by MAFF.

At the end of the season, MAFF calculates the yield for the commune and compares the yield to the threshold yield. If the yield for the insured season is lower than the deductible level of the threshold yield, farmers will get a payout. Payout calculations are based not on an individual field of a farmer but the entire commune (i.e., khum). The commune-level yield value is determined based on RIICE satellite technology[7]. The RIICE yield estimation is also compared to MAFF yield data collected on the ground by crop cutting experiments (CCE) for verification purposes.

The threshold yield was calculated from the past five years (from 2016 to 2020) and it was specific for each commune. Every year, the threshold yields are revised to include the most recent years of yield data. Only recent yields have been used as otherwise the threshold yield would include harvests from long ago where production patterns and agronomic practices and, possibly, weather patterns were different. As RIICE technology is used for settlement, this data has been used as well to determine the threshold yields. During the dry-run in 2020 for the RIICE insurance, the calculated threshold yields for each commune were discussed with rice growers during the village visits at the beginning of the growing season and based on farmers' feedback the threshold yields were adjusted for each commune as necessary.

9. Key Challenges to Scale-up and Coping Strategies

The feasibility study identified several challenges that need to be tackled when SFSA starts facilitating the introduction and up-scaling of crop insurance services tailored to the needs of smallholder farmers. The four major challenges and potential coping strategies for SFSA in its role as insurance business facilitator are outlined below:

9.1. Agri insurance awareness

- While the interest in crop insurance is high, true understanding of crop insurance is quite limited among the industry, government and regulators.
- Awareness on agriculture insurance is low among agri-businesses and agri-services providers.
- Smallholder farmers' knowledge of insurance and other financial services is extremely limited.
- Smallholders have zero to minimal understanding of crop insurance

[7] The yields are calculated using the ORYZA crop model from the International Rice Research Institute (IRR) using data generated through the RIICE satellite imagery as well as additional data sources such as weather data from Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) by the United States Geological Survey (USGS).

9.2. Low institutional capacity to design and implement crop insurance

- Experience of implementing crop insurance by the insurance companies is lacking. Forte Insurance has some distribution experience but still lacks product design and underwriting capabilities.
- The agri-insurance ecosystem in Cambodia lacks professionals with capability to research and design crop insurance products according to farmers' requirements.
- Lack of in-house data management and product underwriting capability is a significant challenge.
- Product R&D and pricing can quickly become very expensive when scaling up.
- Availability of quality data (crop yield, crop loss and daily weather) is a significant challenge in Cambodia.

9.3. High premiums and low ability to pay

- Smallholder farmers lack resources to pay insurance premiums.
- Poor quality historical yield and weather data imply that the loading on the insurance premium will be high, which will increase the rate of premium.
- Distribution and loss assessment cost of crop insurance can be significantly high during the initial years when the process is still being developed.
- Data (for pricing and loss assessment) cost is quite expensive, especially during the initial years when enrolment numbers are low.

9.4. Ambiguous regulatory and government policies

- Agricultural insurance is not tax exempt.
- The insurance regulatory policies around product distribution and commission are not supportive. Please refer to Annex xvi: Note on Cassava Production in Cambodia
- Risks **for cassava plantation:** The crop is very sensitive to soil water deficit during the first three months after planting. Water stress at any time in that early period significantly reduces the growth of roots and shoots, which impairs subsequent development of the storage roots, even if the drought stress is alleviated later. Deficit soil moisture is the main risk during first three months after sowing. Once the crop is established, it can be grown with very limited amount of rainfall / soil moisture.

Deficit rainfall during the vegetative growth period might lead to whitefly pest and mosaic virus which can cause severe damage to the crop, sometimes leading to 70% crop damage.

Cassava is also susceptible to waterlogging especially just after planting. If the soil becomes water-logged, sprouting and early growth is affected and yields are reduced. Heavy rains near crop maturity can also damage the roots/tuber.

Water requirement: In general, the total crop water requirement is between 400 to 750 mm for a 300-day production cycle.

Cassava planting Windows:

- First planting window: Feb to March (15% of farmers)
- Second planting window: April to May (70% of farmers)
- Third planting window: June (15% of farmers)

Table 16: Major indicator analysis of fresh cassava per hectare

Expense Items
KHR USD Proportion %

Total Revenue (A)	**5,946,331**	**1,486.58**	**100%**
Intermediate Input (B)	**920,071**	**230.02**	**15.47**
Stem cutting	354,098	88.52	5.95
Fertilizers	44,390	11.10	0.75
Liquid fertilizers	94,411	23.60	1.59
Herbicides	374,579	93.64	6.30
Pesticides	10,682	2.67	0.18
Bags	5,525	1.38	0.09
Plastic cable tie	743	0.19	0.01
Fuel	35,643	8.91	0.60
Cash cost (C)	**1,976,984**	**494.25**	**33.25**
Transportation	273,356	68.34	4.60
Land preparation	165,470	41.37	2.78
Harvest by tractors	21,691	5.42	0.36
Labour cost	1,093,444	273.36	18.39
Interest	216,245	54.06	3.64
land rental fee	206,778	51.69	3.48
Imputed cost (D)	**1,250,359**	**312.59**	**21.03**
Transportation	71,269	17.82	1.20
Land preparation	74,446	18.61	1.25
Harvest by tractors	2,501	0.63	0.04
Labour cost	164,484	41.12	2.77
Interest	285,367	71.34	4.80
land rental fee	652,292	163.07	10.97
Depreciation (E)	**85,337**	**21.33**	**1.44**
Total expense (F = B+ C+E)	**2,982,392**	**745.59**	**50.16**
Total cost (G = F +D)	**4,232,751**	**1,058.19**	**71.18**
Net farm income (H = A-F)	**2,963,939**	**773.03**	**52.00**
Net profit (I = A-G)	**1,713,580**	**428.40**	**28.82**
Net value added (J = A- B -E)	**4,940,923**	**1,235.23**	**83.09**

- Annex xvii: Insurance Regulation in Cambodia for detailed information.

The coping strategies for the aforementioned challenges are outlined in table 6.

Table 6: Coping strategies to the challenges faced

Key challenges	Coping Strategies
Low insurance awareness among farmers and farmer-centric organisations	• SFSA is creating awareness among potential stakeholders and farmers through the financial education programmes since July 2020 together with AMK and Forte with financial support from SCBF. • SFSA will organize training programmes for aggregators' core and field staff. The trained staffs' will in turn train the farmers. • SFSA is developing different tools like videos, training materials, leaflets, advertisements in local papers and documentaries to increase the efficiency of outreach. • In addition, SFSA will organize national and regional-level workshops to increase insurance awareness from time-to-time.
Lack of institutional service provider / capacity development	• Capacity building of SFSA's partners to achieve the desired outcomes. This includes the following: o Technical assistance in developing insurance products. o Assistance in using risk-assessment methodologies. o Designing business plans for insurers and aggregators. o Training on WII and its implementation mechanisms. o Underwriting support and training on crop insurance products. o Training in data collection, data management and data analysis.
High insurance premiums and low WTP/ATP	• Bundle crop insurance with agricultural loans or inputs as an extended service. • Negotiate with insurers/reinsurers to make the insurance product affordable by managing the cost of distribution and loadings • Approach the government for a tax exemption.
Data availability and data management	• SFSA installed three AWS in three provinces during the feasibility study to unlock essential meteorological data sources. • For additional data, SFSA will depend on the government institutions and other development agencies. • SFSA will create a data management protocol and train local experts on the same.
Crop insurance policy and regulatory framework	• Regular meetings, result sharing, exposure visit in project areas and workshops. • SFSA will invite the regulatory staff to its capacity building workshops for market partners to enable them to learn from the insurance pilots. This may enable them to further develop the regulatory framework for WII crop insurance.

10. Going forward: Action plan

SFSA has completed the two-year preparatory phase with the findings and conclusions outlined in the previous chapters and is now prepared to launch the following insurance commercial programmes from January 2022 onwards:

Table 7: Action Plan

Sl	Crop	Season	Insurance product offer	Market partners	Provinces
1	Rice	Wet	AYI that includes deficit and excess rainfall and flood	Forte, AMK, MAFF	Battambang, Pursat
2	Cassava	Wet	WII that includes deficit and excess rainfall	Forte, AMK, MAFF	Pailin
3	Maize	Dry	WII that includes deficit and unseasonal excess rainfall	Forte, AMK, MAFF	Pailin

- SFSA will pilot the first insurance programmes starting in January 2022 for deficit and excess rainfall for rice and cassava during the 2022 wet season and maize in the 2022 dry season.
- All these products will be developed based on the findings of dry run data analysis that were completed in Battambang, Pursat and Pailin Provinces.
- SFSA will conduct similar dry runs before entering new areas.
- Furthermore, SFSA already started Aqua Insurance feasibility study in Battambang, Pursat and Siam Reap Provinces during 2021 and 2022 in support with World Vision International to expand insurance in other sectors.
- SFSA has also started working with International Development Enterprises (iDE) in Battambang and Pursat provinces to expand the insurance programmes for vegetable producers.

In addition to the key insurance partners listed in table 7, the following will also partner to implement the upcoming commercial programmes:

- **Insurance companies**: The insurer selected for piloting is Forte Insurance Plc. It has the required human and financial resources, as well as relevant experience in index insurance.
- **Reinsurers**: SCOR agreed to extend their support as a reinsurer.
- **Potential aggregators** include AMK, AgriBee, iDE and World Vision International. With their network of farmers and their field experience, the range of the developed insurance products will significantly increase. In addition to the above-mentioned aggregators, SFSA will negotiate with mobile banking operators to facilitate and accelerate the payment process.

Table 8: Potential Stakeholders and Partners

Market actors	Potential Partner	Status of partnership
Reinsurer	• SCOR Reinsurance	SCOR has agreed to extend their reinsurance support to Forte for both WII and AYI programmes.
Insurer	• Forte Insurance Plc.	Forte has agreed to be the insurance partner.
Aggregator	• **Lending**: AMK • **Input Company**: AgriBee • **Output Market**: iDE, Agrion	AMK agreed to be distribution partner. iDE agreed to include vegetable producers.
Data Source	• AWS • Satellite CHIRPS 5 km	SFSA installed three weather stations, and the CHIRPS data is configured for Cambodia. DMO will be approached for daily weather data.
Research	• RIICE • sarmap • International Rice Research Institute (IRRI)	There is a partnership with the RIICE team for research and development.

10.1. SFSA market development approach

This section provides an overview of the market development approach and the proposed roadmap over the short, medium and long term in Cambodia (Figure 9).

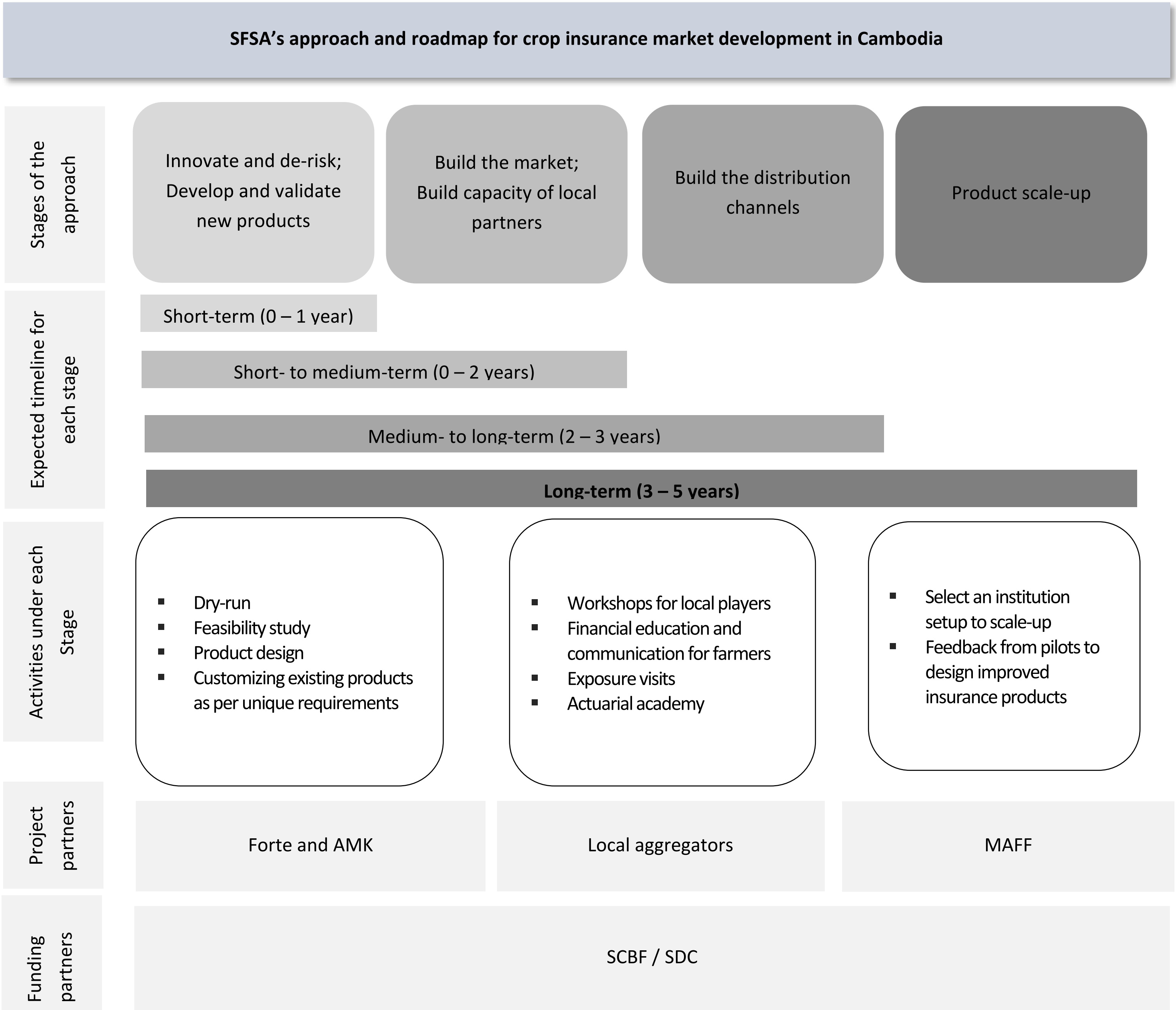


Figure 9: Roadmap for SFSA's Weather Index-based Insurance in Cambodia

SFSA has completed the two-year preparatory phase with the findings and conclusions outlined in the previous chapters and is now prepared to launch the "Small-scale commercial pilot" with the support from Forte, SCOR and AMK during crop seasons in 2022 and 2023. A successful pilot will be key to demonstrate the value of insurance to the government and other stakeholders and enable

SFSA to plan and implement large-scale commercial insurance programmes in the future. Market development involves various stages. When entering a new market, there is a four-stage approach to develop the market environment in a country, which are explained in *Table 9*. This approach is based on findings from stakeholder need assessments.

Table 9: Market development approach

Innovate to de-risk Develop and validate new products	**Aim:** To (a) improve the agricultural insurance products that were developed over the course of the feasibility study, as well as to (b) develop new products for new communes and crops in Cambodia. These products are fine-tuned based on the specific client risk profile and according to the distribution channels that fit local conditions. **Track record elsewhere:** In Africa and Asia, SFSA developed mobile-based agricultural insurance products that enable many farmer groups to access insurance. Agricultural input companies put a registration card with a unique code in each bag of seed or fertilizer. When a farmer opens the bag, he finds the card and follows its instructions to send a message. This message enables SFSA to determine the farmer's location and monitor rainfall using satellites. Payouts to the farmer are done via mobile money transfer in case of a claim. The premiums are paid by the input company. We propose to develop similar programmes in Cambodia. **Progress to date in Cambodia:** Following the feasibility study, we started a RIICE dry-run project to develop location- and crop-specific insurance products for Cambodian farmers. Until 2020, SFSA collected crop and weather data for rice, maize and cassava at various locations in Northwest Cambodia. Various rainfall-related products were developed. **Key partners:** Farmer aggregators.
Build the market and capacity of local partners	**Aim:** To increase the uptake of agricultural insurance products by farmers, SFSA has undertaken a financial education exercise for stakeholders in the supply and demand-side of agriculture insurance to enhance farmers' basic financial literacy. **Track record elsewhere:** During last few years, SFSA has organized various workshops in Bangladesh, Myanmar, Indonesia and Kenya for regulators, public and private insurers, and agri-input aggregators. **Progress to date in Cambodia:** In 2018 and 2019, two national level workshops were organized in Cambodia, including various stakeholders. **Key partners:** Farmer aggregators, insurers and reinsurers.

Scale up Technical advice for resilience at scale	**Aim:** to reach as many farmers as possible using the successful products and distribution channels. **Track record elsewhere:** In East Africa and Asia, SFSA has served over 2 million farmers cumulatively with drought and excess rain products distributed via microfinance institutions, banks, farmer aggregators and mobile phones. **Progress to date in Cambodia:** With an aim of taking insurance innovation to the very last mile by providing choices and new tools for smallholder farmers in Cambodia, SFSA is working with Forte, SCOR, MAFF along with the RIICE Technology team to test and enhance their development and resilience. **Key partners:** Insurers, reinsurers, telcos, farmer aggregators, cooperatives and the Government.

Key Stakeholders

Crop insurance is a relatively new concept in Cambodia. While there has been some formal limited implementation experience, many potential stakeholders have shown considerable interest in creating an index insurance market to protect farmer dependent on rainfall. This section identifies and categorizes the organisations and groups that would manage the implementation of crop insurance and sets out the roles and responsibilities of each stakeholder.

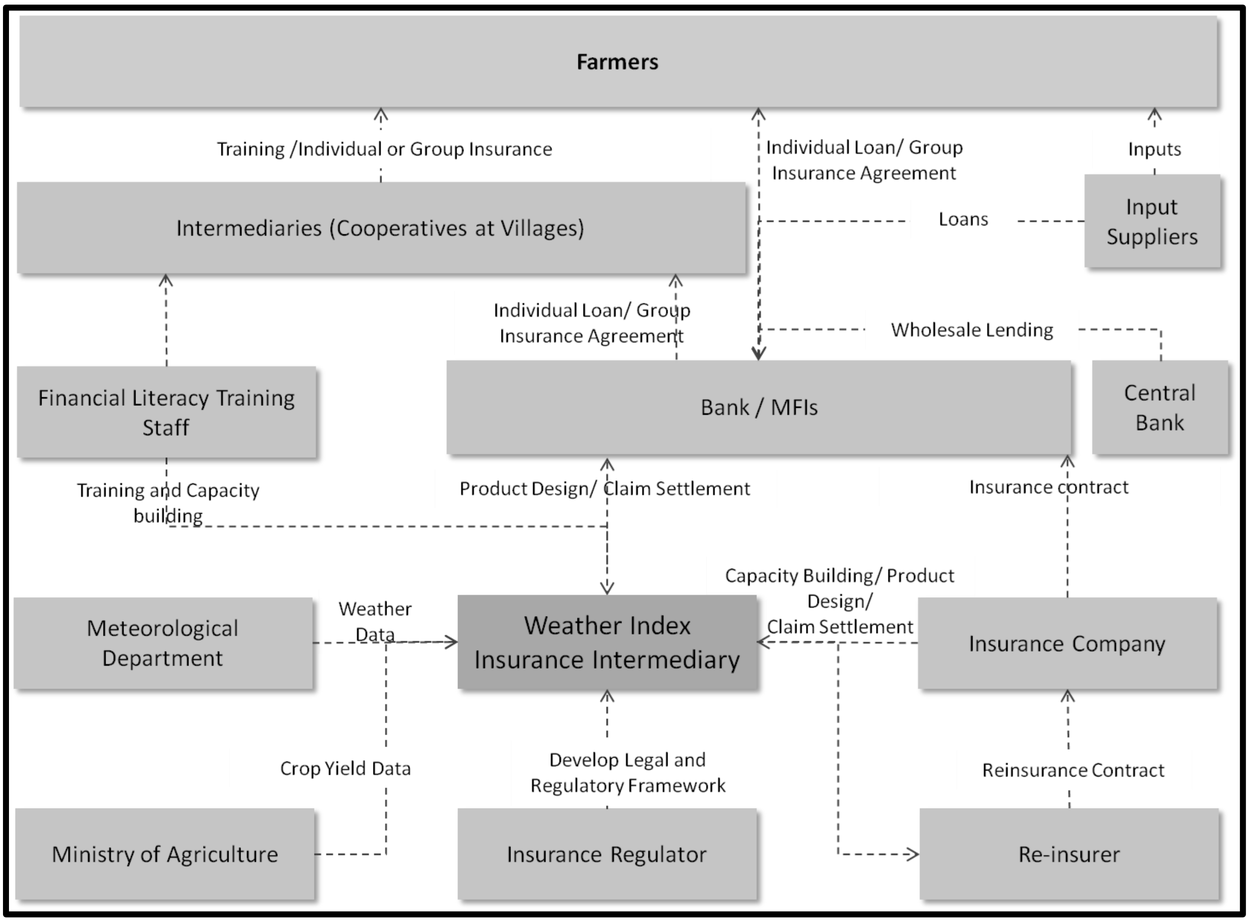


Figure 10: Stakeholder Map to illustrate stakeholder relationships in insurance market development

In this approach, crop insurance is linked to loans provided by banks and/or microfinance institutions. This model is variable. Contract farming organisations or input suppliers could also be integrated in the lending process. In Cambodia, SFSA implemented the dry runs in cooperation with Forte, AMK and Rohat since 2018. The following section explains an outline of roles and responsibilities of different stakeholders involved in the development of the crop insurance ecosystem in Cambodia.

10.2. Roles and Responsibilities of the Different Stakeholders

The below table outlines the roles and responsibilities of the different stakeholders involved in the development of the crop insurance ecosystem in Cambodia.

Partner Type → Insurance/ Reinsurance Companies	
Proposed responsibility - Pricing - Reinsurance - Policy documentation - Loss assessment and payment **Potential partners** - SCOR Re - Swiss Re - Cambodia Re - Forte Plc.	**Proposed role: Risk carrier** One key task in developing crop insurance is to provide a suitable risk-transfer mechanism. Our experience in other countries shows that existing insurance companies are best placed to carry the risk, in partnership with regional and/or global reinsurance companies. The companies also significantly benefit from the scale that is provided to their operations from the large number of users of their products.
Partner Type → Weather and Yield Data Provider	
Proposed responsibility - Increasing the number of observatories - Collecting and disseminating accurate data **Potential partners** - MAFF - Meteorology Department (DMO) - Water Resources Department	**Proposed role: Data provider** The role of a weather and yield data provider is critical for the success of any index insurance programmes. MAFF and the Department of Meteorology and Water Resources are the authorized agencies for recording and providing this data in the country. Distribution of weather stations / rain-gauges is not sufficient for the successful implementation of WII in Cambodia, necessitating the need to increase the network of observatories. Rainfall data from CHIRPS 5 km data is available for entire Cambodia only from 1982 onwards.

Partner Type → Distribution Partners	
Proposed responsibility - Leverage existing working relationships with beneficiaries for easier adoption - Conduct cash transaction as and when required - Build a trusted relationship with target beneficiaries - Transfer information to beneficiaries	**Proposed role: Intermediary** Distribution partners act as an intermediary between the local insurance company and the target beneficiaries. While insurance companies may interact directly with the target beneficiaries, it was observed that there is no existing direct relationship between the two, which can result in low up-take of crop insurance. It was also observed that the most effective distribution channels are those that have a working relationship with a large proportion of the target market, could transact with cash and are trusted by the target beneficiaries. These may be contract-farming organisations, financial institutions such as banks and MFIs, cooperatives, NGOs and input suppliers. In some cases, writing an insurance contract directly between the distribution channel and the insurer can reduce transaction costs. Establishing long-term relationships with farmers also adds more stability to the partners' long-term business.
Potential partners - AMK - AgriBee - AgriBuddy - Rohat	

Partner Type → Mobile Network Partners	
Proposed responsibility - Identifying farmer location - Registration - E-wallets for premium payments and claim settlement	**Proposed role: Facilitates ease of transaction and information flow** Mobile technology and platforms are essential to identify farmers' locations, process registration, and premium payments to mobile/e-wallets and claim settlement, as well as keep the costs marginal. This also provides an opportunity for the mobile network partners to leverage the opportunities created, develop their own market and revenues, increase the number of users, short message service business and receive commissions from mobile money payments.
Potential Partners - TrueMoney, Wing - Ly Hour Pay Pro - Pi Pay - ABA Bank: E-Cash - Metfone: E-Money	

Partner Type → Input Supplier	
Proposed responsibility - Creating Input Packages with MFIs and banks to create innovative ways for farmers to receive the loan through seeds, fertilizers or pesticides	**Proposed role: Provides high quality inputs** Whilst not direct project participants, it is important that there is a functioning market for the supply of inputs to ensure that farmers are able to purchase high quality farm inputs. For the implementation of this project, it is important to establish good working relationships between Banks/ MFIs and input suppliers. This could be accomplished by creating farm input packages where the farmers receive their loan in the form of seeds, fertilizers and pesticides.
Potential partners - Rohat - AgriBuddy - AgriBee	

<table>
<tr><th colspan="2">Partner Type → Insurance Market Enabler / Facilitator</th></tr>
<tr><td>Proposed responsibility
- Product development and partner coordination
- Resource mobilisation
- Marketing and distribution
- Business development
- Capacity-building
- Data collection/contract monitoring
- Advocacy/policy dialogues</td><td rowspan="2">Proposed role: Insurance surveyor
SFSA monitors and assesses risks and develops insurance products specifically for smallholders. These products typically cover a variety of crops against weather risks like drought, storms, flood and erratic rains and yields cover.</td></tr>
<tr><td>Potential partners
- SFSA</td></tr>
</table>

<table>
<tr><th colspan="2">Partner Type → Farmers</th></tr>
<tr><td>Proposed responsibility
- Use insurance products and services
- Provide feedback to support contract design and improvement
- Participate in feedback sessions and interviews</td><td rowspan="2">Proposed role: Use insurance products and services
Besides using the final products and services, farmers play a critical role in product development. For instance, the dry runs and feasibility studies conducted allowed understanding the challenges faced by farmers and their strengths. Additionally, they also serve as a critical target audience for capacity-building to ensure high uptake of the product.</td></tr>
<tr><td>Potential partners
- Farmers
- Farmers' associations
- Farmer-centric organisations</td></tr>
</table>

<table>
<tr><th colspan="2">Partner Type → Policymakers / Regulators</th></tr>
<tr><td>Proposed responsibility
- Developing an efficient and accurate data sharing mechanism
- Deploying agri-extension officers to help foster trust and stronger working relationships with farmers
- Defining the role of crop insurance
- Developing macro policies
- Developing regulatory frameworks</td><td rowspan="2">Proposed role: Creating and supporting a conducive ecosystem for project implementation
Collaboration with MAFF is essential for the success of crop insurance programmes. Designing accurate crop insurance contracts also requires accurate agricultural data, especially on yields, hence requiring strong working relationships and efficient data sharing mechanisms. In addition, the MAFF’s agri-extension officers’ relationship with farmers necessitates the patronage of the Ministry to conduct effective marketing and training programmes for farmers. MAFF could become a key implementing partner and also a recipient of the benefits provided by the implementation project, including:
• Policy (defining the role of WII and AYI): MAFF could draft policies and papers to define the role of the insurance in agri-financing and development.
• Developing a regulatory framework: MAFF could assist in defining the role of crop insurance and necessary amendments for subsidies.
• Macro policy: whereby MAFF would become the client and purchase crop insurance as a food security policy, which would guarantee a pay-out as measured by a composite index and give early warning.</td></tr>
<tr><td>Potential Partners
- MAFF</td></tr>
</table>

<table>
<tr><th colspan="2">Partner Type → Policymakers / Regulator</th></tr>
<tr><td>Proposed responsibility
- Creating regulatory environment to facilitate index insurance activities
- Designing and exploring new regulations to facilitate increase in lending</td><td rowspan="2">Proposed Role: Enhance the regulatory environment
Insurance is a heavily regulated industry and close contact with the Insurance Business Regulatory Board is necessary. Crop insurance is a complex product, and the product approval authority ideally should be involved from the development stage. Additionally, there is a need to enhance the regulatory environment to facilitate index insurance activities by using mobile phone technology in delivering insurance to farmers, electronic messages acting as policy documents and claim pay-outs via mobile money discharging insurers’ liability. Finally, some potential regulation which makes it mandatory for all agriculture loans to be accompanied by insurance could spur lending.</td></tr>
<tr><td>Potential Partners
- Ministry of Finance</td></tr>
</table>

Annex i: Project Partners

Syngenta Foundation for Sustainable Agriculture (SFSA): is a non-profit organization established by Syngenta under Swiss law. SFSA's mission is to create value for resource-poor smallholder farmers in developing countries through innovation in sustainable agriculture and the activation of value chains. SFSA operates across the product streams of agri-services; agricultural insurance solutions (AIS); access to seeds; research and development and policy.

Under SFSA's AIS stream, work on agricultural insurance has been ongoing since 2009 with the development of innovative and affordable insurance solutions tailored to smallholders in East Africa. In 2014, SFSA created an independent social enterprise (ACRE Africa) with operations in three countries, with over 1.3 million farmers insured, and an innovative range of micro-insurance products. While not an insurance company, SFSA's AIS Team operates as an insurance intermediary working with local insurers and other stakeholders. It monitors and assesses risks and develops insurance products specifically for smallholders. These products typically cover a variety of crops against weather risks like drought, storms, floods, and erratic rains. Other examples include yield cover.

The mission of SFSA's AIS stream is to develop, implement, scale up, and disseminate smallholder insurance across Asia, Africa, and Latin America, using insurance to transform agriculture. The aim is for farmers to see agricultural insurance as a vital input for better harvests by taking insurance innovation to the very last mile, providing opportunities and new tools for smallholder farmers to enhance their development, recovery, and resilience. Climate insurance, microfinance, and agricultural development come together to form a holistic support system by:

- Enhancing the resilience of smallholders through climate insurance.
- Enabling farmers to graduate from poverty by reducing the risk of investments to confidently develop their farms.
- Expanding financial inclusion by encouraging lenders such as micro-finance institutions (MFIs) to increase agricultural lending to smallholders by enhancing their creditworthiness.
- Ensuring business continuity for farmers and lenders such as MFIs through major natural disasters with recovery lending programmes.

SFSA's market development approach has four phases which is outlined in Frame A below. This approach is based on findings from the needs assessment of stakeholders. SFSA's AIS team has a wide range of experience and expertise, including in reinsurance, actuary, underwriting, product and business development, country-specific knowledge, agronomy and agriculture, insurance training and capacity building, public and private sector resource mobilization. In Cambodia, since 2017, SFSA's AIS team has been laying the groundwork and developing relationships with local organisations to support the efforts around agricultural input insurance. The progress to date within the country has been largely made on developing and validating new products and building the capacity of local partners to enable them to disseminate AIS products to farmers. To ascertain the validity of new products, a feasibility study is conducted on-ground.

Frame A: SFSA's four-stage market development approach

Forte Insurance (Cambodia) Plc: Forte began its insurance underwriting and brokerage wing in Phnom Penh head office in 1996 and was one of the first insurers to set up in Cambodia. Their mission is to provide low-cost risk management solutions to low income and vulnerable people with innovative, affordable and sustainable microinsurance products. Forte's strategy is to reach out to low-income people in the rural areas of Cambodia through a partner agent model. By 1998, it opened purpose-built offices in the heart of Cambodia's bustling capital city. With the backing of the largest regional and worldwide reinsurers, it set out to provide secure and comprehensive coverage across Cambodia. Today, Forte is the largest, leading and most recognized insurer within the country. They offer microinsurance products for general and life insurance, targeting the low-income population in the rural areas of Cambodia. Their main functions involve underwriting, claims management and settlement, policy administration, and sales and marketing.

AMK Microfinance Institution Plc. (AMK): is one of the leading microfinance institutions in Cambodia, aiming to help large numbers of poor people to improve their livelihood options through the delivery of appropriate and viable financial services. AMK currently offers a range of tailored microfinance services, including credit, savings, money transfer, ATM, agent banking and micro-insurance to over 500,000 clients.

AMK's mission is to help large numbers of poor people to improve their livelihood options through the delivery of appropriate and viable microfinance services. AMK continues to focus on low-income populations as it becomes more active in the mainstream market with an aim to provide inclusive financial services. AMK will spend most of its resources to be effective in the market and operate with multiple business lines and channels. AMK will carefully examine the possibility to offer products or services which will impact poor people positively and who can later on be brought into the formal financial sector. To achieve this objective, AMK is pursuing the following business strategies:

- Through a strong understanding of the clients' needs, AMK aims to be a one-stop responsible financial service provider by offering multiple products and services. Every product will be created based on the need to serve different demands of the client. In addition, AMK will provide more and more of bundled products and services and as well as cross-sell all available products and services to its pool of target clients, which should increase the efficiency of delivery and reduce the cost to the client.

- With its investment into a deep-reaching network, AMK aims to take maximum advantage by leveraging all its channels, and by deploying appropriate technology to offer better and efficient services to its target clients. These include agent-based payments, ATMs, as well as the office and branch networks.
- For long term success, AMK aims to be known by the public as a reliable, trustworthy and easy to access institution by offering professional services to all clients regardless of their social status, age, race, sex, or religious.

Rohat Agrotech Co Ltd was registered as a private partnership limited company with the Cambodian Ministry of Commerce on 24 February 2017. In the first year, Rohat Agrotech focused on distributing agrochemicals such as rice herbicide, insecticide and fungicide from a world-class company (UPL/RiceCo); as well as irrigation materials such as quality water hoses, sprinkler hoses (SAN FU, Taiwan), drip tapes and water filtration equipment (AZUD, Spain) for horticultural crops. Additionally, Rohat Agrotech is also a rice seed distributor along with providing farming consultancy services related to selection of farming technology for sustainability and higher yield and objective-oriented planning to lower risks in a context with changing climate.

Rohat's mission is to help small and big farmers to achieve their farming goals by introducing sustainable technologies for increased yields at lower cost and help the farmers prepare objective-oriented planning to lower the risk. Rohat has 100,000 direct rural clients to whom they offer supply chain and agri-input solutions and have a market share of around 5% (Ref. Charya Nin, Personal Communication).

Annex ii: List of Insurance Sector Stakeholders

Regulator		**Micro Insurance Company**	
1	Ministry of Economy and Finance	1	BIMA Cambodia
		2	Cambodian People Micro Insurance
In-country Reinsurer		3	Cambodia Life Insurance/CamLife
1	Cambodia Re	4	Mekong Microinsurance
		5	Previor Micro Life Insurance
General Insurance Company		**Life Insurance Company**	
1	Asia Insurance	1	Manulife
2	Cambodia-Vietnam Insurance	2	Prudential
3	Caminco Insurance	3	Sovannaphum
4	Campu Lonpac Insurance	4	Dai-ichi Life Insurance
5	Forte Insurance	5	AIA Life Insurance
6	Infinity Insurance	6	Grand China Life Insurance
7	People & Partner Insurance	7	Phillip Life Assurance
8	East Insurance	8	Forte Life Insurance
9	Ly Hour Insurance	9	Etiqa Life Insurance
10	Phillip General Insurance	10	Fortune Life Insurance
11	Newa Insurance		
12	Dara Insurance		
13	CB General Insurance		
14	Prosur Insurance		
15	Etiqa General Insurance		

Annex iii:List of Mobile Payment Service Provider

Mobile Money		**Service**
1	TrueMoney	Money transfer, bill payment, payroll, phone top-up, cash-in & out, etc.
2	Wing	Money transfer, bill payment, payroll, phone top-up, cash-in & out, e-commerce payments, etc.
3	Ly Hour Pay Pro	Money transfer, bill payment, payroll, phone top-up, cash-in & out, e-commerce payments, etc.
4	Pi Pay	Based on mobile app: top-up PiPay wallet; Pay&Go terminals
5	ABA Bank: E-Cash	Bill payment, money transfer, E-Cash enables money transfer recipients to withdraw money from an ABA ATM without needing an ATM card
6	Metfone: E-Money	Money transfer, withdraw and deposit, bill payment, phone top-up, etc.

Annex iv: List of Telecom and Mobile Service Provider

Television broadcast and cable networks	
1	PNN TV
2	Apsara TV
3	Bayon TV
4	Cambodia Cable Television (CCTV)
5	Cambodian News Channel (CNC)
6	Cambodian Television Networks (CTN)
7	CTV 8 HD
8	Hang Meas HDTV
9	Khmer TV 9 HDTV
10	My TV
11	National Television of Cambodia (TVK)
12	One TV
13	Phnom Penh Television (TV3)
14	TV5 Cambodia

Mobile phone networks	
1	Smart Axiata Co., Ltd (Smart)
2	CamGSM Co., Ltd. (Mobitel)
3	Xinwei (Cambodia) Telecom Co., Ltd (CooTel)
4	South East Asia Telecom Co., Ltd. (Seatel)
5	Viettel (Cambodia) Pte., Ltd. (Metfone)
6	Cambodia Advance Communications (qb)

Annex v: Dry Run Protocol

1. Dry run protocol

1.1 Concept of a "dry run"

- To understand the local characteristics of farming and the varieties grown
- To understand the impact of risks on the crop to be insured
- Test insurance contract terms and conditions defined for the crop, against the actual crop growth

1.2 Goal

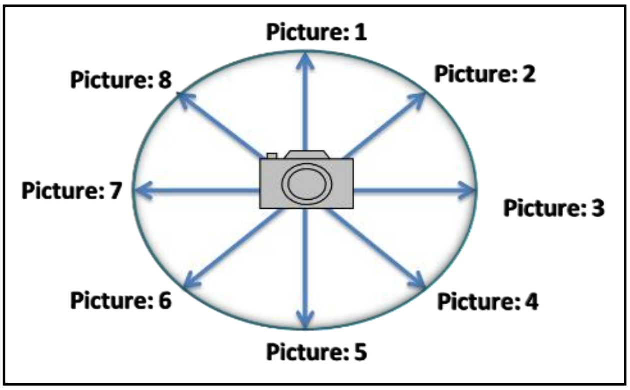
Develop a tailored index insurance product for the client and scale it quickly.

1.3 Observations via Extension Officers

Provide objective, detailed information through pictures of farmer experience every two weeks, and report emergency stress events through additional pictures and stress reports (<u>Extension officer report overview</u> at the end of this document). These pictures and reports provide us with a visual timeline of the crop development, enabling us to tailor the index and policy to more closely reflect the farmer's on-farm experience.

1.4 Sample Size and Frequency

Collect GPS coordinates of 10 farms selecting farm representatives at the locations that your farmers produce in and make observation every week.



2. Physical Environment of the Farm

At the start of the dry run, for <u>EACH of the observation farms</u>, take 4-8 pictures, while standing on the farm showing its surroundings; for example, showing what the neighbours are farming, rivers, hills, trees or swampland. This is best done by standing in the middle of the farm and taking pictures in a circle around you, as shown in the diagram.

3. Crop Development Stages

Mark the date (start and end) of the following events: sowing, germination, flowering, grain filling and harvest. Fill in the table in Q.5 in <u>Field extension officer report overview</u>. Also report what inputs are used during each stage with their quality and value.

Why do we ask you to record this?
These dates give us an idea of when these stages were reached which we can compare to other factors i.e., onset of rains or impact of stress events on the timing of the crop development. Please therefore be as exact as possible in recording these dates.

4. Monitoring Crop Performance: Farm Pictures

For **EACH** of the observation farms:

- Please select a location on the farm where you can take pictures throughout the season.
- Please mark the GPS Location of this location in the agreed format.
- During the season, please take a picture/or several of the crop every two weeks, after sowing. Please send this picture via email.
    - Rename each photo with farm name and date taken. The same information should appear in the subject line of the email.
    - Provide comments on the condition or stage in the email, what farmers are (input application, weeding, etc.).

Why do we ask you to do this? These pictures give us a weekly view of the crop so we can track its development from sowing to harvesting. In case of any stress, we can estimate when these stress factors started and to what extent they affected the crop.

Annex vi: Rational for Weather Index-based Crop Insurance

The success of agricultural production does not only depend on a farmer’s agricultural expertise and investment, but also on the climatic and environmental conditions, which are generally beyond the grower’s control. Innovations that encourage and protect farmer investment, especially in the context of climate change, are timely.

Traditional risk management mechanisms like micro-credit loans, donations, savings or crop insurance are less effective to cover the farmer’s losses. Traditional crop insurance requires higher pricing due to frequent loss assessment which is subject to administrative difficulties. In case of multiple perils, loss assessment for each peril is difficult and underwriters need exact and accurate information to reduce adverse selection and moral hazard problem along with monitoring and administrative costs. All these factors affect the premium rate, and it is challenging for the farmers in a developing context like Cambodia to bear these. Weather index-based crop insurance is the one that can overcome the limitations if it is developed by considering country context, weather conditions and available infrastructure. WII contract is a contingent claim contract for which payment is based on specific objective weather parameters that are closely correlated with farmer’s yield loss. The underlying index is easily and objectively measurable, transparent and based on random variables. Index-based crop insurance is a viable risk mitigation tool that creates a safety net to enable and encourage farmers to invest in their farms to raise productivity and reduce the risks financial institutions face when lending in agriculture.

In India, over the last 10 years, index insurance has grown to enable access to agricultural credit for over 22 million farmers, unlocking a value of USD 3.1 billion in agricultural investment. Based on developing countries’ experiences and considering the issues specific to Cambodia, SFSA has taken an initiative by focusing on some important issues: proper preparation for index measurement and premium determination, flexible product design using a smaller number of perils and multi-peril options and different risk layering, wider stakeholder partnership, insurance and reinsurance support at the national and international levels.

WII has greater potential to help reduce weather risks in an agricultural system where financing, production, processing and marketing are well functioning and integrated. Insurance can be a suitable risk management option, but it cannot solve problems related to agricultural production inefficiencies. To represent the best value proposition, insurance should therefore be grafted onto a system where other vital economic parts are already functioning but where the insurance improves efficiency or further unlocks the economic potential in agricultural production.

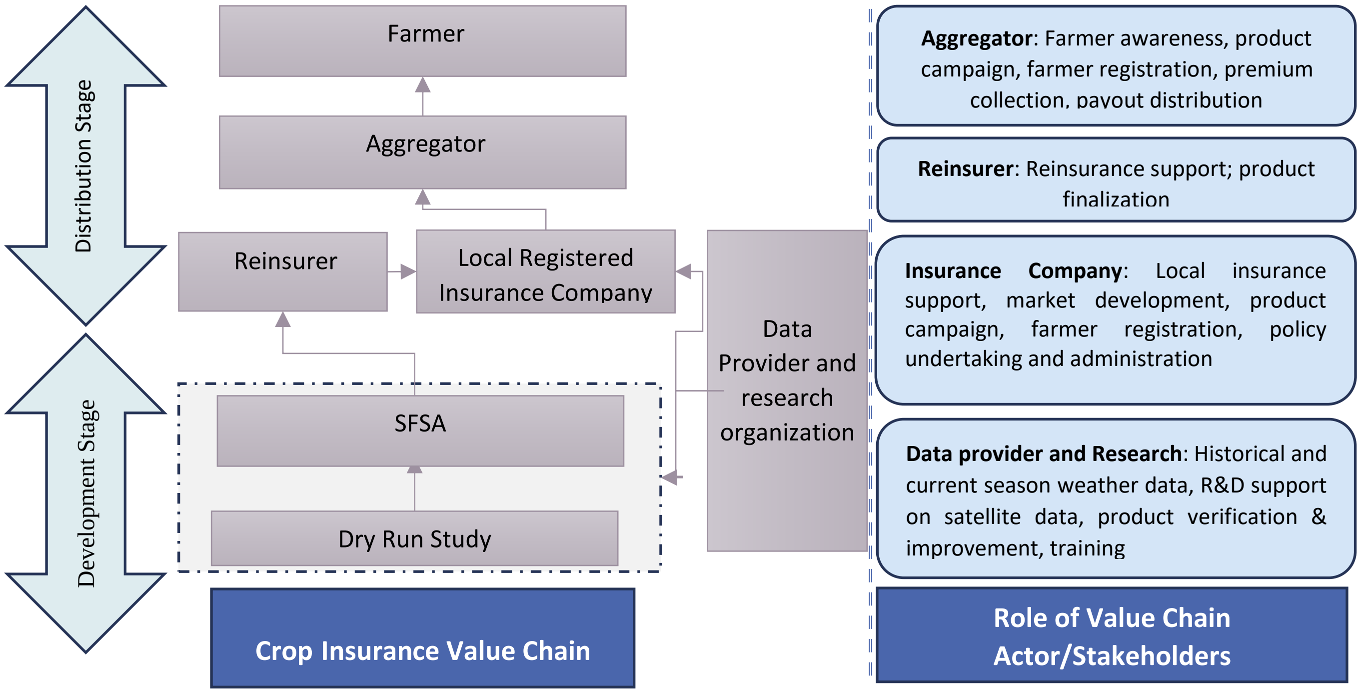


Figure 11: Insurance Value Chain and Stakeholders

Ideally, index insurance should be integrated into coordinated supply chain relationships with linkages between input provision, commodity sales, and additional flows of resources, extension services, technical advice and production oversight. Such relationships for instance exist in markets for rice, exported crops (such as potatoes) and certified seed production. SFSA would recommend focusing on such systems for scale-up strategies. A key linkage that should be particularly emphasized is with agricultural finance. Without bundling insurance with credit, many farmers will lack both the capital to pay the insurance premium and sufficient incentive to use scarce resources to buy risk coverage. Placing insurance products within complementary systems with broader linkages can also facilitate simpler contract design, as other mechanisms can deal more efficiently with the aspects of risk and crop losses that cannot be indexed.

Where is weather index inappropriate? Index insurance contracts will not work well for all agricultural producers. Many agricultural commodities are grown in microclimates. For instance, coffee grows on certain mountainsides in various continents and countries, and fruits such as apples and cherries also commonly grow in areas with very large differences in weather patterns within only a few miles. In highly spatially heterogeneous production areas, basis risk will likely be so high as to make index insurance problematic. Under these conditions, index insurance will work only if it is highly localized and/or can be written to protect only against the most extreme loss events. Even in these cases, it may be critical to tie index insurance to lending, since loans are one method of mitigating basis risk.

Over-fitting the data is another concern with index insurance. If one has a limited amount of crop yield data, fitting the statistical relationship between the index and that limited data can become problematic. Small sample sizes and fitting regressions within the sample can lead to complex contract designs that may or may not be effective hedging mechanisms for individual farmers. While scientists are tempted to fit complex relationships to crop patterns, interviews with farmers may reveal more about the types of weather events of most concern. When designing a weather index contract, one may be tempted to focus on the relationship between weather events and a single crop. When it fails to rain for an extended period, however, many crops will be adversely affected. Likewise, when it rains for an extended period, resulting in significant cloud cover during critical photosynthesis periods, several crops may suffer (UNDP, 2016).

Annex vii: WII – Rice, Pursat Province

Observation made based on the data collected from Pursat district:

1. Farmers prefer cultivating long duration rice in the Pursat province.
2. The mean crop duration is 171 (median is 173) days after discarding those cases where crop duration is less than 150 days. There were only 5 cases (out of 41) where the crop duration was less than 150 days.
3. Sowing date varied from 20 April to 2 June, i.e., 44 days. The sowing picks up pace by 26th April.
4. Paddy harvest starts by 22nd September but picks up pace by 14th October. Other than two cases, all the rice fields were harvested by 10th Nov 2020.
5. The estimated crop duration was taken as 185 days.

Cover duration: The cover period was divided into four stages, i.e., nursery phase, vegetative phase, reproductive phase and grain ripening / maturity stage. The nursery phase can be varied in length depending on the start of the wet season and the topography but based on reports it can be estimated that the transplanting will be done by 15th June, which is the actual start of the cover period.

Index 1 - Deficit Rainfall Index (DRI) covers the risk of less than required total rainfall during the growth phases. The nursery phase does not face any significant risk as the nursery is grown under protective care with assured irrigation. The vegetative phase and reproductive phase both face the risk of losses due to deficit rainfall. Both these phases need sufficient and well-distributed rains. The grain ripening phase does not face any risk of low rainfall and the residual soil moisture is enough for upkeep. A cap of 60mm on daily rainfall is there to reduce the impact of single day rain events on total rainfall.

Index 2 - Excess rainfall index (ERI) covers the risk of yield losses due to heavy rainfall. Rice has great tolerance for submergence and minor flooding. But heavy rainfall during the flowering phase or maturity phase can lead to significant yield reduction.

Index 3 - Cumulative dry days index (CDDI) covers the risk of drought periods during crucial phases and the risk of skewed rainfall distribution.

Design Analysis: Our aim was to keep the pure risk premium around 5% of Sum Insured. We checked the index against information available from secondary sources on the internet and it seems like the payout spikes in the index designed correlates to actual loss events in Cambodia. The index successfully captures 1983 and 2000 floods but misses out on 2011 floods. According to the daily rainfall data in 2011 the rainfall was continuous and well-distributed over a large period across the country. This led to riverine floods, which are difficult to mimic with a simple WII index.

Table 10: Weather Index Insurance Term sheet (Rice – Pursat Province)

Sum Insured (USD)	Sowing Date	Cover Start Date*	Cover End Date	Crop Duration
307	1-May	15-Jun	17-Dec	185

Phase Name	Nursery Stage	Vegetative Stage*	Reproductive Stage	Ripening Stage
Phase Length	45	65	40	35
Phase Start Date	1-May	15-Jun	19-Aug	28-Sep
Phase End Date	14-Jun	18-Aug	27-Sep	1-Nov
Index 1	**Deficit Rainfall Index (DRI)**			
Index Definition	Phase-wise cumulative rainfall below trigger			
Phase Name	**Nursery Stage**	**Vegetative**	**Reproductive**	**Ripening Stage**
Trigger (mm)	Not Covered	250	175	Not Covered
Exit(mm)		150	105	
Rainfall Cap (mm)		60	60	
Payout (per mm) (in USD)		0.9	1.75	
Sum Insured (in USD)		92.2	123	
Index 2	**Excess Rainfall Index (ERI)**			
Index Definition	**Total rainfall for three (3) consecutive days**			
Phase Name	**Nursery Stage**	**Vegetative**	**Reproductive**	**Ripening Stage**
Trigger (mm)	Not Covered	180	160	70
Exit(mm)		300	280	190
Payout (per mm) (in USD)		2605	4688	7292
Sum Insured (in USD)		78.12	140.63	218.75
Index 3	**Cumulative Dry Days Index (CDDI)***			
Index Definition	Phase wise consecutive dry days above trigger			
Days	Loss (as % total SI) against cumulative dry days			
Phase Name	**Nursery Stage**	**Vegetative**	**Reproductive**	**Ripening Stage**
12	Not Covered	5%	10%	Not Covered
13		8%	14%	
14		12%	19%	
15		17%	25%	
16		23%	32%	
17		30%	40%	
18		38%	49%	
19		46%	59%	
20		56%	70%	
Rainy day if > (in mm)		3	3	
Sum Insured (in USD)	0	175	218.75	0

Annex viii: WII – Rice, Battambang Province

Design assumptions:

- Based on the data provided, it can be assumed that short to medium duration rice is grown in Battambang. The data points where crop period was less than 100 days or harvesting date before 5th September or after 14th October were discarded. Thus, data from 33 farms (out of 39) were considered for the analysis.
- The mean crop duration is 137 (median is 138)
- Sowing dates vary from 13th April to 27th June, with 11th May being the median.
- Paddy harvest starts by 6th September and picks up pace by 24th September. All the rice fields were harvested by 14th October 2020.
- The estimated crop duration was taken as 155 days which covers most of paddy sown in 2020.

The cover period was divided into four stages, i.e., nursery phase, vegetative phase, reproductive phase and grain ripening/ maturity stage. The nursery phase can be of varying length depending on the arrival of monsoon and the topography but based on reports it can be estimated that the transplanting will be done by the 2nd week of June, which is when the cover starts.

Index 1 - Deficit Rainfall Index (DRI) covers the risk of less than the required total rainfall during the growth phases. The nursery phase does not face any significant risk as the nursery is grown under protective care with assured irrigation. The vegetative phase and reproductive phase both face the risk of losses due to deficit rainfall. Both these phases need sufficient and well-distributed rains. The grain ripening phase does not face any risk of low rainfall and the residual soil moisture is enough for upkeep. A cap of 60mm on daily rainfall is there to reduce the impact of single day rain events on total rainfall.

Index 2 - Excess rainfall index (ERI) covers the risk of yield losses due to heavy rainfall. Rice has great tolerance for submergence and minor flooding, but crop damage can still happen when there is a downpour. Yield losses can be substantial when rainfall happens during the flowering stage or in the grain maturity phase.

Index 3 - Cumulative dry days index (CDDI) covers the risk of drought periods during crucial phases and the risk of skewed rainfall distribution.

Table 11: Weather Index Insurance Term sheet (Rice – Battambang Province)

Sum Insured (KHR)	*Sowing Date*	Cover Start Date*	Cover End Date	Cover Duration
307	10-May	14-Jun	11-Oct	155

Phase Name	Nursery Stage	Vegetative Stage	Reproductive Stage	Ripening Stage
Phase Length	35	55	35	30
Phase Start Date	10-May	14-Jun	8-Aug	12-Sep
Phase End Date	13-Jun	7-Aug	11-Sep	11-Oct
Index 1	**Deficit Rainfall Index (DRI)**			
Index Definition	Phase-wise cumulative rainfall below trigger			
Phase Name	**Nursery Stage**	**Vegetative Stage**	**Reproductive Stage**	**Ripening Stage**
Trigger (mm)	Not Covered	250	175	Not Covered
Exit(mm)		150	105	
Rainfall Cap (mm)		60	60	
Payout (per mm) (in USD)		3750	7143	
Sum Insured (in USD)		94	125	
Index 2	**Excess Rainfall Index (ERI)**			
Index Definition	**Total rainfall in three (3) consecutive days**			
Phase Name	**Nursery Stage**	**Vegetative Stage**	**Reproductive Stage**	**Ripening Stage**
Trigger (mm)	Not Covered	120	100	50
Exit(mm)		220	200	150
Payout (per mm) (in USD)		3125	5625	8750
Sum Insured (in USD)		78	140	220
Index 3	**Cumulative Dry Days Index (CDDI)***			
Index Definition	Phase-wise consecutive dry days above trigger			
Days	Loss (as % total SI) against cumulative dry days			
Phase Name	**Nursery Stage**	**Vegetative Stage**	**Reproductive Stage**	**Ripening Stage**
12	Not Covered	5%	10%	Not Covered
13		8%	14%	
14		12%	19%	
15		17%	25%	
16		23%	32%	
17		30%	40%	
18		38%	49%	
19		46%	59%	
20		56%	70%	
Rainy day if > (in MM)		3	3	
Sum Insured (in USD)		175	220	0

Annex ix: WII – Maize

In Cambodia, maize is an extremely important crop and is sown in two periods, (A) Early Wet Season (Late March-April sowing), and (B) Main Wet Season (July-August sowing). In Cambodia, low temperatures are rarely a limiting factor. Temperatures above 38^{0}C in March-April might affect the plants, but are rare. The primary risk for maize is water stress, especially water deficit.

Early Wet Season (EWS) Maize: Sowing of the Early Wet Season (EWS) maize starts around the end of March and picks up pace by early April. The crop duration is 100-110 days.

***Main Wet Season (MWS) Maize*:** Sowing of the MWS maize starts around the end of June and is mostly over by the 3rd week of August. The crop duration is 100-110 days.

Index 1: Low Rainfall Index (LRI): EWS maize has a significant probability of suffering from water stress in the early stages if not managed properly with mulching and irrigation wherever the facilities are available. The water deficit is measured using LRI which is calculated by cumulating the total rainfall during the phase with daily rainfall capped at 20 mm. The daily rainfall ceiling of 20 mm is required to account for rain runoff as maize is often grown on uplands.

Index 2: Excess Rainfall Index (ERI): Maize is susceptible to heavy rainfall when the shoots are emerging and tender. Heavy rainfall in the last phase can lead to significant fall in quality and can also lead to lodging.

Index 3: Cumulative Wet Days Index (CWDI): One of the significant risks to maize is water logging or pooling in the early phases of crop growth, when the soil remains saturated for a long time, leading to plant death and significant loss of yield. The cumulative wet days index is meant to cover the risk of incessant rain which can lead to pooling or heavily saturated soil. The risk is much lower in the other phases and hence not covered.

The Sum Insured (SI) is KHR 1,400,000 and the average pure risk premium for all the locations is 9.73% of SI.

Table 12: Weather Index Insurance Term sheet (EWS Maize)

Sum Insured (USD)	Season	Cover Start Date*	Cover End Date	Cover Duration
1400000	EWS	10-Apr	28 Jul	110

Phase	**1**	**2**	**3**	**4**
Phase Name	**Early Vegetative development**	**Late Vegetative Development**	**Reproductive Stage and Co development**	**Maturity Stage**
Phase Length	30	25	30	25
Phase Start Date	10-Apr	10-May	4-Jun	4-Jul
Phase End Date	9-May	3-Jun	3-Jul	28-Jul
Index 1	**Low Rainfall Index (LRI)**			
Index Definition	Phase-wise cumulative rainfall below trigger			
Phase	1	2	3	4
Trigger (mm)	80	120	150	NOT COVERED
Exit(mm)	40	60	80	
Rainfall Cap (mm)	20	20	20	
Unit Payout (USD)	1.3	2	2.2	
Max Payout (USD)	52	120	155	
Index 2	**Excess Rainfall Index (ERI)**			
Index Definition	Total rainfall in three (3) consecutive days			
Phase	1	2	3	4
Trigger (mm)	70	NOT COVERED	NOT COVERED	80
Exit(mm)	140			160
Unit Payout (USD)	0.75			2.15
Max Payout (USD)	52			172

Index 3	**Cumulative Wet Days Index (CWDI)**			
Index Definition	Phase-wise consecutive rainy days above trigger			
Phase	1	2	3	4
Wet Days Triggers	Loss (as % total SI) against cumulative wet days			
11	4%	NOT COVERED	NOT COVERED	NOT COVERED
12	6%			
13	8%			
14	10%			
15	12%			
16	14%			
17	16%			
18	18%			
19	20%			
Rain day if > (in MM)	3			
Max Payout (USD)	70			
Please note that CDDI will extend to the next phase, i.e., if the day period starts in phase 2 and extends to phase 3 then payout will be calculated as per phase 3. For the same dry event two payouts won't be made.				

Table 13: Weather Index Insurance Term sheet (MWS Maize)

Sum Insured (USD)	Season	Cover Start Date*	Cover End Date	Cover Duration
1400000	MWS	15-Aug-20	14-Aug	100

Phase	**1**	**2**	**3**	**4**
Phase Name	**Early Vegetative development**	**Late Vegetative Development**	**Reproductive Stage & Co development**	**Maturity Stage**
Phase Length	25	25	30	20
Phase Start Date	15-Aug	9-Sep	4-Oct	3-Nov
Phase End Date	8-Sep	3-Oct	2-Nov	22-Nov
Index 1	**Low Rainfall Index (LRI)**			
Index Definition	**Phase-wise cumulative rainfall below trigger**			
Phase	1	2	3	4
Trigger (mm)	120	150	110	Not Covered
Exit(mm)	60	90	50	
Daily Rainfall Cap (mm)*	20	20	20	
Unit Payout (USD)	0.86	2.00	2.57	
Max Payout (USD)	52	120	155	
Index 2	**Excess Rainfall Index (LRI)**			
Index Definition	**Total rainfall in three (3) consecutive days above trigger**			
Phase	1	2	3	4
Trigger (mm)	70	Not Covered	Not Covered	80
Exit(mm)	140			160
Unit Payout (USD)	0.75			2.19
Max Payout (USD)	53			175
Index 3	**Cumulative Wet Days Index (CWDI)**			
Index Definition	**Consecutive wet days above trigger**			
Wet Day Trigger	Loss (as % total SI) against cumulative dry days			
11	4%	Not Covered	Not Covered	Not Covered
12	6%			
13	8%			
14	10%			
15	12%			
16	14%			
17	16%			
18	18%			
19	20%			
Rain day if > (in MM)	3			
Max Payout (USD)	70			

Annex x: WII – Cassava, Pailin Province

Cassava is probably the second most important crop in Cambodia after rice. The crop is hardy and can be grown in upland areas. According to a review of secondary literature the crop has primarily three risks:

- Insufficient water availability after sowing can lead to poor growth which reduces yields even after water stress is alleviated.
- Severe drought during tuber formation phase can lead to pests (whitefly) and disease (mosaic virus) infestation which damages the crop severely.
- Water logging just after planting can lead to root rot and lower yields.
- Excess rainfall near maturity (root- thickening) phase can lead to root damage, lowering the quality and yield.

Cassava is planted from February to June in three sowing windows:

- First planting window: Feb-March (15% people planting)
- Second planting window: April-May (70% people planting)
- Third planting window: June (15% sowing)

Based on the information provided on cassava cropping pattern for Pailin province a weather index insurance product was designed. The cropping period is taken as 300 days and divided into 4 phases, namely, 1st to the 3rd **month after planting (MAP),** 4th to the 7th MAP, 8th to 9th Map, and 9th to 11th MAP. The insurance cover is for 260 days and for the first 3 phases only. The last phase is not covered because:

A. Risk of excess rainfall is low in the 4th phase as it falls between the months of December and March, which is a dry period.
B. There is no rain during the period, so any water deficit risk is uninsurable.

Index 1: Low Rainfall index (LRI): Cassava is a hardy crop and can grow well even with poorly distributed rain. The first three months are especially crucial as water deficit during that phase can lead to unrecoverable yield loss. Water requirement during the 2nd and 3rd phases is moderate. A cap of 30 mm on daily rainfall has been kept ensuring that single day heavy rainfall will not contribute too much to the phases' quota.

Index 2: Excess Rainfall Index (LRI): The cassava crop is susceptible to heavy rainfall in phase 1 which can cause yield loss before the plants have fully established themselves. In the 3rd phase, heavy rainfall can cause a decrease in starch quantity and root damage. Phase 2 is not affected by excess rainfall unless there is flooding.

Index 3: Cumulative Wet Days Index (CDDI): One of the significant risks of Cassava is water logging in the 1st phase which causes root rot and a severe decrease in yield. CWDI covers the risk of waterlogging due to incessant rain over many days. A day is considered to be rainy if it receives a minimum of 5 mm of precipitation.

The Sum Insured (SI) is USD 500 per hectare (KHR 2,000,000) and the average pure risk premium for all the locations is 10.23% of SI.

Table 14: Weather Index Insurance Term sheet - Cassava

Phase	**1**	**2**	**3**
Phase Name	**1-3 MAP**	**4-7 MAP**	**8-9 MAP**
Phase Length	90	110	60
Phase Start Date	26-Mar	24-Jun	12-Oct
Phase End Date	23-Jun	11-Oct	10-Dec
Index 1	**Low Rainfall Index (LRI)**		
Index Definition	Phase-wise cumulative rainfall below trigger		
Phase	1	2	3
Trigger (mm)	300	400	100
Exit(mm)	100	200	50
Rainfall Cap (mm)	30	30	30
Payout (per mm) (in USD)	1.25	1.625	2.5
Sum Insured (in USD)	250	325	125
Index 2	**Excess Rainfall Index (ERI)**		
Index Definition	Total rainfall in mentioned consecutive days		
Phase	1	2	3
Trigger (mm)	80	Not Covered	70
Exit(mm)	180		170
Consecutive Days	3		3
Payout (per mm) (in USD)	1.25		2
Sum Insured (in USD)	125		200
Index 3	**Cumulative Wet Days Index (CWDI)**		
Index Definition	Phase-wise consecutive rainy days above trigger		
Phase	1	2	3
Wet Days Triggers	Loss (as % total SI) against cumulative dry days		
10	5%	Not Covered	Not Covered
11	7%		
12	10%		
13	14%		
14	19%		
15	25%		
16	32%		
17	40%		
18	49%		
Rain day if > (in MM)	5		
Sum Insured (in USD)	245		

Annex xi: Pay-outs for Dry Run WII Products for 2020

i. 2020 Weather Index Insurance Payout for Rice - Pursat Province

Province	District	Village	Data Source	Payout 2020 (as % of SI)	Payout 2019 (as % of SI)
Pursat		Pursat _AWS	AWS	24%	NA
Pursat	Kandieng	Kandieng	CHIRPS	5%	0%
Pursat	Bakan	Ou Ta Paong	CHIRPS	11%	0%
Pursat	Bakan	Sway Don Kaer	CHIRPS	15%	0%
Pursat	Bakan	Trapeang Chong	CHIRPS	17%	0%

Rainfall exceeding the ERI trigger in the fourth (ripening) phase is the primary reason for payout in 2020 for the four locations with data. This corroborates with ground reports of flood / excess rainfall related crop damage.

ii. 2020 Weather Index Insurance Payout for Rice - Battambang Province

Province	District	Village	Data Source	Payout 2020 (as % of SI)	Payout 2019 (as % of SI)
Battambang		BTB_AWS	AWS	70%	NA
Battambang	Koas Kralor	Koas Krala	CHIRPS	30%	12.0%
Battambang	Koas Kralor	Thipakdei	CHIRPS	29%	0%
Battambang	Moung Russey	Kakaoh	CHIRPS	18%	5.0%
Battambang	Moung Russey	Prey Touch	CHIRPS	37%	12.6%
Battambang	Thmor Kol	Chrouy Sdau 1	CHIRPS	19%	48.1%
Battambang	Thmor Kol	Ta Meun	CHIRPS	23%	21.1%

Lack of rainfall in the 3rd phase and rainfall exceeding ERI trigger in the fourth (ripening) phase is the primary reason for payout in 2020 for all the above communes.

iii. 2020 Weather Index Insurance Payout for EWS Maize

Province	District	Village	Data Source	Payout 2020 (as % of SI)	Payout 2019 (as % of SI)
Pailin		Pailin_AWS	AWS	70%	NA
Battambang		Battambang_AWS	AWS	70%	NA
Pailin			CHIRPS	2%	14.9%
Battambang	Koas Kralor	Koas Krala	CHIRPS	0%	17.3%
Battambang	Koas Kralor	Thipakdei	CHIRPS	0%	0%
Battambang	Moung Russey	Kakaoh	CHIRPS	0%	0%
Battambang	Moung Russey	Prey Touch	CHIRPS	0%	19.6%
Battambang	Thmor Kol	Chrouy Sdau 1	CHIRPS	4%	15.5%
Battambang	Thmor Kol	Ta Meun	CHIRPS	2%	14.9%

Low rainfall index is the reason for payout in 2020 with AWS data.

iv. 2020 Weather Index Insurance Payout for MWS Maize

Province	District	Village	Data Source	Payout 2020 (as % of SI)	Payout 2019 (as % of SI)
Pailin		Pailin_AWS	AWS	13%	NA
Battambang		Battambang_AWS	AWS	50%	NA
Pailin			CHIRPS	11%	6.8%
Battambang	Koas Kralor	Koas Krala	CHIRPS	15%	13.0%
Battambang	Koas Kralor	Thipakdei	CHIRPS	9%	6.1%
Battambang	Moung Russey	Kakaoh	CHIRPS	8%	33.8%
Battambang	Moung Russey	Prey Touch	CHIRPS	13%	17.8%
Battambang	Thmor Kol	Chrouy Sdau 1	CHIRPS	10%	0.0%
Battambang	Thmor Kol	Ta Meun	CHIRPS	11%	6.8%

v. 2020 Weather Index Insurance Payout for Cassava

Province	District	Village	Data Source	Payout 2020 (as % of SI)	Payout 2019 (as % of SI)
Pailin		Pailin_AWS	AWS	22%	NA
Battambang		Battambang_AWS	AWS	30%	NA
Pailin			CHIRPS	19%	0%
Battambang	Koas Kralor	Koas Krala	CHIRPS	30%	0%
Battambang	Koas Kralor	Thipakdei	CHIRPS	29%	0%
Battambang	Moung Russey	Kakaoh	CHIRPS	18%	18%
Battambang	Moung Russey	Prey Touch	CHIRPS	37%	0%
Battambang	Thmor Kol	Chrouy Sdau 1	CHIRPS	19%	8%
Battambang	Thmor Kol	Ta Meun	CHIRPS	23%	0%

The primary reason for losses (or payout) in 2020 was excess rainfall in the 3rd phase. This term-sheet captures the floods in Cambodia when it rained heavily in the 2nd week of October.

Annex xii: Basis Risk Analysis

For calculation of Basis Risk three methodologies and four data sources have been used to compare the payouts, namely AYI (based on ground sampling), RIICE technology based yield calculation, weather index based on AWS data and CHIRPS data.

Province	Battambang	Pursat
District	Moung Russey	Bakan
Commune	Prey Touch	Trapeang Chorng
Crop	RICE	RICE
Farmers' Expected Yield (MT/Ha)	4.83	3.95
Average yield (2016-2019)	4.67	4.47
Threshold Yield (MT/Ha)	Min (EY, AY)	
RIICE Calculated yield (MT/Ha)	3.10	2.28
Actual Yield 2020 (MT/Ha)	2.19	3.66
Yield below threshold as per RIICE methodology	34.0%	42.3%
Yield below threshold as per Ground Crop Sampling	53.3%	7.2%
WII Payout (with AWS Data) as % of SI	70.0%	24.0%
WII Payout (with CHIRPS Data) as % SI	27.0%	17.0%
Note: • 'Expected yield' of EY is defined as a yield expected by the farmers in the region • CHIRPS data is being used for WII payout in rest of the calculations		

<u>Comment</u>

There is a poor correlation between all three methodologies. At first glance, the area yield index with CCE for yield measurement seems to be the most accurate methodology based on the analysis. But note that there is huge variability in yield, sowing data and crop duration among the data collected from Battambang. This makes it difficult for both RIICE and WII to model a single product/design to suit all permutations. The analysis of Pursat where the crop variety is more uniform does provide a much better correlation for both 2019 and 2020.

<u>Basis Risk Calculation</u>

The definition of Basis comes from finance, where it is defined as the risk due to an imperfect hedge. Thus, Basis risk in financial markets tends towards zero as future prices and spot prices start converging near expiry.

In the case of crop insurance, Basis is the difference between expected payout and actual payout. Basis risk is often a function of (A) imperfect design of contracts and (B) imperfect damage assessment methodology. In index insurance, Basis risk arises when the index measurements do not match an individual insured's actual losses and don't converge near the expiry of the insurance contract. Basis risk is an important measure as it can be used to understand if the insurance contract is a good fit and explain the overall satisfaction of the farmers and insurers with the design of the contract. A simple way to calculate basis risk is to measure the standard deviation of Basis in the contract, where Basis is defined as:

Basis = Minimum (Actual Yield, Expected Yield, Average Yield) X Cost of Cultivation – Insurance Payout

$$Basis\ Risk = \sqrt{(\sum_{1}^{n}(Basis^2)/n)}$$

Thus, Basis Risk for all the data sources is calculated as follows:

Battambang Province (Prey Touch village)				
Methodology	**Mean Basis (per Ha)**		**Basis Risk**	
	(in USD)	**As % of EY**	**in (KHR)**	**As % of EY**
RIICE	-63.9	-19.2%	405253	30.4%
AYII	-1.3	-0.4%	314547	23.6%
WII	-54.1	-16.2%	381681	28.6%

Pursat Province (Trapeang Chong Village)				
Methodology	**Mean Basis (per Ha)**		**Basis Risk**	
	(in KHR)	**As % of EY**	**in (KHR)**	**As % of EY**
RIICE	76.6	28.1%	348926	32.0%
AYII	-16	-5.9%	170628	15.7%
WII	-14.6	-5.4%	168643	15.5%

Way forward

Designing a sophisticated crop insurance product with low basis risk is possible but a lot of ground information is required. This holds for any methodology that is used, including RIICE.

- In the case of Pursat, it is encouraging that Basis Risk is low and can be further lowered with the improvement of data quality, but basis risk is significantly high in case of Battambang.
- Also, the WII products are relatively simple in this case as only the primary hazard (deficit or excess rainfall) was taken into account. With the use of other weather parameters such as temperature, humidity, and solar radiation increasingly sophisticated products can be designed.
- A combination of multiple methodologies, i.e., remote sensing plus area yield or remote sensing plus weather index should also be considered.

Basis Risk can be further lowered with the improvement of data quality, inclusion of additional data from different trusted sources and methodologies.

Annex xiii: Overview of Crop production in Cambodia

The agricultural sector accounts for 35 percent of the Cambodia's GDP and employs approximately 3 million people[8]. Within the agricultural sector GDP, crop production contributes approximately 54%, with fisheries contributing 25%, 15% livestock, and around 6% for forestry. Rice, maize, and cassava are classified as the most important crops in the country.

Low land crop production: Rice

Rice is the most important crop in Cambodia and is considered the main staple food for Cambodians, accounting for 70% of daily calorie intake. Paddy production contributes up to 50% of the sector's GDP[9]. Most of the production (around 80%) is rainfed, which means farmers often grow rice in the main wet season (one crop per year). Farmers who have access to irrigation can cultivate rice twice a year. The national average paddy yield is between 3 – 4 t/ha (Figure 12). The cultivated area for rice is around 3 million hectares with an estimated paddy production volume of 10.79 million tonnes per annum. The annual production exceeds the domestic demands by approximately five million tonnes, and this surplus is exported in the form of paddy and milled rice. To support the rice sector, the government launched the Policy Paper on the "Promotion of Paddy Production and Rice Export" and formulated the National Strategic Plan for Agricultural Development 2019-2023 which emphasises three important aspects: (1) productivity enhancement; (2) diversification and (3) agricultural commercialisation. The main focus areas of the policy are to:

- rehabilitate and construct new infrastructure (e.g., roads, irrigations, energy, etc.);
- strengthen extension services and agricultural inputs;
- reform land use and management;
- support mechanization;
- build resilience and adaptive capacity to climate change;
- form and strengthen farmer organisations; and
- build and coordinate institutions.

However, several problems confront rice production in Cambodia. The trends indicate a decline in soil fertility, an increase in labour costs and labour shortages, and a rise in experienced adverse effects due to climate variabilities and climate change. As majority of cultivated rice is rainfed, the challenges include: unreliable water irrigation supplies due to high demands for water to irrigate rice production and breakdown of some irrigation infrastructure; application of inefficient crop establishment methods (namely hand broadcasting); majority of farmers use poor seed quality; and poor weed management.

8 "FAO: Cambodia at a glance". http://www.fao.org/cambodia/fao-in-cambodia/cambodia-at-a-glance/en/

9 U.S. Embassy in Cambodia (2020). "Fast Facts about Cambodia's Agriculture Sector". https://kh.usembassy.gov/fast-facts-about-cambodias-agriculture-sector/

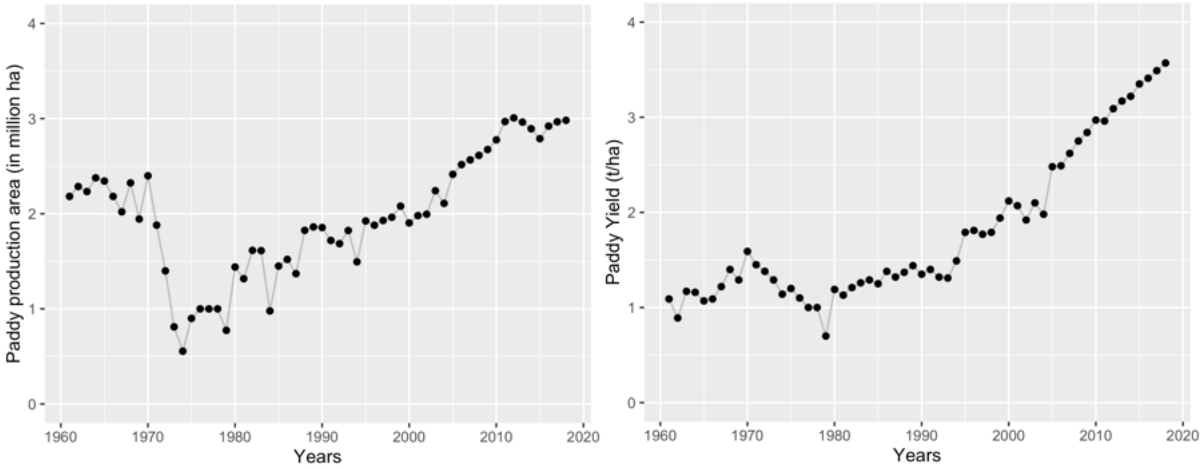


Figure 12: Cambodia’s paddy production areas in million hectares on the left and national average paddy yield in tonne per hectare on the right (Source: FAOSTAT, 2020).

Upland crop production: Maize and cassava

Maize and cassava – in terms of cultivated area and production – are currently the second most important crops after rice. Red maize (also known as yellow maize/corn) is the main cash crop planted in Cambodia largely for livestock feed, whereas white maize (also known as waxy maize/corn) is planted mainly for domestic human consumption. Cassava is also the main cash crop commonly planted as an alternative to red maize. Both maize and cassava are commonly cultivated in every province in Cambodia; but most production areas are in the upland fields of Battambang, Pailin, Kampong Cham, Tbong Khmum, Kratie, Strung Treng, Ratanak Kiri, Banteay Meanchey, Oddar Meanchey, Kampong Thom, Preah Vihear, and Kandal provinces.

Red maize growers in Cambodia tend to grow two crop cycles per year – the first crop sown in around May and the second crop in around August; while cassava growers can only plant one crop per year as the crop cycle lasts between 7-10 months. Maize and cassava were observed to be planted intercrop during the early establishment years of other tree-based plantations such as cashews, mango, durian, longan, pepper, or rubber tree.

In 2018, the production area of maize was 123,439 hectares producing approximately 0.6 million tonnes (Figure 13); while the cultivated area of cassava in the same year was 272,172 hectares, producing 7.65 million tonnes (Figure 14). On average, yields of maize and cassava across the country were 4.9 t/ha and 28.1 t/ha respectively. Farmers often switch between maize and cassava every 2 to 3 years.

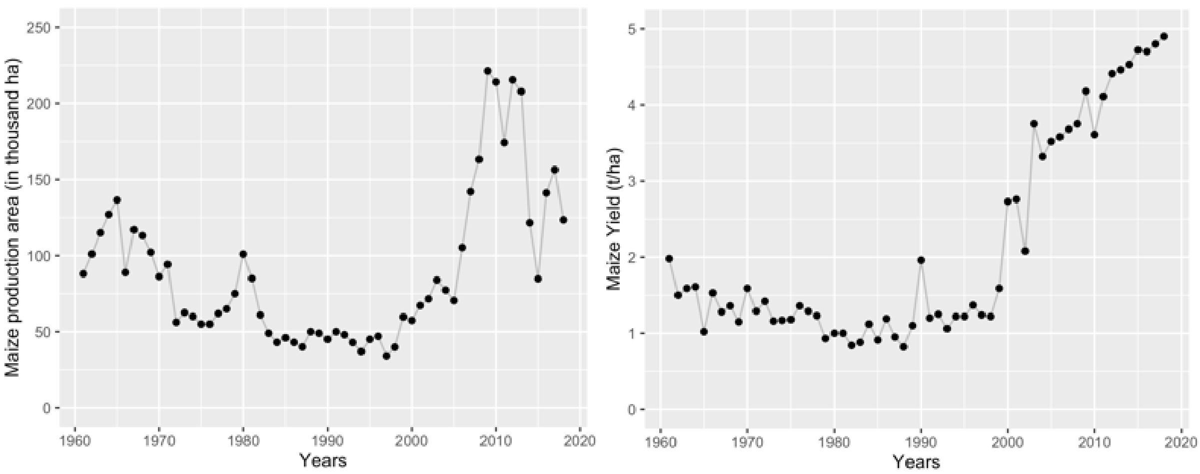


Figure 13: Cambodia's maize cultivated areas in thousand hectares on the left and national average maize yield in tonne per hectare on the right (Source: FAOSTAT, 2020).

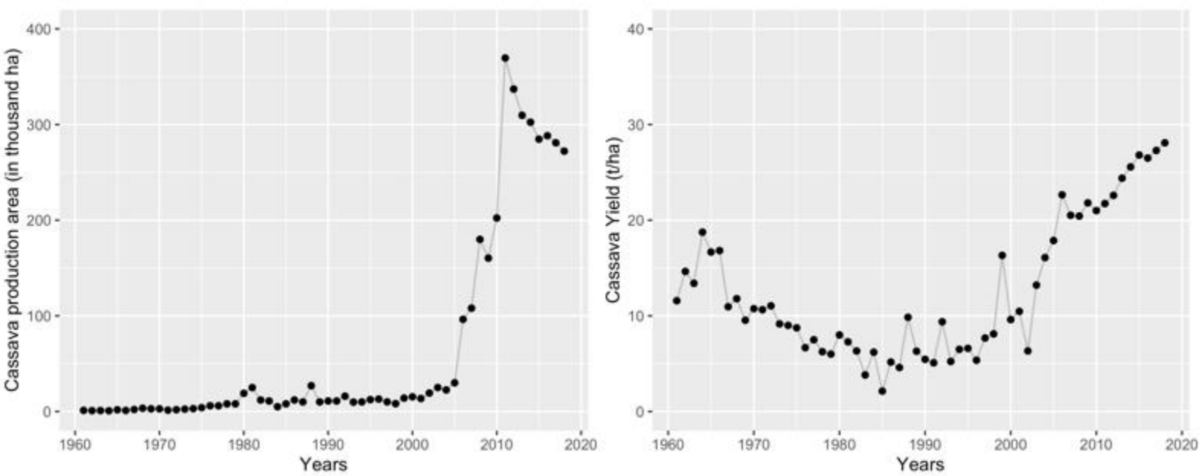


Figure 14: Cambodia's cassava cultivated areas in thousand hectares on the left and national average cassava yield in tons per hectare on the right (Source: FAOSTAT, 2020).

Production of red maize and cassava are affected by a number of constraints, including prolonged droughts, soil erosion and soil fertility decline, increase in insect pest and disease problems, lack of suitable mechanised harvesters and poor post-harvest management at the farm level. Additional issues for cassava include lack of access to high-yielding varieties and healthy planting materials, high fluctuations in cassava price, substantial losses at-and-post harvest, and inadequate processing and use of cassava.

Annex xiv: Note on Rice Cultivation in Study Area

Rice growing household profiles: On average the family size of rice growing households in Battambang and Pursat is between 4 to 5 people and 3 to 5 people, respectively. Only around 2 people worked full time on the farm; suggesting they had to rely on extra hired labour and farm service contractors to complete most of their farm operations.

Farm sizes in Battambang and Pursat averaged per family were 4.9 ha (ranging between 3.3 to 5.5 ha) and 2.9 ha (ranging between 2.1 to 3.2 ha); respectively. On average, annual incomes were USD 8,509 for a family in Battambang and USD 9,043 for a family in Pursat; rice production contributed 73% (Battambang) and 67% (Pursat) of the family income.

Number of paddy crop cycles annually: The study showed most farmers in the study areas (94.2%) grew two rice crop cycles annually. The first cycle of wet season rice was mostly grown between May and August, and the second cycle was mainly grown between September and November. These surveyed paddy farms are highly intensified (as they have access to supplementary water for irrigation), compared to around 80% of the paddy farms nationwide with no access to supplementary water.

Crop establishment method: Every monitored field was planted by hand-broadcasting on either flooded or wet fields. The farmers explained the main reasons for adopting hand-broadcasting were that it is easy and quick, and it has a very low cost compared to manual transplanting. However, a few major drawbacks with manual broadcasting were reported, including highly uneven seed distributions (too high and too low plant density in one field), most of the seeds remaining on the soil's surface, and the difficulty of walking into the field for hand-weeding and/or performing other crop management activities.

Crop varieties: The varieties used between the first cycle and second cycle of wet season rice were the same, with the top four varieties being Somali, Sen Kra Ob, Sragne and Malis Sral. These are quick maturing varieties ranging from 100 to 150 days. This suggests, depending on the rice varieties, water requirements range from around 70 to 120 days from sowing to the flowering phase.

Fertilizer application: The fertilizer used was in a form of inorganic fertilizer. The most common fertilizers were urea, DAP and NPK. A number of fertilizer applications were applied in between 1 to 3 splits. Farmers with one application had applied fertilizers during the tillering phase at around 20 days after planting, while those with the two-split applications applied during the tillering and flowering phases. Those with three split applications informed that the first application was made during sowing, followed by the second around 20 days after sowing and the final application during the booting or flowering phase. Based on the data gathered during the second cycle of wet season rice growth, there were some differences in the amount of fertilizer applied by villages, but they were insignificantly different (p-value = 0.396). The average fertilizer used was 311.19 kg/ha with a standard deviation of 127 kg/ha. The application rate seems to be fairly high compared to the overall application rate across the country.

Weed management: Control of weed in rice is important to minimise yield losses, reduce production costs and enhance grain quality. Weed reduces yields through direct competition for water, sunlight, and nutrients. The presence of weed seeds in grain may decrease the buying price, and produce more weed if farmers used kept-seed contaminated with weed seeds for the next crop; thereby increasing labour and input costs. The study found that farmers invested very little on herbicide application. Majority of the inspected fields were not applied with pre-emergence herbicide which was not a recommended practice for better weed management. There are various herbicide products available for pre-emergence application, but most farmers have not implemented this practice which means that they may not be able to control the weed at a later stage using in-crop selective herbicides because it is already too big to be controlled.

We also found that almost every field was heavily affected by a high population of weed, which is a major factor limiting crop yields. These findings suggest that specific training is required for farmers about best weed management practices and overall good agronomic practices.

Insect and disease management: Farmers perceived that almost every insect found in the fields was harmful to the crop. In general, farmers could not distinguish between the bad and good bugs. Every time they saw more insects in their crop, they started thinking about the hard controlling method such as using broad-spectrum insecticide which kills various types of insects. They were not aware of control methods recommended by Integrated Pest Management (IPM), and they did not evaluate the economic damage before applying insecticides. This could increase the potential for pest outbreaks at later point in time. Hence, it is very important to educate farmers on IPM and pest threshold levels to minimize pesticide usage while reducing pesticide residual effects on humans.

The main insects damaging the rice found were stem borers, leaf folders, and grain suckers. Most fields were not damaged too seriously. However, most farmers had one insecticide spray to control either leaf/stem borers or grain suckers. Overall, only a small percentage of farmers applied the insecticides two or three times. These findings suggest that farmers should be trained on the IPM practices and encouraged to adopt these. This could prevent and/or reduce pest outbreaks and substantial economic losses.

Harvesting and crop yield: All of the paddy fields were harvested through combined harvesters, which combine reaping, threshing, and cleaning into a single operation. The combined harvesters are owned mostly by service contractors. The paddy yields were significantly different between the first and second cycles of wet season rice. The results showed that the average paddy yield of the first season rice across the study areas was 4.4 t/ha (± 0.9 standard deviation) with a median yield of 4.3 t/ha; while the mean yield of the second cycle was 3.18 t/ha (±1.5 standard deviation) with the median of 3.38 t/ha (Figure 15). Specifically for the 2nd wet season production, there were some differences in crop yields by villages; but they were not statistically different (p-value = 0.925). At the farm-level, there was an obvious difference in crop yields. This is because each farmer has different levels of intensity and efficiency of the inputs used and water availability. The study found that the top 10% of farmers achieved yields at 5.0 t/ha; while the next 10% received very poor yields as low as 0.75 t/ha. Besides these, we found that 2.5% of the farmers had a complete crop failure due to lack of water. Technically, the main factors that are responsible for yield gaps and risks amongst farmers are: (1) biotic (pests, weeds) and abiotic factors (soil, water, temperatures, input quality and quantity, etc.); (2) farmers' knowledge and crop management practices (how a crop is planted and managed, what efficiency inputs were used, etc.); and (3) institutional and policy support (irrigation, road, crop insurance, etc.). All these factors can potentially be addressed in order to minimise farmers' risks and to push average yields up to 5 t/ha or higher.

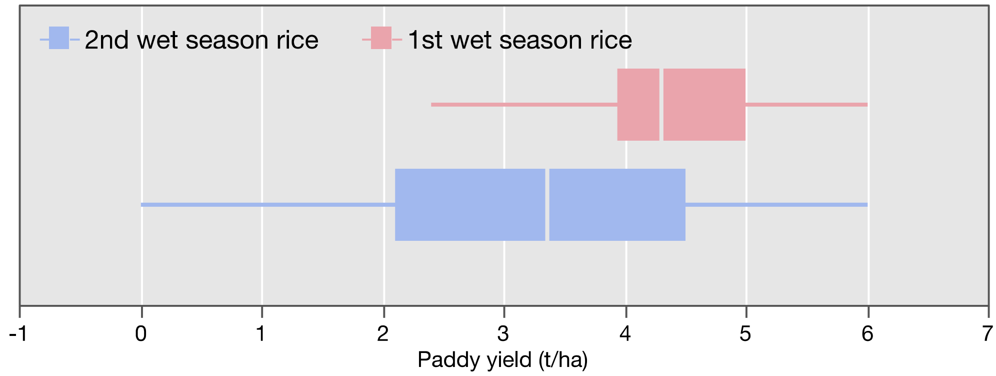


Figure 15: Paddy yields between the 1st and 2nd cycles of paddy production in wet season.

Economic analysis: The gross margin, which is the gross income less the variable costs, was employed to assess the economic performance of the 1st and 2nd crop of the wet season across the studied areas. The calculations were based on the actual operational expenses that had been made on the monitored fields and paddy prices received by individual farmers. The breakdown of production expenses and gross margins in USD per hectare are shown in Figure 18. The study discovered differences in paddy production costs between the 1st and 2nd crops of the wet season paddy production. For the 1st wet season rice, the expense on paddy production was 463.20 $/ha (±93 Std Dev); while the 2nd crop cycle expense was 558.96 $/ha (±157 Std Dev). Large portions were spent on fertilizer, crop protection, and planting (with seed).

We also found a significant difference between gross margins of the 1st and 2nd crop of the wet season paddy production. For the 1st wet season rice, farmers received on average a gross margin of 560.61 $/ha (with 93% of the growers receiving a positive gross margin); while the 2nd season farmers' paddy production received a very low gross margin of 25.34 $/ha (with only 61% of growers receiving a positive gross margin). The main reasons for receiving a very low gross margin during the 2nd crop cycle was because of a poor crop yield; mainly from drought effects and higher production costs (compared to the first crop). Our field observation suggests that farmers need more agronomy training and on-farm technical support to enhance input use efficiency and to maximize profits.

Rice production risks and challenges: First wet season paddy production

During the crop growth, we observed some of the production difficulties and risks. These include: drought effects on crop growth during the crop establishment and early growing stages; weed competition from the early crop growth through to harvesting; and inability to properly manage water in the fields due to unreliable irrigation supply and uneven fields. This season, we found very minor damage from disease and insect pests. We also noticed moderate yield variabilities between villages. The main factors for these were different levels of soil fertility, water supply availability, weed and fertilizer use.

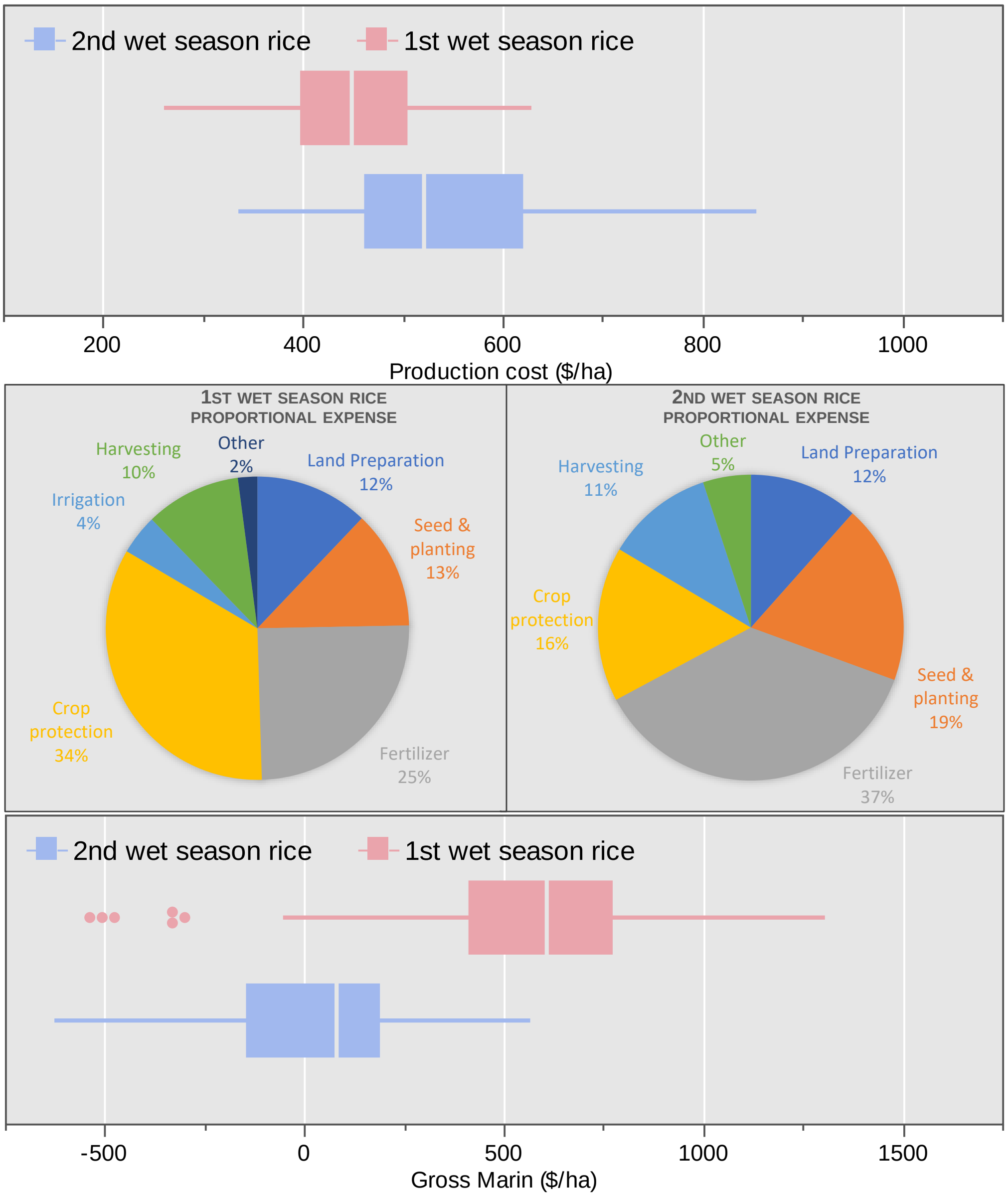
Table 15: Gross margin budget of paddy production averaged by villages; added with the average values from all the villages

Descriptions	Average cost in US$/ha by village							Average US$/ha
	Buo Srangae	Kab Kralanh	Koun Khlong	Poulyum	Prean Nil	Prey Damrei	Stueng Kambot	
Variable Costs ($)	***601***	***586***	***499***	***492***	***559***	***486***	***496***	***531***
Land preparation	72	59	65	59	70	62	75	66
Planting								
Seed	129	122	82	96	95	67	99	99
Broadcasting	12	8	8	7	7	7	5	8
Weed Management								
Herbicide	19	25	9	23	13	18	42	21
Application	5	9	5	9	7	9	14	8
Fertiliser								
Fertiliser	202	206	210	163	210	179	132	186
Application	16	20	14	13	8	7	20	14
Pest management								
Insecticide	36	45	12	22	49	30	20	31
Application	9	17	3	11	7	7	14	10
Fungicide	9	28	12	11	12	19	0	13
Application	4	11	5	6	4	6	0	5
Harvesting								
Harvesting	80	33	62	68	65	65	59	62
Other	8	3	12	4	12	11	17	10
Gross Income ($)	***520***	***429***	***578***	***566***	***593***	***611***	***656***	***565***
Yield (t/ha)	2.97	2.45	3.30	3.23	3.39	3.49	3.75	3.23
Price ($/t)	188	188	188	188	188	188	188	188
Gross Margin ($/t)	**-42**	**-125**	**121**	**116**	**78**	**170**	**209**	**75**

Rice production risks and challenges: 2nd wet season paddy production

Several crop production difficulties and challenges were found during the weekly crop monitoring, including:

- During sowing between July to August, there was none to very little rain and as a result, sowing windows were delayed by a month and some farmers had to plant their crop in dry fields with little moisture resulting in poor germination.
- During the early crop growing phase, some effects from droughts and insects were observed.
- During the vegetative stage, some fields were badly affected by weed.
- During the reproductive and grain filling stages, there were some adverse effects from lack of rain and high weed density.



<u>Figure 16: Paddy production expenses and gross margins of the 1st crop and 2nd crop of the wet season</u>

Annex xv : Note on Maize Cultivation

Maize growing household profiles: Household demographics and socioeconomic characteristics from interviews demonstrate that across the 8 communes of Pailin province the household size is 4.7 people (ranging from 3.9 to 5.0 people), and approximately 2 people work full-time on the farm. As a result, most household farms needed extra service support from hired labour and farming machinery service contractors to accomplish most of the farming operations. Farmland ownership was 5.1 ha on average with a range of 0.5 ha and 40 ha, and the median land size was 4.0 ha.

Maize production cycles annually: The study indicates that maize was grown twice (two cycles) annually, with the first crop of the wet season being planted during May and June, and the second one was mostly between August and September. These two cropping cycles annually are fully reliant on wet season rainfall.

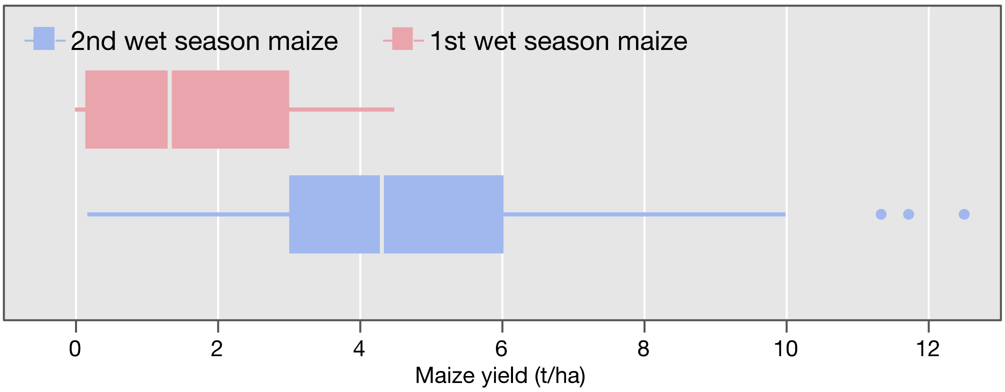


Figure 17: Maize yields between the 1st and 2nd cycle of maize production in wet season

Crop varieties and planting technique: For the 1st crop season, most farmers started their first land preparation either in January or February. The second land preparation was either in March or April. The land preparations were mostly done by service contractors. The planting was done either in late March or April by a machine planter using hybrid seeds purchased from a local market. The top eight common varieties used were 9999, LVN-10, BO-4858, CP-888, 888, RP-101, BX-379 and BB4848. And for the second crop growth, most farmers started their first land plough either in June and July; and the second plough was mostly in July and August. The planting was done mostly in August and September by a machine planter using hybrid seeds purchased from a local market. The crop lifespan was around 115 days (from planting to harvesting). The top eight common varieties used included LVN-10, CP-888, BO-4858, 9999, 8888, RP-101, PPN, BX-379 and BB4848.

Our findings from field observation showed that a machine planter was used to plant maize seeds on poor seedbeds (prepared using disk ploughs). We noticed some issues with uneven sowing depth and a small proportion of seeds uncovered by soil (placed on the soil surface). All these things had adverse effects on seed germination, and ultimately had negative impacts on overall plant density and distribution of many inspected fields. The breakdown cost of planting and seeds is in **Figure 18**.

Fertilization application: Back in 2005, Pailin's maize growers began their (maize) crop growth without any application of fertilizer. The maize yield at that time was mostly between 7 to 10 tonnes per hectare. We noticed substantial soil depletion from soil erosion and continuous growing crops without the use of additional fertilizer. The surveyed farmers reported their current crop yields had dropped by 40 to 60% compared to the past 10 to 15 years. Based on the household interviews and field monitoring activities, farmers started to use chemical fertilizer mostly in a liquid form, and a very small number of them (less than 5%) applied DAP, urea, and/or NPK fertilizer. Some of the reasons behind their doubt or reluctance were: (1) additional costs of fertilizer application and risks involved; and (2) some showed concerns that the chemical fertilizer would damage their soil. The maintenance of crop yield is increasing in difficulty as sufficient nutrients were not returned to the soil, and the use of production techniques were not sustainable. This brings a knowledge gap on sustainable and profitable crop production, which could benefit from future projects including agronomic technical support as a part of the project focus. The breakdown cost of fertilizer application is presented in **Figure** 18.

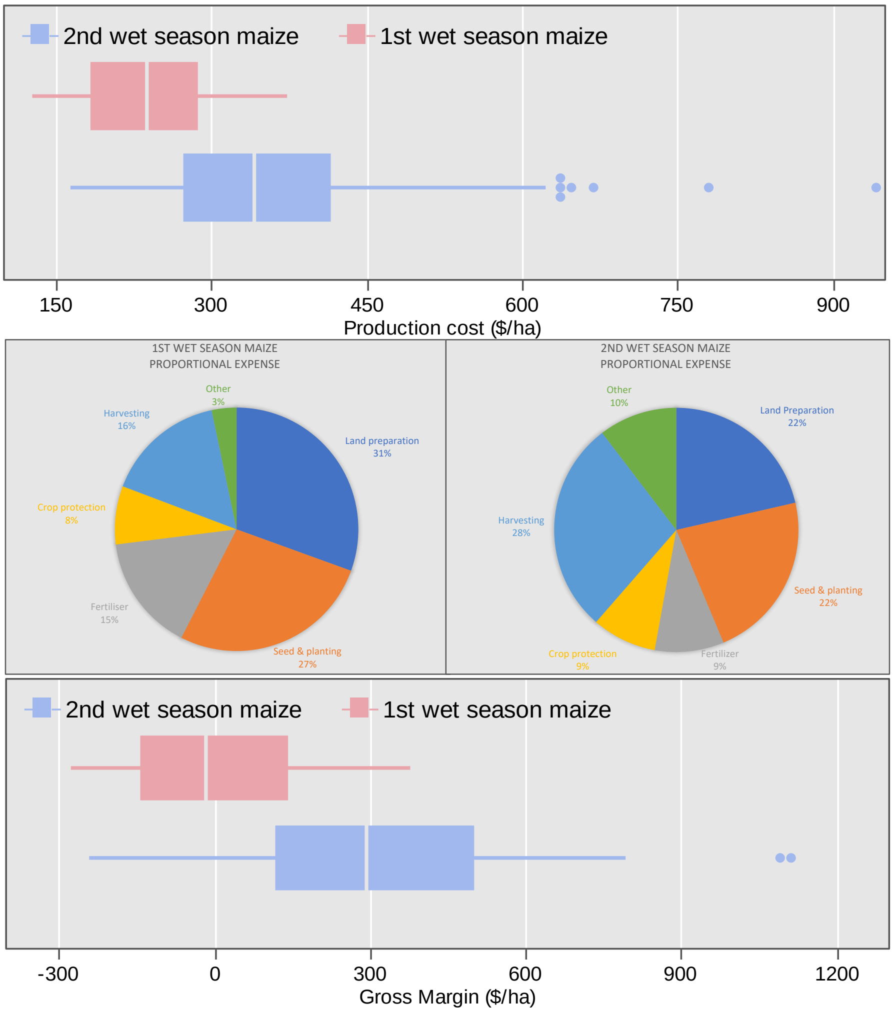


Figure 18: Wet season Maize production expenses and gross margins

Crop protection: Besides the effects of drought and excessive rainfall, weed and pests were reported to be the major production constraints in Pailin. Weed infestation (reportedly more important than the insect) is of significance as it lowers maize yields and increasing the production cost. the study found that weeds were controlled largely by using chemicals. Minor hand weeding practices were observed; but are not popular because manual weed control practice is getting more expensive, laborious, and time-consuming.

Four main types of herbicides used to control weed included Glyphosate, Atrazine, 2,4-D, and Paraquat. Glyphosate herbicide was used by some farmers as the pre-emergence herbicide. Atrazine and 2,4-D were applied by the majority at post-emergence between 10 and 25 days after sowing. While Paraquat was applied by some farmers at 40 to 50 days after sowing. We noticed some damages/injuries particularly from 2,4-D and Paraquat on maize. With the 2,4-D effects, common symptoms of plant injury were malformed brace roots, brittle stems, and stunting growth. The impact from Paraquat was rapid leaf burning within one or two days of application. The injury did not move within the plant; it only affected the plant tissue of the droplets they had contacted. The breakdown costs of crop protection including herbicides and pesticides are presented in **Figure 18.**

Harvesting and crop yield: The household survey and field monitoring showed that maize was harvested and shucked (the ears) by hand. Firstly, farmers (with the support of hired labour) pulled the ears from the stalk of the plant. Once the hand-pick was completed, they collected the ears and put them in one place, then shucked the ears (that is to remove the husks covering the ears). This method of harvesting is expensive, laborious and time-consuming. In addition, some farmers shared that they found it difficult to find labour to do the harvesting. The breakdown for the cost of combined harvesting and shucking is present in **Figure 18**.

Maize yields were significantly different between the first and second crop of the wet season. For the first wet season crop, the average cob yield across the study areas was 1.68 t/ha, varying between 0 – 4.50 t/ha; with the first quartile, median and third quartile of 0.16, 1.35 and 3.03 t/ha, respectively. While the second crop had an average yield of 4.79 t/ha, varying from 0.17 – 12.5 t/ha; with the first quartile, median and third quartile of 3.03, 4.33 and 6.03 t/ha, respectively.

Economic analysis: The gross margin was used to assess the economic performance of the 1st crop and 2nd crop of the wet season across the studied areas. The calculations were based on the actual operational expenses of the monitored fields and maize prices received by individual farmers. The breakdown production expenses and gross margins in USD per hectare were shown in **Figure 12**. The study discovered differences in paddy production costs between the 1st and 2nd crop of the wet season maize production. For the 1st wet season maize, the average expense on maize production was 238.98 $/ha (±67 Std Dev), varying between 127.66 to 374 $/ha; with the first quartile, median and third quartile of 183.88, 238.75 and 287.57 $/ha, respectively. Whereas the 2nd crop production average expense was 367.09 $/ha (±138.63), ranging between 163.88 to 942.22 $/ha with the first quartile, median and third quartile expenses of 272.49, 341.88 and 416.01 $/ha, respectively. A large proportion in both cropping seasons were spent on land preparation, seeds and planting and harvesting (**Figure 18**).

1st wet season maize production risks and challenges: Poor yield was one of the main production challenges found during the crop monitoring. Additionally, there were substantial variabilities in yields throughout the study areas. Two villages were close to a complete crop failure, four villages received very low yields (less than 2 t/ha), three villages obtained normal yields (around 3 t/ha) and one village had yields of more than 4 t/ha. The two main weather-related issues observed included prolonged drought and less rain from the early crop growth to the late flowering phase in most monitored fields; as well as poor (uneven) rainfall distribution. We observed most maize in the study areas were planted in the highlands with different levels of slopes and soil depth. These findings are for the design of area-yield index-based insurance or hybrid insurance products as production risks and yields vary significantly between the villages.

2nd wet season maize production risks and challenges: Several crop production challenges were observed during the weekly crop monitoring, including:

- During sowing, there was no to very little rain between July and August. This resulting in the sowing windows being delayed by a month and farmers having to plant their crops on dry lands resulting in poor germination.
- During the early crop growth stage, effects from droughts and insects were observed.
- During the vegetation stage some fields were badly affected by weed.
- At the reproductive and grain filling stages, there were some adverse effects from a lack of rain and high weed density.
- At harvesting there was insufficient labour to manually harvest the crop.

Annex xvi: Note on Cassava Production in Cambodia

Risks for cassava plantation: The crop is very sensitive to soil water deficit during the first three months after planting. Water stress at any time in that early period significantly reduces the growth of roots and shoots, which impairs subsequent development of the storage roots, even if the drought stress is alleviated later. Deficit soil moisture is the main risk during first three months after sowing. Once the crop is established, it can be grown with very limited amount of rainfall / soil moisture.

Deficit rainfall during the vegetative growth period might lead to whitefly pest and mosaic virus which can cause severe damage to the crop, sometimes leading to 70% crop damage.

Cassava is also susceptible to waterlogging especially just after planting. If the soil becomes water-logged, sprouting and early growth is affected and yields are reduced. Heavy rains near crop maturity can also damage the roots/tuber.

Water requirement: In general, the total crop water requirement is between 400 to 750 mm for a 300-day production cycle.

Cassava planting Windows:

- First planting window: Feb to March (15% of farmers)
- Second planting window: April to May (70% of farmers)
- Third planting window: June (15% of farmers)

Table 16: Major indicator analysis of fresh cassava per hectare[10]

Expense Items	KHR	*USD*	*Proportion %*
Total Revenue (A)	**5,946,331**	**1,486.58**	**100%**
Intermediate Input (B)	**920,071**	**230.02**	**15.47**
Stem cutting	354,098	88.52	5.95
Fertilizers	44,390	11.10	0.75
Liquid fertilizers	94,411	23.60	1.59
Herbicides	374,579	93.64	6.30
Pesticides	10,682	2.67	0.18
Bags	5,525	1.38	0.09
Plastic cable tie	743	0.19	0.01
Fuel	35,643	8.91	0.60
Cash cost (C)	**1,976,984**	**494.25**	**33.25**
Transportation	273,356	68.34	4.60
Land preparation	165,470	41.37	2.78
Harvest by tractors	21,691	5.42	0.36
Labour cost	1,093,444	273.36	18.39
Interest	216,245	54.06	3.64
land rental fee	206,778	51.69	3.48
Imputed cost (D)	**1,250,359**	**312.59**	**21.03**
Transportation	71,269	17.82	1.20
Land preparation	74,446	18.61	1.25
Harvest by tractors	2,501	0.63	0.04
Labour cost	164,484	41.12	2.77
Interest	285,367	71.34	4.80
land rental fee	652,292	163.07	10.97
Depreciation (E)	**85,337**	**21.33**	**1.44**
Total expense (F = B+ C+E)	**2,982,392**	**745.59**	**50.16**
Total cost (G = F +D)	**4,232,751**	**1,058.19**	**71.18**
Net farm income (H = A-F)	**2,963,939**	**773.03**	**52.00**
Net profit (I = A-G)	**1,713,580**	**428.40**	**28.82**
Net value added (J = A- B -E)	**4,940,923**	**1,235.23**	**83.09**

[10] Source: International Journal of Agricultural Technology 2021 Vol. 17(1):277-290

Annex xvii: Insurance Regulation in Cambodia

Agricultural insurance regulation

Currently Cambodia does not have any specific regulatory policies for agricultural insurance. However, ongoing pilots on agricultural programmes are covered by the microinsurance regulation. With the growth in the agriculture sector and the increasing frequency of disasters, the Royal Government of Cambodia is looking to initiate a national agricultural insurance programme in order to help farmers manage their unforeseen farming risks. Lessons learnt and recommendations obtained from the agricultural insurance projects are vital ingredients in developing agricultural insurance regulation and launching the national agriculture insurance programmes. The government is putting their efforts to formulate and gradually improve agricultural insurance regulatory environment along with national and international development agencies. The efforts have been supported by international aid agencies such as GIZ and ADB. A brief note on the current status of microinsurance in Cambodia can be accessed here.

Regulations and insurance industry progression

The Law on Insurance was passed on 9 January 1964 and abrogated in 1975 by the Khmer Rouge regime. After the prolonged civil war, the Royal Government of Cambodia promulgated the Law on Insurance to the public to promote and manage the rebirth of the insurance industry in 1992. One year after the announcement of the insurance law, one insurance company called the Cambodian National Insurance Plc. was created in 1993, followed by Forte Insurance (Cambodia) Plc. and Asia Insurance (Cambodia) Plc. established in 1996.

The Law on Insurance was abrogated in 2000. Under the updated 2000 version, the government strengthened the insurance industry by (1) increasing the solvency and capital requirements and (2) establishing a state-owned reinsurance company in 2002 called Cambodian Reinsurance Company Plc. (known as Cambodia Re). Growth of the insurance industry was slow during the first two and half decades since the rebirth of the country's insurance industry in 1992, but it rapidly increased after 2015. Currently, there are 13 General Insurers, 1 Reinsurer, 11 Life Insurers, 7 Micro Insurers, 36 Insurance Agents and Brokers, and 3 Loss Adjusters[11]. The gross premium growth for the insurance industry estimated around USD 260 million in 2019 compared to the previous year (USD 196.7 million) and USD 60.3 million in 2014, suggesting an average annual growth rate of approximately 35% in the gross premiums.

In Cambodia, the Ministry of Economy and Finance (MEF) is responsible for issuing regulations and managing and supervising insurance businesses. This means every insurance company – including micro-insurers, agents and brokers, and loss justifiers – must obtain a license from MEF before their insurance business activities can be operated. The Insurance and Pension Division of the General Department of Financial Industry in MEF is delegated to supervise insurance and manage an

11 Kimyorn C. (2019). Insurance market report, Cambodia. General Department of Financial Industry, Ministry of Economy and Finance, Cambodia.

Insurance Industry Development Fund for promoting, supporting, and encouraging the dissemination of interests in insurance to the public.

Distribution of insurance products

According to the Law on Insurance, insurance products can only be distributed through a duly licensed insurance agent and/or through a broker. The law does not specify if insurance products can be distributed through the insurer's staff. However, the Ministry of Economy and Finance has explained that it is permissible. In addition, a ministerial offer even grants the insurer's staff a specific authorization to act as the insurance salespersons. The Ministry - even though there is no statement about group insurance policies - a compulsory group insurance policy is an insurance policy in itself. For this reason, the policyholder, acting for a group of insureds, cannot be considered as an insurance intermediary. For a referrer (of insurance[12]), the Ministry emphasises that there is no need for a license, because they do not act on behalf of the insurance contract parties.

However, it can be difficult to distribute insurance products through a third party due to a particular request for a minimum capital deposit of USD 10,000 for insurance agents and USD 50,000 for insurance brokers. For this reason, life insurance companies end up recruiting employees instead, also known as consultants. Under the tax and labour regulations, insurance companies can be severely sanctioned if the employment relationship is not genuine.

It should be noted that according to Fontaine, A. (2020)[13]; "bancassurance, which is essential for micro-insurers, life insurers and to some extent to general insurers, is generally not permitted, due to the National Bank of Cambodia's position stating that these can only refer to insurers and cannot act on their behalf. According to the above, acting as referrer only, these establishments should not be required to obtain a license from the MEF. But surprisingly the MEF requires them to obtain an agent license. Therefore, insurance companies have no other choice than having their own staff (not an agent for the reasons outlined above) in the banks and MFIs' premises, which drastically increases the acquisition cost". There are no restrictions on outsourcing activities that are not subject to licensing.

Taxation

The Law on Financial Management 2017 has introduced a significant change to the current tax regime by instructing insurance companies to separate tax payments based on types of insurance – meaning risk and property insurance businesses are required to pay tax at the rate of 5 percent on gross premium, while savings and other activities – which are not property or risk insurance, or reinsurance – should be subject to the common tax rate of 20 percent on profit. In addition, insurance companies are required to pay a 0.5 percent contribution to the Insurance Industry Development Fund of the Ministry of Economy and Finance.

[12] A referrer of insurance can't earn commission from distributing insurance

13 Fontaine, A. (2020). Cambodia. *In* "THE INSURANCE AND REINSURANCE LAW REVIEW" (P. Rogan, ed.), pp. 507.

Insurance companies are not required to pay value added tax (VAT), but insurance intermediaries must pay VAT on their commissions. For this reason, the insurance companies cannot claim a VAT deduction on the commissions of the insurance intermediaries. This non-deductible VAT, therefore, gets included in the gross premium amount, and thus taxed at 5 percent as well. Therefore, a part of the premium is subjected to double taxation. In the near future, expected changes in taxation on insurance intermediaries should mitigate the aforementioned tax implications. The new regulation indicates that reinsurance premiums are generally not subject to the aforementioned 5 percent tax (i.e., an endowment product), but insurance companies must withhold 14 percent on the reinsurance premium paid abroad.

Dispute resolution

Even though there is often a short description of arbitration stated in the insurance policy between the policyholder and the insurance company, no reference on any arbitration forum and no indication of arbitration procedure are generally provided. In other words, descriptions on how to challenge the insurer's decision or the use of loss adjusters are generally not given to settle a dispute. Currently, the Ministry of Economy and Finance does not have any Alternative Dispute Resolution mechanism. However, the Law on Insurance suggests the Ministry to create an insurance arbitration centre. If a dispute is brought before a court, parties need to follow the rules of the Civil Procedure Code.

It is important to note that there is no rule of interpretation clearly stated in the Law on Insurance and no law on consumer protection. Furthermore, there are very few rules of interpretation in the Civil Code. However, since every insurance product must be approved by the MEF, this means that the MEF has its own interpretation that may be used as a benchmark for policyholders and insureds that are under the same insurance policy.

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