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WEATHER-PROOFING AGRICULTURE IN THE MEKONG DELTA: MARKET REPORT

By Clickable Impact Consulting Group

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DISCLAIMER

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1. INTRODUCTION

Climate change poses significant risks to agriculture and aquaculture farmers in the Mekong Delta. As one of the world's most extensive rice-growing regions and a major producer of fruits, vegetables, and aquaculture products, the livelihoods of millions depend on the Delta's fertile lands and water resources. However, changing climate patterns are leading to several challenges for the farmers, which will only worsen with climate change. To address these challenges, the project "Weather-proofing agriculture through parametric insurance" has been established under the Business Partnership Platform ("BPP") by Hillridge, MSIG Insurance Vietnam ("MSIG Vietnam"), and the Australian Government.

The project aims to design tailored and affordable parametric insurance solutions to support climate change adaptation and mitigate income volatility for Mekong Delta farmers. Unlike traditional insurance, parametric insurance offers payouts based on predefined triggers linked to specific weather or climate-related parameters, making it well-suited for the Delta's increasingly unpredictable climate patterns.

Under the BPP, the Department of Foreign Affairs and Trade ("DFAT")'s principal program aims to accelerate the Australian Government's collaboration with inclusive businesses to create development impacts and sustainable commercial returns. This partnership leverages Hillridge's expertise in insurance product design, project management, technology platform customisation, grower engagement, and business development. MSIG Vietnam contributes climate insurance for droughts and custom solutions for smallholder growers, while the Australian Government provides catalytic funding, gender expertise, network connections, capability building, and recognition.

The project's strategy includes tailoring parametric insurance products to address typical climate risks faced by producers in the Mekong Delta, delivering industry training to increase adoption, and supporting premium purchases by female smallholder farmers and other underrepresented groups.

2. EXECUTIVE SUMMARY

The Mekong Delta region in southwestern Vietnam is home to more than 20 million people. It produces over half of the country's rice and accounts for over a third of the domestic fruit sector and two-thirds of the aquaculture sector. Collectively, we estimate annual agriculture and aquaculture production in the region to be worth **$16.1 billion**.

At the same time, the Mekong Delta is heavily exposed to climate impacts such as erratic rainfall patterns, rising air and sea temperatures, drought, and saline intrusion. In the face of this changing climate, farmers whose livelihoods primarily depend on agriculture and aquaculture practices are most vulnerable. Although the report findings suggested that less than half of the production is relatively resilient to climate extremes including fish production, greenhouses and indoor production, and production in irrigated non-coastal zones during dry periods, the remaining of agriculture and aquaculture production remains vulnerable to climate risks, in which **$6.8 billion** worth of production is suitable for parametric insurance. Coupling with low insurance rates, this climate-exposed production segment provides an ideal opportunity for parametric insurance expansion and gaining government support.

Parametric insurance can play a crucial role in climate risk mitigation, providing a safety net for farmers in the delta. Unlike traditional insurance, which assesses actual losses after a weather or climate event occurs, parametric insurance pays out based on predefined triggers linked to specific weather parameters. This approach is suitable for addressing risks associated with increasingly unpredictable weather and climate patterns.

Therefore, we conducted this research to better understand specific local conditions and producer needs and requirements while, identifying gaps in the understanding and application of agriculture insurance in general, and parametric insurance in particular. This Market Report offers a comprehensive analysis of agriculture and aquaculture production in the Mekong Delta. It categorises the agriculture and aquaculture sectors into priority commodities, their related risk periods, and critical provinces most susceptible to climate risks. The report also delves into the willingness and capability of farmers to purchase parametric insurance based on the climate risks they face.

After assessing factors such as willingness to pay among producers, existing policy support, commodity climate vulnerability, and the level of impact of weather risks on profitability, our key findings identify rice, mango, durian, and shrimp as priority commodities. Relevant weather risks and risk periods for these commodities are summarised in Table 1 below.

Table 1: Recommendation for parametric insurance by priority crop and model provinces

Commodity	Example Province	Weather Risk	Risk Period
Rice	An Giang (irrigated zone)	High rainfall	July – August
Rice	Kien Giang (coastal zone)	High rainfall & strong wind	October – November
Mango	Dong Thap	High temperature	December – January, April
		High rainfall	June, August – October
Durian	Vinh Long	High rainfall	March - May
Shrimp	Soc Trang	High rainfall & low temperature	September – January
		High rainfall & low temperature	April-June

The Report found that parametric insurance in the rice and fruits sectors should focus on new-type cooperatives, large-scale farming companies, and agricultural trading companies to enhance scalability due to their consolidated production areas and great resource access. Whereas in aquaculture, the insurance should be directed towards large-scale companies, particularly those involved in intensive, outdoor farming. These operations often lack advanced technology, making them ideal candidates for parametric insurance to mitigate climate and financial risks.

To effectively design a suitable channel for parametric insurance purchase, a tailored approach should be applied to farmers, specify the provinces and commodities. Most farmers own a smartphone, coupling with relatively high bank account ownership rate. Rice farmers in An Giang and mango farmers in Dong Thap, who exhibit higher rates of mobile banking ownership, parametric insurance purchase can be done online. On the other hand, farmers who does not own a bank account or mobile banking account would prefer different approach either through more financial literacy training or a more direct approach of purchasing insurance.

Assessing the inclination of farmers to purchase parametric insurance reveals that a significant proportion across surveyed provinces has previous experience with insurance, predominantly health and social coverage. Rice and shrimp farmers, along with select fruit growers, have some familiarity with agri-insurance stemming from

the discontinued National Insurance Program of 2011. However, based on farmer interviews, most who have heard of agri-insurance are more familiar with indemnity-based rather than parametric insurance. This necessitates extensive educational campaigns to disseminate knowledge on the advantages of parametric insurance and eliminate scepticism among producers toward the concept of insurance in general.

Most farmers prefer full coverage against losses, with premium rates varying across commodities from 2-10%. Rice farmers in irrigated zones like An Giang are willing to make the highest financial commitment, allocating 10% of their income toward parametric insurance. Conversely, pomelo and dragon fruit farmers perceive minimal need for this product, as yield and revenue fluctuations have low impacts on their profitability. Overall, there is a demand for parametric insurance products indicating a market gap for product development here.

3. OVERVIEW OF THE MEKONG DELTA AGRICULTURE AND AQUACULTURE SECTORS

3.1. Characteristics of the Mekong Delta

The Mekong Delta region in southwestern Vietnam is home to over 20 million people and is crucial to the country's agricultural and aquaculture production. Specifically, the region inherits favourable natural conditions with the alluvial soil compatible with wet rice cultivation. The climate is hot all year round with abundant rainfall, and the Mekong River brings great diversity of aquatic products. Mangrove forests also play an important role in enhancing aquaculture development.

The region has received increased attention and investments from both the public and private sector in expanding agricultural infrastructure, enhancing value chains, and increasing producers' climate resilience. The region is the agricultural and aquacultural production hub, with improved livelihoods. The Resolution 120/NQ-CP (Thu Vien Phap Luat, 2020) on the sustainable development of the Mekong Delta emphasises the enhancement of agriculture and aquaculture output, putting the three categories in order of priority: fisheries, fruits, and rice.

A female farmer in the Mekong Delta harvesting rice. Photo @ Freepik

3.2. Overview of the production and consumption of regional products

Table 2: Agriculture and aquaculture landscape in the Mekong Delta

	Agriculture	Aquaculture
Total Efficiency (2021)	The Mekong Delta contributes to more than 50% of Vietnam's rice production (General Statistics Office, 2022) The Mekong Delta is also a major fruit producer nationally, contributing 36.5% of the country's fruit production (UNDP, 2022).	The region also contributes to 65% of aquaculture production, especially shrimp, which contributed to more than 80% of national production (General Statistics Office, 2022).
Total Production Value (2021)	Rice: ~US$5.7 billion Fruits and vegetables: ~$4.9 billion	~US$5.5 billion
Export Value (2021)	$3.3 billion (Tap chi Cong Thuong, n.d.) and $3.5 billion respectively in rice and fruit export value to main markets such as Korea, Japan, China, the EU, and the USA. High-export-value fruits produced in the region are dragon fruit, durian, and mangoes. The Mekong Delta contributes 90% of the national rice exports.	Shrimp has significantly improved the value of aquaculture products in the region, with seafood export value as a whole reaching $8.9 billion, in which $3.9 billion were dedicated to shrimp export alone (UNDP, 2022).
Climate Change Impact	Extreme weather including floods, heavy rains, and thunderstorms caused a yield reduction of 27.9% on crops and livestock. Particularly, higher wet season rainfall may reduce rice yields through inundation damage, localised flooding damaging farm infrastructure. Extreme weather events like these can reduce rice yield by 24,9%, aquatic products by almost 44%, and fruit trees at the highest of almost 50% (UNDP, 2022). Salinity intrusion is also prevalent in the region which affected about 2.1 million hectares of the Mekong Delta coastal areas during the dry season (from December to May) (Le et al., n.d.), caused a yield reduction of 41.5%. Additionally, droughts have been exacerbated by the changing climate, impacting a yield reduction of 35.8% (UNDP, 2022).	

4. METHODOLOGY FOR SELECTING PRIORITY COMMODITIES AND PROVINCES

4.1. Approach

In this Report, all data collection and analysis are tailored to individual provinces due to the diverse geographical and natural characteristics across the Mekong Delta region. Recognizing the distinct value chains of agriculture (for rice and fruits) and aquaculture, we have tailored different approaches accordingly. After delineating the value chains, the process involves identifying key stakeholders for deeper engagement and exploration of parametric insurance products, facilitating continuous product enhancement and adaptations.

Acknowledging that the demand for agricultural insurance, particularly weather-index insurance, is driven by both public-sector policies and private-sector initiatives, this Report endeavours to engage both groups to garner insights into the potential for parametric insurance.

4.2. Method of selecting research sites and survey samples

a. Research site

Instead of conducting research across all 13 provinces, given the varying levels of agricultural and aquaculture production, the Report opted for a focused approach by selecting specific provinces based on criteria such as production area concentration, crop efficiency, and commodity value, as detailed in Table 3.

b. Survey targets selection

We interviewed and surveyed producers, agriculture and aquaculture processors, and distributors, who are direct participants in their respective value chains. This approach provided on-the-ground data on current agricultural practices and landscapes, as well as insights into their understanding and willingness to purchase parametric insurance. We interviewed farmers with different farm sizes with the understanding that although the average farm size in the Mekong Delta, while higher than the national average, remains small-scale (less than 1 hectare). Additionally, the interview process prioritised cooperatives with existing linkages and partnerships with agricultural and aquaculture stakeholders to leverage their scalability and access to a broader pool of organised farmers. Finally, we engaged with representatives and experts from governmental agencies, research institutes, and industry associations for their insights from policy and academic perspectives.

4.3. Methods of collecting information and data

a. Secondary data through published information

High-level data analysis relied on published data from the Statistical Yearbook 2021 and Provincial Yearbooks of the Mekong Delta. These sources formed the basis for the primary commodities list. Additionally, existing reports from reputable multilateral and development organizations, as well as local and provincial reports, were useful to gain an overview of the agriculture landscape and detailed information such as commodity market prices.

b. Primary data

Given that producers, including farmers and cooperatives, are the most vulnerable to and directly affected by weather risks, they constituted the primary target for engagement and data collection. Surveys and in-depth interviews served as the most direct methods to obtain realistic insights for product design and project implementation.

4.4. Methods of processing and analysing information

a. Processing method

Primary data was collected with consent of the participants, totalling up to 92 farmer surveys and 34 in-depth interviews. Batch Processing method was applied due to the province-by-province in-field collection basis, which is suitable for a substantial amount of data.

b. Analytical methods for commodities and research sites selection

Focus commodities were selected based large overall market sizes with significant production concentrations within specific provinces (production values exceeding 100 million USD). The data provided in Table 2 below represent the most prominent commodities featured in each Provincial Yearbook. Note that instances of zero values may suggest that the planted area is not substantial rather than indicating a complete absence of cultivation.

Additionally, during the assessment of main crop priorities for developing weather index insurance, Fish and Vegetables were deprioritised due to several factors. Firstly, interviews with key stakeholders, including the Directorate of Fisheries and Sustainable Shrimp Alliance, indicate that extreme weather events have not had a significant impact on intensive Pangasius catfish production, while farmers already had effective risk management measures in place to mitigate weather variability in this sector.

Secondly, the complexity of vegetable production poses challenges for accurately assessing climate risks. Statistical data aggregate all vegetable types, making it difficult to identify specific varieties that may be vulnerable to weather-related disruptions. Furthermore, vegetable production primarily serves local consumption markets rather than export markets, and the scale of production remains relatively small.

4.5. Indicators for Commodities and Provinces Selection

Criteria for selecting commodities and provinces include large cultivation/production areas, crop efficiency (yield and yield per hectare), crop value (market price and export value), and total production value by crop.

Based on the methodology and the data in Table 3, this Report will focus on the following commodities and provinces:

- Rice in An Giang (irrigated zone) and Kien Giang (coastal zone)
- Fruit tree - Dragon fruit in Long An
- Fruit trees - Orange, Durian, and Pomelo in Vinh Long
- Fruit tree – Mango in Dong Thap
- Aquaculture products – Shrimp in Soc Trang

4.6. Selection of critical weather risks

Given the environmental challenges posed by climate change in Vietnam, the data collection process focuses on weather risks such as low-high rainfall, low-high temperature, and strong wind. Although saline intrusion is prevalent, due to the complexity of this phenomenon, encompassing low topography, a dense system of rivers and canals, drought, low flow rates in the Mekong River during the dry season, depleting water resources, sea level rise, and land subsidence (Nguyen, 2022), it warrants separate future research.

Table 3: Production value of each commodity by province in the Mekong Delta (US$ million)

Province	Rice	Vege-tables	Orange	Dragon fruit	Mango	Pomelo	Durian	Coconut	Longan	Sweet potato	Pine-apple	Shrimp	Fish	Total
Long An	663.2	90.9	<0.1	339.3	2.6	0	0	0	<0,1	<0.1	0	54.7	44.6	**1,195**
Tien Giang	197.2	632.0	5.3	292.1	61.7	0	0	1.3	13.6	1.6	58.4	99.0	160.0	**1,522**
Ben Tre	37.8	38.0	2.9	0	5.3	112.4	0	90.1	6.5	0.1	0	301.1	169.9	**764**
Tra Vinh	260.8	284.0	27.2	0	7.9	0	0	47.7	10.8	5.0	0	246.9	73.1	**963**
Vinh Long	185.7	346.5	539.0	0	76	167.3	239.8	9.1	57.8	63.7	0	<0.1	167.6	**1,853**
Dong Thap	783.8	182.2	68.9	0	159.3	0	0	0.4	32.9	27.9	0	6.0	722.6	**1,984**
An Giang	987.8	0.1	0.9	0.3	111.4	3.4	0	1.3	1.3	0.5	0.2	0.1	515.6	**1,623**
Kien Giang	1,097.9	83.6	0.3	0	11.3	0	0	0	0.1	14.0	30.0	357.0	93.6	**1,688**
Can Tho	347.1	83.6	2.6	0	16.5	6.9	0	0.6	6.9	0.1	0	<0.1	235.6	**700**
Hau Giang	289.3	106.2	18.1	0	11.6	0.0	0	1.0	3.2	0.1	0	0.13	72.1	**502**
Soc Trang	467.3	0	15.3	0	16.7	23.9	0	3.2	23.1	1.5	0	611.4	88.1	**1,251**
Bac Lieu	299.4	129.2	0.1	0	2.7	0	0	0	0.3	0.6	0.1	548.3	93.8	**1,075**
Ca Mau	104.2	23.5	0.3	0	2.2	0	0	2.7	<0.1	0.2	<0.1	727.1	128.4	**989**
Total	**5,722**	**2,000**	**681**	**632**	**485**	**314**	**240**	**157**	**157**	**115**	**89**	**2,952**	**2,565**	**16,108**

5. PRIORITY COMMODITIES AND THEIR CLIMATE RISKS

5.1. Rice

The Mekong Delta is currently the most productive agricultural production area in the country. In 2021, the Mekong Delta contributed more than half of total national production, around 55% of the total. The rice production of the region in most years is higher than the national average, attracting large investments but also bearing great risks due to climate change and extreme weather conditions. The region also accounts for 90% of the country's total rice exports (UNDP, 2022).

All 13 provinces in the Mekong Delta have rice as one of their main crops, with the four most significant provinces being Kien Giang, An Giang, Dong Thap, and Long An, in which the first three provinces have a yield greater than the national average.

Table 4: Rice production by provinces in the Mekong Delta

	Area (thous. ha)	Production (thous. ton)	Yield (ton/ha)	Est. Production Value (USD mil.)
Whole country	**7,238.9**	**43,852.6**	**6.1**	
Mekong Delta	**3,898.7**	**24,327.4**	**6.2**	**5,721.5**
Long An	511.3	2,925.6	5.7	663.2
Tien Giang	131.9	836.2	6.3	197.2
Ben Tre	36.6	166.6	4.6	37.8
Tra Vinh	209.0	1,148.9	5.5	260.8
Vinh Long	134.5	817.9	6.1	185.7
Dong Thap	504.4	3,339.8	6.6	783.8
An Giang	624.9	4,143.0	6.6	987.8
Kien Giang	715.7	4,516.6	6.3	1,097.9
Can Tho	222.4	1,414.2	6.4	347.1
Hau Giang	189.0	1,274.4	6.7	289.3
Soc Trang	327.9	2,058.7	6.3	467.3
Bac Lieu	191.0	1,226.5	6.4	299.4
Ca Mau	100.1	459.0	4.6	104.2

Source: General Statistics Office, 2022

One of the most severe climate risks facing rice farmers in the Mekong Delta is high rainfall. High rainfall in the first month can cause a need to replant crops, while if this happens during the flowering and harvesting stages, it could reduce rice yield. Additionally, at harvest, rice quality might be affected and worse, crops can be destroyed. The harvesting stage of the summer crop season often coincides with peak-intensity rainfall varying from 10 to 50 mm/day, leading to a significant reduction in the harvested yield owing to rice paddy collapse following heavy rainfall events (Nguyen & Phan, 2021). According to Kunimistu and Kudo (2015), heavy rainfall events that occur continuously during the flowering stage of rice can reduce the grain-filling process.

An Giang (Irrigated Zone)

Table 5: Crop calendar and related weather risks of Rice production in An Giang

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Weather risks					Rains										Rains									
2 Rice crops					summer-autumn													winter-spring						
3 Rice crops					summer-autumn						autumn-winter							winter-spring						
Crop cycle								*f*	*f/gf*	*gf/h*	*h*					*f/gf*	*gf/h*				*f*	*f/gf*	*gf/h*	*h*

f: flowering gf: grain-filling h: harvesting

For irrigated zones like An Giang, most rice farmers apply the 3-rice-crop model as indicated in the table above; only few areas apply the 2-rice-crop model, avoiding the autumn-winter crop as it coincides with the rainy season, while some households want to have some time in between the summer-autumn and winter-spring crop for better preparation of soil, thus improve rice production in the following season. The main weather risk they face is high rainfall, often peaks in May–July, which could affect the flowering and harvesting of rice (as rice falls) in the summer-autumn crop. Though rain can impact throughout the rice crop cycle, it is the most damaging at harvest as farmers would not have time to recover. Farmers also often bear the risks in this stage as they must rely on the traders' terms. Traders often decide on a fixed harvesting date, so there is no flexibility for them to harvest earlier or later at the optimal timing. If rainfall occurs during this period, their rice might be damaged just a few days before selling them. The Mekong Delta sometimes experiences long periods of rain of up to 10 days continuously, though it does not occur annually, but the impact can be harmful. This unusual pattern of rain was estimated to occur every three to four years (Dang et al., n.d.). Raining in October–November can affect the fall–winter crop flowering and harvesting period, specifically in the 2021 fall–winter crop season, in which farmers in the irrigated zone suffered a huge loss on their farms near harvest.

Table 6: Survey Results - Rice Profile in An Giang

Number of surveyed households	10
Average farm size	2.95 ha
Average market price	0.36 USD / kg
Climate risk	• High rainfall, in combination with strong wind and drastic difference in temperature during the fall-winter crop season could affect rice yield. • High rainfall from May-July in the summer-fall crop.
Growth stage	• High rainfall has been experienced most frequently from July–November 2023 during the flowering and harvesting period. Some exceptions also include seedling and tillering stages, but impact is seen most detrimental at harvest.
Average total production	18 tonnes
Average total yield loss (%)	12.5%
Additional cost (%) during the summer-autumn crop in the years affected by heavy rain	19%
Average revenue (USD)	6,626 USD
Total estimated impact on profit	31.5%

The survey shows that rice farmers face moderate risk as revenue loss could come up to more than 283 USD/ha due to weather impacts. High rainfall should be the focus as it could have detrimental impact across all stages, most critically at harvest. Surveyed farmers also stated that due to these weather events, they have experienced reductions in yield and increased costs to pay for additional inputs, both of which reduce their profit.

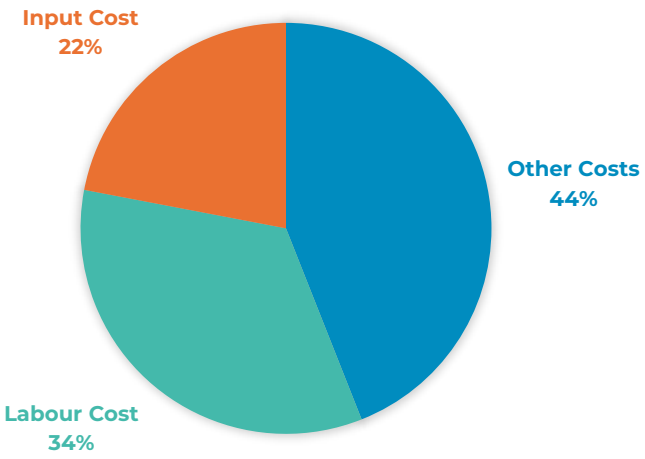


Figure 1: Cost Structure of Rice Production in An Giang

70% of surveyed farmers have savings to pay for the additional costs, specifically input costs to counter pests and diseases cause by heavy rain. To mitigate the weather risks**,** some farmers intercrop rice with fish, mostly for water regulation and their own consumption. However, there is currently no financial mechanism to protect farmers against this risks and limited access to agriculture insurance.

Kien Giang (Coastal Zone)

Table 7: Crop calendar and related weather risks of Rice production in Kien Giang

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Weather risks	High Temp				Rains										Rains and high wind									
2 Rice crops				summer-fall											winter - spring									
Crop cycle									*h*	*h*														
3 Rice crops				summer-fall							fall - winter						winter-spring							
Crop cycle									*h*	*h*						*f*								
1 Rice crop, 1 Shrimp	Shrimp											seasonal Rice crop										Shrimp		
Crop cycle	*j*	*j*													*f*	*f*	*f*							

j: juvenile shrimp f: flowering h: harvesting

In coastal zones of the Mekong Delta, there can be a variety of crop models, notably the "1 shrimp, 1 rice" model. Farmers usually stock shrimp three to five times from January to early August, and plant rice from August to January. This model is affected by rain and high wind in October-November, which could affect the flowering period,

thus preventing ripening for harvest. On the other hand, shrimp can be sensitive to the high temperature in March, specifically when juvenile shrimp overpopulate the pond around 45 days after the first shrimp stock. High temperature could raise the pH level, which causes shrimp to grow slower and become susceptible to diseases and may cause mass shrimp loss. In both 2-crop- and 3-crop-Rice models, high rainfall in June–July could affect the harvesting period of the summer-fall crop and flowering period of the fall-winter crop.

Table 8: Survey Results - Rice Profile in Kien Giang

	Rice	Shrimp
Number of surveyed households	11	5
Average farm size	2.1 ha	1.8 ha
Average market price	0.39 USD / kg	5.93 USD / kg
Climate risk	• High rainfall from May–July could affect summer–fall Rice, experienced in June, July, and August 2023. • High rainfall, in combination with strong wind, in August–November during the fall–winter Rice crop, experienced in October and November 2020, could affect Rice productivity.	High temperatures from February to June, peaking in March and April, could affect shrimp health, pests and disease, thus reducing shrimp yield.
Growth stage	High rainfall from June to July could impact harvesting while in August, it could affect seedling, in September/ October flowering, and November harvesting.	High temperature is detrimental ir small shrimp to juvenile shrimp stage (30–45 days).
Average total production	12.8 tonnes	5.26 tonnes
Average total yield loss	26.4%	3.8%
Additional cost	26%	16%
Average revenue	5,038 USD	30,192 USD
Total estimated impact on profit	52.4%	19.8%

Based on survey results, rice can be seen as a moderate-risk crop, facing high rainfall as the most critical factor affecting rice across most stages, focusing on the summer–fall and fall-winter crop. It could cause around 1.5 tons in yield reduction, subsequently in farmers' revenue. The summer–fall crop rain is most critical during harvesting, while it can affect the fall–winter crop across all stages, from seedling, to flowering, to harvesting. Some households choose to abandon the fall–winter Rice crop to prevent these risks. In the "1 Rice crop, 1 Shrimp" rotational crop model, the small-to-juvenile shrimp are at risk due to high temperature.

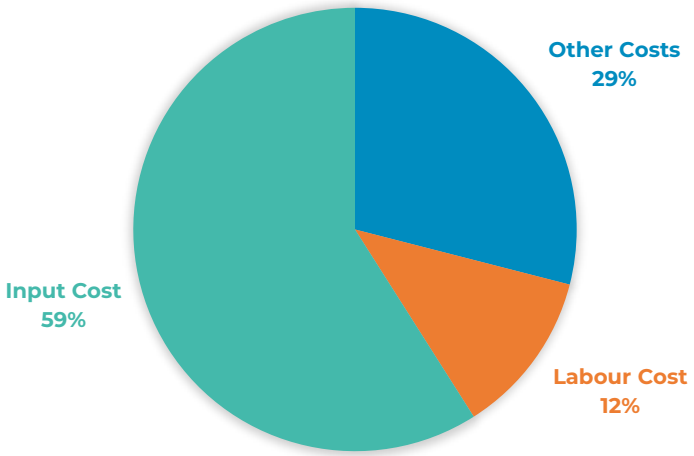


Figure 2: Cost Structure of Rice Production in Kien Giang

Facing these weather risks, around 36% of farmers have intercropped to utilise suitable weather conditions, the remainder face increasing costs due to increased plant care methods and input to relieve pests and diseases, technology application, water drainage, etc. Input cost is the highest cost at 59%.

Alternative wetting and drying (AWD) implementation and its relevance for parametric insurance

Alternate wetting and drying (AWD) is a management practice in irrigated lowland rice that saves water and reduces greenhouse gas (GHG) emissions while maintaining yields. The practice of AWD is defined by the periodic drying and reflooding of the rice field. At present, AWD is widely accepted as the most promising practice for reducing GHG emissions from irrigated rice for its large methane reductions and multiple benefits. In a study of AWD application conducted in An Giang, the results showed the impact of AWD on profit varied depending on the season. The impact of AWD on profit was significant and positive for the early wet season and throughout the year but was not significant for the dry and late wet seasons. AWD farmers may obtain higher profits than non-AWD farmers due to water from precipitation, which may

reduce severe water stress and alleviate some of the adoption constraints (Leon & Izumi, 2021).

During GHG reduction projects implementation, weather could have a critical impact toward rice farmers. Recognizing that continuous flooding from heavy rain over a long period of time could increase levels of methane emissions from rice during dry periods and will generate penalties/reduced carbon revenue for farmers through no fault of their own, parametric excess rainfall insurance can provide a hedge against this outcome.

The International Rice Research Institute (IRRI) has implemented AWD pilots in Hau Giang, An Giang, Can Tho, and Bac Lieu since 2011, with longstanding connections with An Giang. The farmers and cooperatives in these provinces can be the potential customers in developing the insurance policies for rice.

5.2. Mango

Forty-three percent of mango production area nationally is located in the Mekong Delta and contributes 60% to the total national crop. It is a high-value commodity, specifically for exporting to the EU, China, Japan, and Korea. An Giang and Dong Thap are the top two contributors in the region, specifically Dong Thap with the highest production value at US$159 million. The majority of mango farms are in Cao Lanh, Dong Thap, in which 90% of the mango varieties planted is Cat Chu, followed by Hoa Loc and green-skinned mangoes.

Table 9: Mango production by provinces in the Mekong Delta

	Area (thous. ha)	Production (thous. tonnes)	Yield (t/ha)	Est. Production Value (US$m)
Whole country	**113.9**	**999.6**	**8.8**	
Mekong Delta	**49.1**	**596.8**	**12.1**	**485.3**
Long An	0.5	4.2	7.7	2.6
Tien Giang	3.3	65.8	19.9	61.7
Ben Tre	0.8	8.5	11.4	5.3
Tra Vinh	1.5	12.7	8.3	7.9
Vinh Long	4.9	81.1	16.6	76.0
Dong Thap	13.9	169.9	12.2	159.3
An Giang	12.4	178.3	14.4	111.4
Kien Giang	2.4	13.6	5.7	11.3
Can Tho	3.1	15.8	5.1	16.5
Hau Giang	3.2	12.3	3.9	11.6

Soc Trang	1.8	26.8	15.2	16.7
Bac Lieu	0.6	4.3	7.0	2.7
Ca Mau	0.8	3.5	4.4	2.2

Source: General Statistics Office, 2022

We conducted interviews with the head of cooperatives in notable mango co-operatives in Cao Lanh to explore the main and most crucial weather risks that mango farmers face in this region.

Table 10: Crop calendar and related weather risks of Mango production in Dong Thap

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Weather risks	High temp																				High temp			
							Rains				Rains													
Mango	1st crop								2nd crop								3rd crop							
Crop cycle			*f*	*f*	*f*	*fb*	*fb*	*fb*			*f*	*f*	*f*	*fb*	*fb*	*fb*			*f*	*f*	*f*	*fb*	*fb*	*fb*

f: flowering fb: fruit-bearing

The farmers we interviewed estimated that the weather dictates 60–70% of fluctuations in mango yields. Mango is a perennial crop which is planted once and can be harvested for many years to come. Flowering usually happens in two to three intervals annually, though this is not definite as mangoes grow on a rolling basis. The second flowering starts from July to October, which is the off-season as heavy rain (August–October) can affect the flowering and fruit-bearing of the trees, which are the most crucial periods for mangoes. High rainfall levels could also flush away all the chemicals and fertilisers at root, which affect mango trees' growth. The longest period of consecutive rain is seven days.

Additionally, high temperatures from January to April can affect the volume and quality of fruits. In the season with enabling weather conditions, one cluster of flowers could produce five to seven fruits, but sudden rain or in the wet season, the rate of a cluster of flowers producing fruit is reduced significantly to 20–30%. The highest temperature that the commune has experienced is 37–38 degrees; it affects the stamen, which dries off the flowering and, in turn, produces less fruit. Many farmers have switched to growing mangoes in the off-season when supply is low to benefit from the high market price, but the yield is insignificant.

Table 11: Survey Results - Mango Profile in Dong Thap

Number of surveyed households	10
Average farm size	1.2 ha
Average market price	0.56 USD / kg
Climate risk	High rainfall during the wet season, specifically from August to September, affecting yield and increased cost in this period of 2023.
Growth stage	High rainfall in this period could coincide with the flowering stage which slows down fruit-bearing rate.
Average total production	12.1 tonnes
Average total yield loss	33.7%
Additional cost	42.5%
Average revenue	6,635 USD
Total estimated impact on profit	76.2%

The result of farmers' survey shows that high rainfall is the most critical toward mango farmers, as it could reduce around 3 tonnes/ha in yield and around 1130 USD/ha in additional costs to make up for the loss, mostly dedicated to plant care and fertilisers. These costs make up more than half of the total cost. High rainfall increased costs and affected productivity in mango farms of all surveyed households.

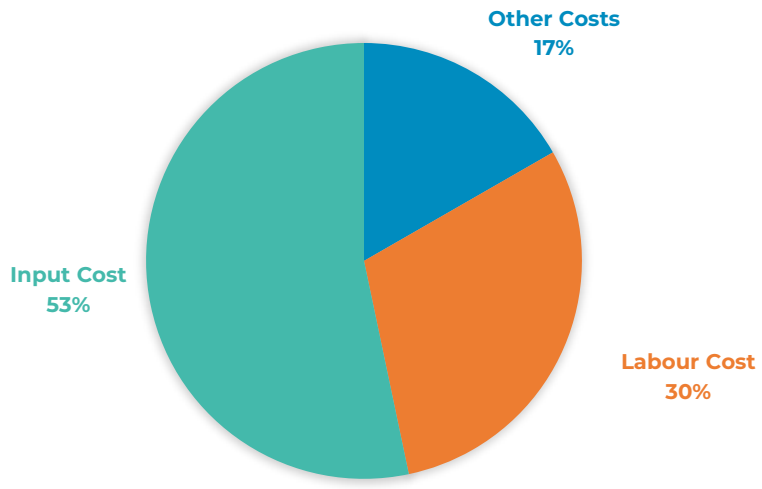


Figure 3: Cost Structure of Mango Production in Dong Thap

Mango farmers employ a multifaceted approach to risk management, in which 30% each of surveyed farmers dedicate their strategy toward cost-saving measures, integrate intercropping with fish, and reduce farming areas. In order to save labour costs, some mango farmers usually fertigate their whole farming area, despite it not being the best farming practice for this crop. This shows the limitations in financial tools to protect mango farmers from climate risks.

5.3. Dragon fruit

In 2021, 33% of dragon fruit production area is located in the Mekong Delta and contributes around 43% to the total national yield. It is a high-value commodity, specifically for exporting to the EU, USA, China, and countries in the Association of Southeast Asian Nations (ASEAN). Long An is the main contributor in the region, concentrated in Chau Thanh, Tan Tru, and Tan An Districts.

Table 12: Dragon fruit production by provinces in the Mekong Delta

	Area (thous. ha)	Production (thous. tonnes)	Yield (t/ha)	Est. Production Value (US$m)
Whole country	**64.0**	**1400.0**	**21.9**	
Mekong Delta	**21.4**	**606.7**	**28.3**	**631.8**
Long An	11.7	325.7	27.9	339.3
Tien Giang	9.7	280.5	28.8	292.2
An Giang	<0.1	0.5	16.1	0.3

Source: General Statistics Office, 2022

Dragon fruit farmers usually face weather risk, with the average impact level on profit being 27.9% (Khuu et al., 2022). Based on the latest report of the Department of Cultivation, Plant Protection and Quality Management of Agricultural Products Long An, the effects of storms and floods often occur from July to November every year, causing dragon fruit gardens to be flooded due to the lack of a drainage canal system that requires pumping.

Table 13: Crop calendar and related weather risks of dragon fruit production in Long An

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Weather risks	High temp																		High temp					
									Rains															
Dragon fruit	off-season				in-season														off-season					
Crop cycle		*f*				*f*			*f*			*f*			*f*					*f*			*f*	

f: flowering

The dragon fruit crop typically thrives from May through November, marking the on-season, while the off-season spans from December to April. However, dragon fruit's fruiting is ongoing, with flowering lasting approximately 20 days and the entire fruiting cycle spanning around 55 days.

High temperatures, particularly in April, can also disrupt pollination and flowering in dragon fruit. Despite these challenges, dragon fruit cultivation remains relatively resilient, with its year-round growth cycle mitigating the impact of weather fluctuations. Consequently, the associated costs do not accumulate to the extent of causing significant losses for farmers (25% of the total revenue), and the cost is even lower if dragon fruit is in season.

Table 14: Survey Results - Dragon fruit Profile in Long An

Number of surveyed households	10
Average farm size	0.67 ha
Average market price	0.64 USD / kg
Climate risk	High temperature in combination with low rainfall from March to May, peak in April, could affect dragon fruit yield.
Growth stage	Dragon fruit farming households have experienced high temperatures and dry weather around April - May in 2020, affecting flowering and pollination stages.
Average total production	23.83 tonnes
Average total yield loss	3.7%
Additional cost	3.3%
Average revenue	15,394 USD
Total estimated impact on profit	7%

Due to excessive heat in 2020 observed by the majority of surveyed farmers, all households were affected, though not significantly. They experienced an increase in cost and decrease in productivity. A big portion of cost is attributed to chemical and infrastructure (stated as other costs), followed by input and labour costs.

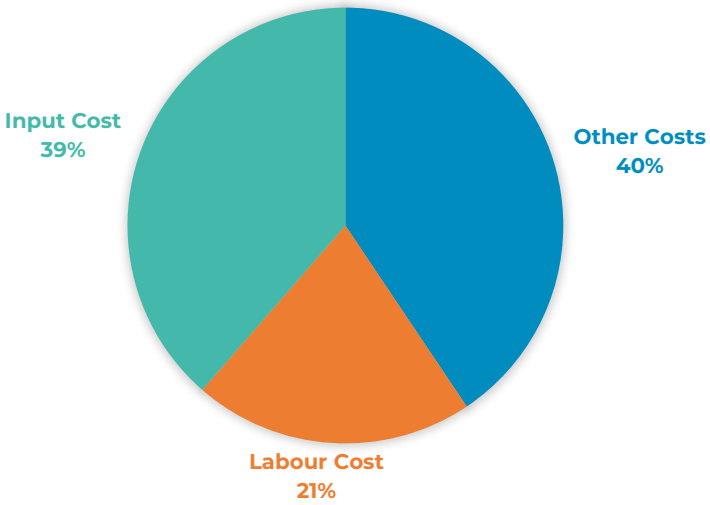


Figure 4: Cost Structure of Dragonfruit Production in Long An

Significantly high rainfall can be a challenge for dragon fruit cultivation, causing flooding at root which could lead to lower rate of fruit-bearing, elevating the risk of pests and diseases, and reducing fruit quality. Farmers have already implemented a practice that can salvage up to 90% of the yield, which is to install a lighting system, tackling the lack of sunlight for even fruit-bearing. Additionally, dragon fruit is a weather-resilient crop that could grow year-round; therefore, the added costs and revenue loss were not significant. Weather is not the critical factor for the farmers we interview, but rather, demand.

5.4. Pomelo

Vinh Long is the province with the largest pomelo-growing yield value in the Mekong Delta, with total planted area only coming second to Ben Tre in 2021. pomelo, like mango, is a perennial crop which can flower and bear fruit all year round and is a plant that is resistant to extreme weather conditions. Therefore, there is no off-season, but to save water, farmers can start pruning and planting the base at the beginning of the rainy season around May, as pomelo favours moisture.

Table 15: Pomelo production by provinces in the Mekong Delta

	Area (thous. ha)	Production (thous. tonnes)	Yield (t/ha)	Est. Production Value (US$m)
Whole country	**108.1**	**1,034.7**	**9.6**	
Mekong Delta	**21.3**	**233.5**	**11.0**	**313.8**
Ben Tre	9.4	89.9	9.6	112.4
Vinh Long	8.8	114.7	13.0	167.3
An Giang	0.5	3.2	6.6	3.4
Can Tho	0.8	6.6	8.1	6.9
Soc Trang	1.8	19.1	10.8	23.9

Source: General Statistics Office, 2022

Pomelo tree will produce fruit after one year. However, farmers need to continue to grow the tree; thus, they only start harvesting from the third year. Within a one-year cycle, six months after planting, pomelo tree will begin to flower, and six months later, pomelo can begin to be harvested. Currently, grapefruit prices are falling to only 3,000–4,000 VND/kg, so farmers are losing revenue because demand is currently low.

Table 16: Crop calendar and related weather risks of pomelo production in Vinh Long

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Weather risks	High temp																		High temp					
						Rains																		
Pomelo	annual crop																							
Crop cycle	*f*	*f*	*f*	*f*									*h*	*h*										

f: flowering *h: harvesting*

As pomelo can be produced year-round, during the dry season from November–May, pomelo might be affected by high temperature during March and April if it falls into the flowering period; it might in turn slow down the pace of fruit-bearing to be harvested. However, farmers can irrigate more often during the dry season and drain out water when it rains too heavily.

Table 17: Survey Result - Pomelo Profile in Vinh Long

Number of surveyed households	10
Average farm size	3 ha
Average market price	0.24 USD / kg
Climate risk	High temperatures in March - May could affect pomelo yield, coinciding with the dry season.
Growth stage	High temperatures were significant in March - May 2023, affecting the flowering stages.
Average total production	64.1 tonnes
Average total yield loss	6.1%
Additional cost	4.1%
Average revenue	15,137 USD
Total estimated impact on profit	10.2%

Based on the survey results, due to high temperature in the dry season from March–May, all of the households face some level of increase in costs at around 210 USD/ha and yield reduction of around 0.5 tonnes/ha. More than half of the total costs are dedicated to input costs, including fertilisers and microbial as the chart indicated below. All surveyed farmers applied water retention to save water for irrigation in the dry season as their main risk management method.

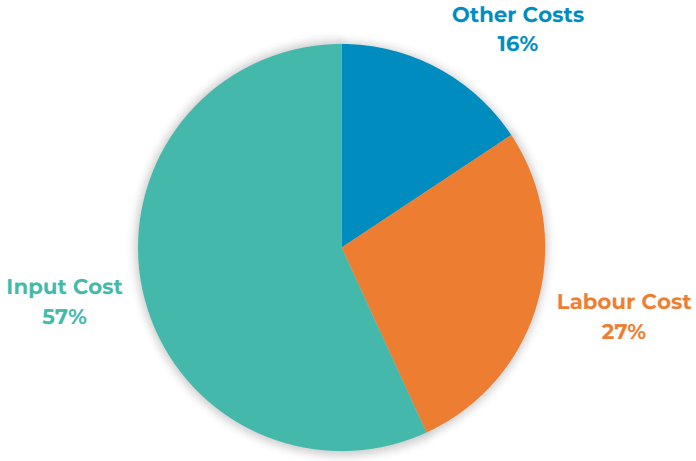


Figure 5: Cost Structure of Pomelo Production in Vinh Long

5.5. Durian

Vinh Long, renowned as the durian capital of the Mekong Delta, boasts a vast production area spanning 3.5 thousand hectares, a significant contributor to approximately 4.5% of the national yield. The province primarily exports its durian produce to key markets including China, the USA, and various countries within the ASEAN region. Vietnam's durian exports to China experienced exponential growth in 2023, reaching an export value of $2.3 billion, representing a tenfold increase compared to the export value recorded in 2021 (Vietnam Boosts Durian Exports to China, Competes with Thailand, Malaysia, n.d.).

Table 18: Durian production by provinces in the Mekong Delta

	Area (thous. ha)	Production (thous. ton)	Yield (t/ha)	Est. Yield Value (USD mil.)
Whole country	84.9	862.5	10.2	
Mekong Delta	**3.5**	**38.4**	**11.0**	**239.8**
Vinh Long	3.5	38.4	11.0	239.8

Source: General Statistics Office, 2022

Durian farmers typically start pruning and applying fertiliser at root in April, anticipating flowering to occur in May. Around 45 days after flowering begins, the pistil emerges for pollination. Subsequently, it takes another 45 days for the young fruit to develop, culminating in a total of 90 days from flowering to fruit maturation. Finally, after this period, the fruit is ready for harvest, completing the cycle approximately 45 days later.

Due to the influence of the dry season, durian trees will flower seasonally. If the plant is left to flower naturally, the season and speed of flowering, as well as productivity, will depend on the weather. Therefore, off-season durians require many techniques to control the concentrated flower growth and fruit-bearing by covering the base with nylon to prevent rainwater seeping in, spraying chemical, and pruning branches. For durian trees to flower at a high concentration rate, it is necessary to apply synchronous flower-inducing techniques, including cutting off the water in the ditch to dry, covering the surface with nylon and surrounding the base to avoid rain absorption at root.

When the flower blooms widely, it will produce an anther. If the anther falls during a storm, there will be no pollen grains to produce fruit, reducing productivity. Therefore, farmers often carry out self- and additional pollination at night, especially in the rainy season.

Table 19: Crop calendar and related weather risks of durian production in Vinh Long

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Weather risks	High temp																				High temp			
					Rains																			
Durian			off-season																					
Crop cycle					*f+p*	*f+p*																		
Durian	in-season																							
Crop cycle	*f+p*	*f+p*	*f+p*	*f+p*																				

f: flowering *p: additional pollination*

During the off-season, spanning from April to July, coinciding with the rainy season, durian cultivation faces heightened challenges. Conversely, the on-season, which could commence as early as February, strategically avoids the heavy rains prevalent during the flowering period. The period from June to August experiences particularly high rainfall, especially at night, posing significant obstacles to pollination, thus impeding fruiting. Extended periods of heavy rain, lasting two to three consecutive nights, could diminish yields by approximately 50%. In Vinh Long, the longest consecutive rainfall period typically lasts around seven days, exacerbating the risks associated with adverse weather conditions. Consequently, yields may decrease by as much as 2.5 times due to these weather-related challenges.

The off-season presents an opportunity for durian farmers to capitalize on higher prices, which can reach up to 120,000 VND/kg, compared to 50,000 VND/kg in-season durians. This price differential incentivises farmers to shift toward off-season production despite the associated increase in costs.

Table 20: Survey Results - Durian Profile in Vinh Long

Number of surveyed households	10
Average farm size	0.9 ha
Average market price	2.8 USD / kg
Climate risk	• Excessive rainfall affects 90% of the surveyed household, who produce durians in the off-season (rainy). Most rainfall concentrates from July–October, peaking in July and August last year (2023). • One household suffered from salinity intrusion

	from February–March during in-season durians.
Growth stage	Depending on farmers' base planting time, high rainfall can affect either flowering, fruit-bearing, or both stages.
Average total production	5.4 tonnes
Average total yield loss	72%
Additional cost	119%
Average revenue	13,492.5 USD
Total estimated impact on profit	191%

The survey results demonstrate the high-risk nature of durian, and that farmers face tremendous risks related to excessive rain during production. High rainfall could cause almost three-quarter of yield; thus, impact revenue and their export volume.

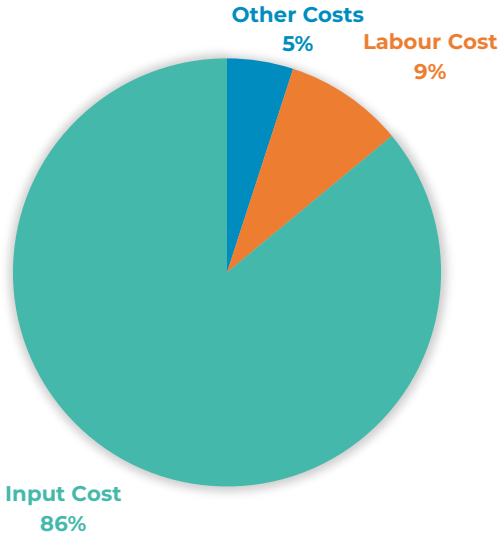


Figure 6: **Cost Structure of Durian Production in Vinh Long**

The highest costs for durian farmers to counter the weather risks in the off-season are additional inputs, including plant protection chemicals, alongside heightened labour requirements, compounded by the increased occurrence of pests and diseases.

To mitigate the impacts of weather risks, farmers employ various strategies, such as covering the roots to prevent flooding and spraying chemicals to reduce flower loss, thereby safeguarding their yield and maintaining production stability amidst unpredictable weather patterns. Forty percent of farmers also stated that they reduce farming areas to prevent losses.

5.6. Orange

Apart from durian, Vinh Long is also the "orange capital" of the Mekong Delta, which contributes to around 39% of the total orange production area in the region, and 36% of the national yield.

Table 21: Orange production by provinces in the Mekong Delta

	Area (thous. ha)	Production (thous. tonnes)	Yield (t/ha)	Est. Production Value (US$m)
Whole country	**111.8**	**1,784.7**	**16.0**	
Mekong Delta	**38.8**	**1,013.7**	**26.1**	**681.1**
Long An	<0.1	0.1	4.5	<0.1
Tien Giang	1.1	25.5	22.7	5.3
Ben Tre	1.6	14.0	9.0	2.9
Tra Vinh	4.0	81.6	20.2	27.2
Vinh Long	15.0	646.8	43.1	539.0
Dong Thap	4.5	94.6	21.2	68.9
An Giang	0.3	4.4	15.4	0.9
Kien Giang	0.2	1.5	10.0	0.3
Can Tho	1.2	10.5	8.8	2.6
Hau Giang	7.7	87.0	11.3	18.1
Soc Trang	2.8	45.8	16.3	15.3
Bac Lieu	<0.1	0.4	8.6	0.1
Ca Mau	0.4	1.6	4.1	0.3

Source: General Statistics Office, 2022

Farmers are transitioning to off-season orange production, enticed by the higher market prices it offers. The off-season for oranges spans from January to June, with fruiting typically commencing around April to May, culminating in harvesting in June. In contrast, the in-season production for oranges occurs from March to August or September.

One critical factor affecting orange production, particularly during the transition from winter to spring, is seasonal rainfall in early March. This precipitation can lead to significant fluctuations in day and night temperatures, inducing a temperature shock for orange trees during the flowering stage, consequently impeding fruiting during the off-season. Additionally, rainfall during May and June can also adversely impact flowering and fruit-bearing in oranges. However, the effects are often more pronounced during the off-season, particularly when coupled with high temperatures.

Table 22: Crop calendar and related weather risks of orange production in Vinh Long

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Weather risks	High temp																		High temp					
	Seasonal				Rains																			
Orange	off-season																				off-season			
Crop cycle	*f*	*f*	*fb*	*fb*	*fb*	*fb*																		
Orange	in-season																							
Crop cycle					*f*	*f*	*fb*	*fb*	*fb*	*fb*														

f: flowering fb: fruit-bearing

Revenue from orange production is potentially dropping by 50% due to excessively high temperatures, resulting in discoloration of the oranges. These adverse weather conditions have led to losses for farmers in both the last and current harvest seasons, compounded by a decline in market prices and the burden of maintaining high input costs. To mitigate the risks posed by adverse weather, farmers have resorted to covering oranges with fruit nets, despite the associated high costs.

Regarding the willingness of farmers to purchase weather-index insurance, they have yet to prioritize investment in such risk management measures. This is because the orange market is primarily geared toward local consumption, with less emphasis on high export value, reducing the urgency for farmers to invest in agricultural insurance or other risk mitigation strategies.

Table 23: Survey Results - Orange Profile in Vinh Long

Number of surveyed households	10
Average farm size	1.73 ha
Average market price	0.23 USD / kg
Climate risk	• High temperature in the dry season from December/January to March. • High rainfall in the rainy season from July–October, peak in August.
Growth stage	• High temperature and high rainfall could affect flowering and fruit-bearing in both seasons. • Farmers have experienced big losses in two periods: January–March 2023 and August–September 2023.

Average total production	100.7 tonnes
Average total yield loss	39.9%
Additional cost	44.5%
Average revenue	27,868 USD
Total estimated impact on profit	84.4%

The survey results indicate that oranges are a moderate-risk crop; its productivity could be impacted by excessive heat or rain. As oranges prefer moisture, in-season rain could be beneficial to the crop, and high temperature could result in more detrimental impact in the off-season.

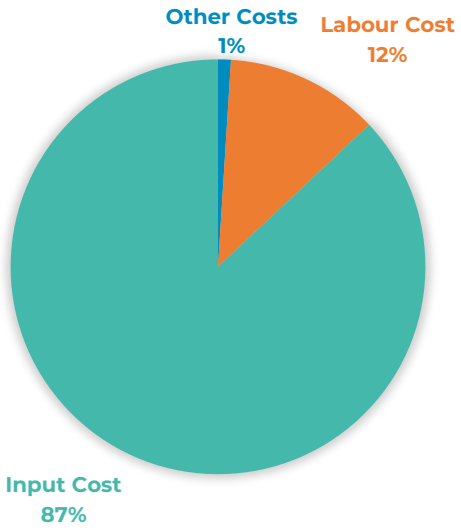


Figure 7: Cost Structure of Orange Production in Vinh Long

The survey results also show that orange farmers who produce in the dry season (or off-season) encountered the highest additional costs (67–75%). All of the surveyed households impacted by weather risks had additional costs to make up for the yield loss, in which 20% of the farmers saw quality reduction in their products. The costs are mainly dedicated to inputs including plant protection drugs, fertilisers, etc. To save costs, most orange farmers try to save water for irrigation in the dry season.

5.7. Shrimp

Shrimp farming in the Mekong Delta takes up 91% of the total area across the whole country, making it the "shrimp capital" of Vietnam. There are four prominent provinces with the highest concentration of shrimp farming, including Ca Mau, Bac Lieu, Soc Trang, and Kien Giang. Although shrimp is a high-value product, with an average selling price reaching $7468.8/tonne, it remains with a low average yield of 1.45 tonnes/ha. Shrimp is a sensitive species; it is prone to pest and disease and could be affected under various unfavourable conditions such as poor pond water quality, cross-contamination, low oxygen levels, and weather risks. Though other non-pest and disease factors are the major causes of shrimp death, currently there is limited research pinpointing the deciding factor that cause shrimp mortality. This makes it complicated to identify if weather can directly impact shrimp health.

Table 24: Shrimp production by provinces in the Mekong Delta

	Area (thous. ha)	Production (thous. tonnes)	Yield (t/ha)	Est. Production Value (US$m)
Whole country	**752.9**	**992.6**	**1.3**	
Mekong Delta	**688.7**	**836.3**	**1.21**	**2,951.9**
Long An	6.5	15.9	2.46	54.7
Tien Giang	7.9	28.8	3.65	99.0
Ben Tre	37.8	87.1	2.30	301.1
Tra Vinh	33,1	71.0	2.14	246.9
Vinh Long	<0.1	<0.1	1.30	<0.1
Dong Thap	1.2	1.8	1.46	6.0
An Giang	0.1	<0.1	0.15	<0.1
Kien Giang	144.2	103.8	0.72	357.0
Can Tho	<0.1	<0.1	1.00	<0.1
Hau Giang	<0.1	<0.1	0.40	0.1
Soc Trang	53	167.7	3.16	611.5
Bac Lieu	133.6	154.8	1.16	548.3
Ca Mau	271.1	205.3	0.76	727.1

Source: General Statistics Office, 2022

Farmers in the Mekong Delta suffer from shrimp disease losses annually, and this supports the widely held view that shrimp farming is a high-risk-high-return enterprise. Shrimps are vulnerable to various risks including but not limited to water source, disease, seed and weather risk. On average, the impact of weather risk reduces the profit by 18.33%, disease risks reduce the profit by 21.99%, and seed risks decrease

10.98% of the profit (Khuu et al., 2022). On hot days in April and May, the maximum temperature of the air usually exceeds 34°C, which is greater than the optimum temperature range for many shrimp species (Khuu et al., 2022). Extremely high temperatures would cause, both directly and indirectly, negative effects on shrimp as well as the pond-water environment and hence on the growth and survival of shrimp.

Based on a study in 2022 of farmers in Bac Lieu and Ca Mau (Le et al., 2022), 42% of intensive shrimp farming households experienced irregular weather, and 39% experienced drought. The farmers perceived the extreme negative impact that irregular weather brought on their cost, including shrimp seeds, microbial, and feed, as increasing more than 50%, while drought impact is perceived as less extreme.

Weather impact will vary depending on the type of shrimp farming. Extensive shrimp farming, which fully relies on natural inputs though can be impacted by changing weather conditions, is not our target due to its lower yield per ha, as lower shrimp density will mitigate shrimp mortality rate. Additionally, intensive, indoor, and high-tech shrimp farming methods are less affected by weather risks as various measures are in place to mitigate risks and create the optimal environment for shrimp. This leaves intensive outdoor shrimp farming the most vulnerable to varying weather, as it directly affects yield and producers' profitability.

Table 25: Crop calendar and related weather risks of shrimp production in Soc Trang

Month	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2	1	2	1	2	1
Weather risks				High temp															Low temp						
							Rains							Rains											
Shrimp	in-season													off-season										
Growth stage														*s*	*s*								*s*	*s*

s: seedling

After several interviews with actors in the shrimp value chain, including farmers, high rainfall is determined to be the most damaging weather risk to shrimp, while high temperatures are less so due to drought mitigation methods like improving irrigation systems and water management technology. Shrimp are often raised in two seasons. The first season starts from February to the end of August or the beginning of September, and the second season starts from September to January. Though the main shrimp harvest comes from the first one, off-season shrimp farming in the rainy period is riskier but because of low supply, many farmers want to partake due to high

market price. Peak rainfall often occurs in this season, which is riskier due to high rainfall; though it doesn't necessarily cause shrimp deaths, it could weaken the shrimp, especially in the early seedling stage (30 days). The longest consecutive days of rain in Soc Trang were 24 and 26 in September and October last year.

Additionally, the difference in temperature between day and night from January to February could reach 10 degrees and cause the red-bodied disease in shrimp, which reduces shrimp quality and its yield. The seedling period of the two seasons falls into the period of high rainfall and lower temperature at night. High temperature, on the other hand, is not detrimental to shrimp yield as shrimp can survive even up to 35 degrees. The optimal temperature for shrimp is from 28–32 degrees, but from 32 degrees onward, they start to consume more feed, which produces more waste that pollutes the water; this, therefore, raises the costs for shrimp farmers.

White-leg shrimp is the prominent breed grown in the Mekong Delta and faces high risks and is therefore a suitable commodity to focus on in the aquaculture sector. Ca Mau, Soc Trang, and Bac Lieu are projected to suffer from bigger losses in aquaculture. In these provinces, shrimp farming areas will be greatly reduced under a projected 100 cm rise in sea levels (JICA 2013).

This is an opportunity to develop a short-period (30 days) high rainfall insurance policy for white-leg shrimps in the off-season, alongside temperature difference insurance in the good season.

Table 26: Survey Results - Shrimp Profile in Soc Trang

	White-leg Shrimp	Tiger Shrimp
Number of surveyed households	19 households	6 households
Average farm size	0.7ha	0.5ha
Average market price	3.54 USD / kg	3.55 USD / kg
Climate risk	100% of households face high rainfall in the rainy season, most critically from July–September, affecting shrimp survival rate and slowing down its feed consumption. Around 30% of the households also stated that strong wind, in combination with high rainfall, could affect shrimp yield. Most households felt the impact of high rainfall in July–August 2023.	
Growth stage	Excessive rain affects more than 80% of the households when the shrimp is small (30 days).	Excessive rain affects small-to-juvenile tiger Shrimps (30–45 days). Strong wind in the dry

		season (October–December) can affect tiger Shrimps' quality across its life cycle.
Average total production	6.16 tonnes	0.64 tonnes
Average total yield loss	76%	70.3%
Additional cost	51.3%	57.5%
Average revenue	24,245 USD	2,528 USD
Total estimated impact on profit	127.3%	127.8%

The survey results confirm that shrimp is a high-risk commodity and can easily be affected by external factors, including weather extremes like excessive rain and heat, causing significant amounts of yield loss, and in turn, shrimp farmers' revenue. All surveyed farmers suffered a reduction in productivity, with the majority of farmers facing increasing costs, and almost 60% of shrimp quality was affected.

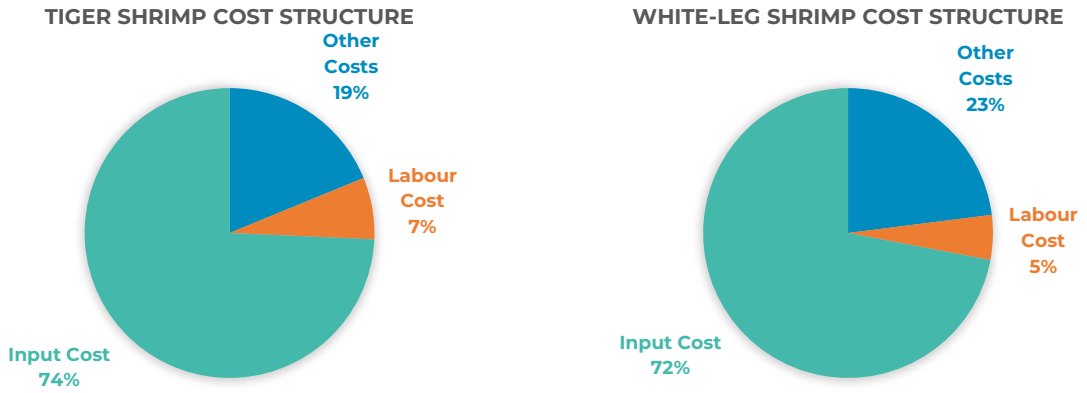


***Figure* 8&9: Cost Structure of Tiger Shrimp and Whiteleg Shrimp Production in Soc Trang**

The highest costs for shrimp farmers are input costs, including shrimp seed, microbial, feed, etc., followed by other operational costs, and labour costs. When shrimp yield or their health are affected, farmers will need to purchase more inputs and feed to improve shrimp quality or make up for shrimp loss by buying new seeds.

6. KEY AGRICULTURAL PLAYERS BY COMMODITY

Source: World Bank & Korea Green Growth Trust Fund, 2022

6.1. Rice and horticulture value chain structure

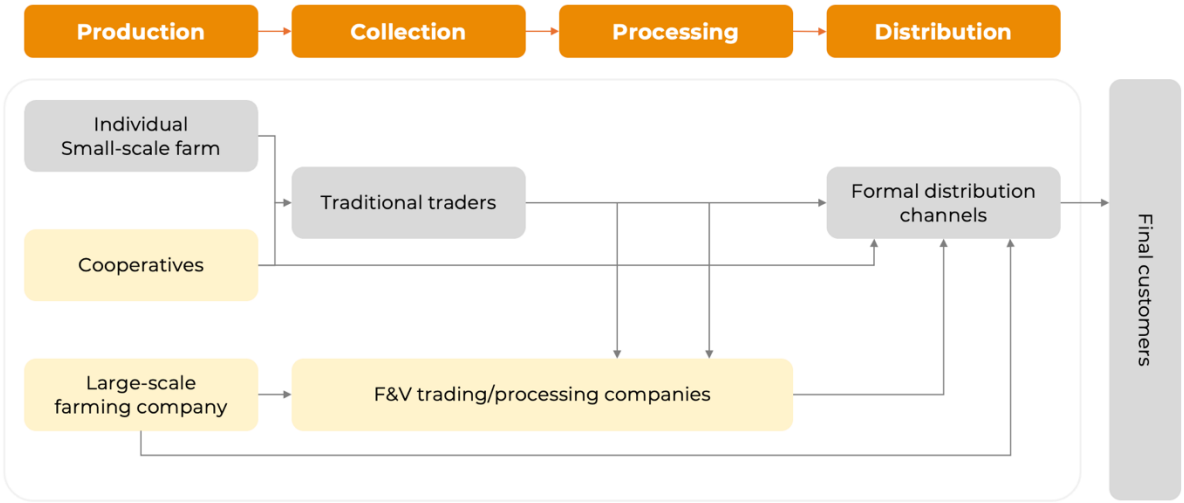


Figure 10: Value chain mapping for Rice and Fruits

6.2. Rice and horticulture stakeholder mapping

Table 27: List of key stakeholders within Rice and Fruits Value Chains

Players	Description	Likelihood of insurance purchase*
Producers		
Individual small-scale farmers and farmers under old-type cooperatives	Agricultural production in Vietnam is decentralized and depends on small-scale households. Small-scale households account for most of the total agricultural outputs produced. Although large-scale production areas are gradually established, they still rely on small-scale and scattered households that face difficulties in applying modern technologies. Individual small-scale farmers may produce and then sell products: o Directly to informal distribution channels such as traditional community markets; or	Low

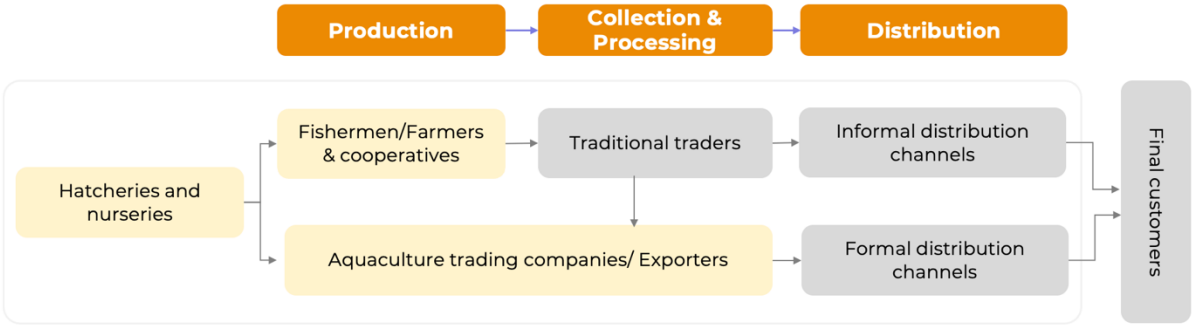
	○ Indirectly to final distribution channels via traders.	
New-type cooperatives	New-type agricultural cooperatives include individuals and households (for example, workers, officers, business households, and farms) willing to voluntarily contribute and take responsibility for the business under the new Cooperative Law provisions issued in 2012. New-type agricultural cooperatives play a vital role in supporting the implementation of the National Target Program to build new rural areas for sustainable development. In agricultural production, several cooperatives effectively gather farmers together to form large-scale and efficient production areas and resources. In addition, some new-type agricultural cooperatives also provide farm inputs to ensure the quality of production of cooperative members (for example seeds, production materials, fertilizers, and technical assistance). Some cooperatives also support their members in selling products to distribution channels. Cooperatives may produce and then sell products: ○ Directly to informal distribution channels, such as traditional community markets; ○ Directly to formal distribution channels, such as supermarkets and restaurants; ○ Directly to exporters; ○ Directly to processing companies; and ○ Indirectly to final distribution channels via traders or trading companies.	High
Large-scale farming companies	In addition to the involvement of individual farmers and cooperatives, there is also participation from large-scale farming companies. However, their total production is minor compared to the production volume from small-scale farmers or new-type cooperatives.	High
Traders		
Traditional traders	Traders or collectors involved in on-field procurement and transportation often buy produce directly from farms. Traditional traders play a key role in connecting producers and distribution channels. Traders sell post-harvest F&V products:	Low

	○ Directly to informal distribution channels, such as traditional community markets; ○ Directly to formal distribution channels, such as supermarkets and restaurants; ○ Directly to processing companies; and ○ Indirectly to final distribution channels via trading companies.	
Agriculture trading companies	Trading companies purchase from other producers for resale. Some large-scale farming companies currently act as trading companies; for example, Vineco owns 14 farms that produce F&V, but it also signs fruit and vegetables procurement agreements with several small-scale farmers.	High * in case they act as large-scale farming companies
Processors		
Agriculture processing companies	Processing companies perform washing operations, post-harvest treatment, and packaging, among other functions. Some large-scale farming companies also function as processing companies, which procure post-harvest products from producers. Pre/processed products are sold: ○ Directly to formal distribution channels in the domestic market; and ○ Directly to exporters.	Low for Rice medium for fruit
Distributors		
Informal distribution channels in the domestic market	In the domestic market, agricultural products are mainly sold through informal distribution channels, including individual retailers, traditional community markets, small food services, and so on. In 2018, Vietnam had 8,539 traditional community markets operating, of which 83 were wholesale markets (MOIT, 2018). Aside from official markets, unofficial markets with individual street traders exist throughout the country.	Low
Formal distribution channels in the domestic market	Formal domestic markets for agricultural products (rice, fruit, vegetable) include supermarkets, food service suppliers, and establishments such as restaurants, cafés, hotels, hospitals, and corporate canteens.	Low

	Vietnam is estimated to have 957 supermarkets (Vietnam Domestic Market Department—MOIT, 2019). Although the number of supermarkets has been rising, the total quantity of F&V purchased through these distribution channels is still minor compared to the traditional distribution channel.	
Exporters	Exported products are distributed mainly through export enterprises, with some traded via cross-border channels. The main export markets for Vietnam agriculture products include China, countries within the ASEAN region, the US, Korea, and the EU. In the first seven months of 2020, the total value of F&V exported from Vietnam to China, Korea, and the EU was over US$1.1 billion, US$94 million, and US$82 million, respectively (calculation based on figures provided by IPSARD, 2020).	Medium

6.3. Aquaculture value chain structure

Figure 11: Value chain mapping for aquaculture



6.4. Aquaculture stakeholder mapping:

Table 28: List of key stakeholders within Aquaculture Value Chains

Players	Description	Likelihood of insurance purchase *
Producers		
Fishermen/Farmers & cooperatives	Fishermen and cooperatives contribute 90% of the seafood output. Farmers and cooperatives primarily sell their goods through markets and hubs rather than directly to businesses. Fishermen don't engage in direct transactions with businesses, making it challenging to access technical support or market information from them. They lack insights into market trends and prices and don't have the bargaining power for their products.	Low
Hatcheries and nurseries	Due to the high-quality demands for shrimp seed related to technology, expertise, and infrastructure, most shrimp seed production units are large-scale enterprises. The top large enterprises include C.P. Vietnam Corporation, Uni-President Vietnam Co., Ltd., Viet-Australia Co., Ltd., Thong Thuan Co., Ltd., and Thien Phu VN Aquaculture Seed Production Co., Ltd. They sell the shrimp seed directly to fishermen and companies.	Medium
Aquaculture Companies	The majority of aquaculture companies are large enterprises that also engage in processing and exporting. Big players in this field include Minh Phu Seafood Corporation, Vinh Hoan Corporation, and Hung Vuong Corporation.	High
Traders & Distributors		
Traditional traders	The markets and hubs are the primary purchasing units that directly interact with farmers. The advantage of sourcing seafood from these markets and hubs is that it allows for the acquisition of raw materials that align with market demand fluctuations. Simultaneously, this practice contributes to addressing the output for fishermen.	Low

Aquaculture trading companies (including processing and distributing to export market)	As of now, the entire country has 636 industrial-scale seafood processing and exporting companies certified for food safety and eligible for export to various markets. There are 300 seafood processing plants concentrated in the Mekong Delta region, specifically in the Cuu Long River Delta area, known for shrimp, tra fish, and seafood raw materials.	High

7. OVERVIEW OF FARMERS' TECHNOLOGICAL READINESS

Regarding smartphone user rate, nearly 90% of the rural population in Vietnam own mobile phones, while nearly 70% of those are smartphones, but their use may be hindered due to limited 3G and 4G connection (Barnard et al., 2023). These statistics indicate that the ownership and use of smartphones in rural areas in Vietnam are quite extensive and can create favourable conditions for scaling the use of digital tools. The most common digital tools in use by farmers to access information on rice farming are TV and radio (80%); phone calls (65%); messaging apps such as Viber, Facebook (FB) messenger, and Zalo (45%); social media (29%); and video imaging (24%) (Burra et al., 2021). It is reported that instant messaging apps are used six to seven times per day (for an average of 20 minutes per session); particularly, 90% of people who are on the Zalo app use it every day.

Another survey carried out by ADB (Morgan & Trinh, 2020), with a sample of more than 1000 people, of which 45% are in rural areas (including Dong Thap), shows that only 9.5% of respondents use smartphones to manage their financial portfolio, and only 18.9% and 15.7% of respondents are aware of digital insurance and digital financial advisors, respectively. Nearly all respondents (99.4%) still use cash for payment, and only about 10% use mobile phones for transfers and payments.

However, non-cash payment transactions in 2022 have increased by 86% in volume and 31.39% in value (Acclime, 2023). About 48% of the population made a digital online payment for an online purchase in 2022 while it was only 15% in 2017. Another survey was conducted by VISA (2022), with 65% of Vietnamese customers carrying less cash in their wallets, 76% using e-wallets, and card users outnumbering cash users (82%). At least once a week, more than 80% of respondents use cards, QR code payments, and e-wallets.

Table 29: Survey results on Mekong Delta's farmers' technological readiness

Province	Commodity	Technological readiness
An Giang	Rice	• 70% of the surveyed farmers own a smartphone, mostly for reading online news, in which 85% own a bank account but only 66% have previously used mobile banking.
Kien Giang	Rice	• 70% of the surveyed farmers own a smartphone, mostly for reading online news. However, only one of them owns a bank account including online banking.
Dong Thap	Mango	• All of the surveyed farmers own a smartphone, in which 80% of them use it for all purposes including news

		updates, social media, and online purchases. • All of them are bank account owners, in which 80% of them have used mobile banking.
Long An	Dragon fruit	• 90% of the surveyed farmers own a smartphone with internet connection, most of them use it for various purposes from news updates to online purchases. All of them have a bank account, although none uses online banking.
Vinh Long	Durian	• 70% of the surveyed farmers own a smartphone with internet connection, in which 40% of them (or their family members) own a bank account, with previous experience of mobile banking. • 85% of them use it for news updates, online purchase, and social media.
	Orange	• 90% of the surveyed farmers own a smartphone with internet connection. • 60% use smartphones for news updates, online purchase, and social media; the rest mostly use it for news or for regular contact. • Half of them own a bank account, in which only 75% use online banking.
	Pomelo	• All of the surveyed farmers own a smartphone, and 90% of them use it for all purposes including online purchases. While all of them have a bank account, none of them are using mobile banking.
Soc Trang	Shrimp	• 81% of surveyed farmers own a smartphone with internet connection. • 52% of farmers use smartphones to read news, followed by 47% who also use it for social media and to purchase goods online. • 66% of farmers own a bank account, and all of them have previously used mobile banking.

Based on the survey results, the majority of farmers across the surveyed provinces own a smartphone with internet connection, mostly for daily news update and social media. Mango farmers in Dong Thap or rice farmers in An Giang are more familiar with online purchases, with a high rate of mobile banking ownership, indicating that these are the provinces in which parametric insurance can be purchased on mobile phone.

For farmers who does not own a mobile banking account, additional trainings are necessary to familiarize farmers with the process of purchasing parametric insurance

online. This can be incorporated in the training materials in growers' engagement programs for rice farmers in Kien Giang, durian farmers in Vinh Long, and shrimp farmers in Soc Trang.

With farmers who does not own a bank account, one strategy to make parametric insurance accessible to them is to work through the Head of Cooperative. The Head of Cooperative will be the focal point to facilitate the parametric insurance purchase and the payout when risks happen for these farmers. To ensure transparency, formal agreements between the cooperative and its member should be implemented on how claims will be managed and distributed.

8. CURRENT ADOPTION OF AGRICULTURE INSURANCE IN THE REGION

Challenges observed in the pilot agricultural insurance program include a low level of understanding of the risks in the agriculture sector, especially risks affecting aquaculture; limited available data to design insurance products; weak linkage between credit and insurance; and low level of financial literacy among farmers about financial products.

Insurance Program/ Research	Type of agri-insurance	Details
The National Agricultural Insurance Pilot Program 2011 – 2013 per Decision No.315/QD-TTg	Yield-based index insurance (rice), damage-based indemnity insurance (aquaculture and livestock)	25.4% of farming households participated in paddy insurance and 3.1% participated in aquaculture. Most of the insured area was in Soc Trang (55%). Farmers had difficulty paying the premiums, and the non-poor households in the insurance project were low. Most rice farmers were poor and near-poor households due to heavy subsidy support from the government (90–100%). On the other hand, more than 95% of the participating households in the aquaculture insurance were non-poor households as it was perceived to be more vulnerable to production. Premium ratio for aquaculture were the highest at 7–15%, while the compensation ratio reached 309% causing significant losses for insurance companies (Bao Minh & Bao Viet) (World Bank, 2019). For crop production, the risk spread (the premium divided by the number of insured households was around $4/household; for livestock was $10.8; but for aquaculture, it was $4,474) (Nguyen & Jolly, 2018). The main challenges observed in this pilot were insurance providers' low level of understanding of the risks in agriculture, especially in the aquaculture sector; and low level of understanding of insurance among farmers as they perceived it as loss- rather than index-based.
Study of 503 households in the	Yield and price-based	78.5% of farmers were very unwilling/unwilling to participate in production insurance and only 34.2% had the demand for rice insurance. The demand is

Mekong Delta (Khuu et al., 2022)	index insurance	low due to the perception of insurance as risky and unfamiliar, and the initial investment cost is too large compared to their financial ability.
Study on shrimp farmers' risk management strategies in Tra Vinh and Ben Tre (Nguyen et al., 2021)	Yield-based insurance	All farmers preferred insurance coverage for a period <40 days after stocking when the rate of infection is high and over half of the farmers chose the highest premium and 100 % compensation rate even though there were no promised subsidies to cover the premium. Farmers were willing to pay US $0.15 per kg of shrimp per year for insurance. An interesting finding is that the higher the farmers' income, the less willing they are to pay for the insurance coverage. Farmers who participated in a training program, low-income farmers, and those with high total and chemical costs were willing to pay a high insurance premium. However, the farmers who are familiar with insurance program companies were less willing to pay a high premium.

Decision No.13/2022/QD-TTg on the implementation of agricultural insurance assistance details as below:

Table 30: Types of existing agriculture insurance and relevant case studies in Vietnam

Eligible Subjects for Premium Subsidies	• Plants: rice, rubber, pepper, cashew, coffee • Aquaculture species: tiger shrimps, whiteleg shrimps, pangasius fish
Levels of subsidies	Under Government Decree No. 07/2021/ND-CP dated January 27, 2021, • Poor or near-poor households: can receive a maximum support of 90% of agricultural insurance premiums • Non-poor or near-poor households: can receive the maximum support level of 20% of agricultural insurance premiums
Eligible Insured Risks	Include natural disasters and diseases affecting the specified plants, animals, and aquaculture species. Interestingly, insurance does not cover diseases affecting aquaculture species listed above.
Eligible Areas by Types of Subject	Rice: Thai Binh, Nam Dinh, Nghe An, Ha Tinh, Binh Thuan, **An Giang**, **Dong Thap** Giant tiger prawns, white leg shrimp, pangasius fish: **Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau**

Despite having several amendments enabling policies for agri-insurance in place, through our interviews with representatives from the Directorate of Fisheries, the awareness of agri-insurance is not high, combined with the previous failed attempt of the pilot program causing major scepticism from insurance companies. It is a big reason why there is no visible product in the market, as they don't see it as high potential, and complicated to implement. Additionally, there is not any parametric insurance product based on weather in the market as of now.

Table 31: Farmers' willingness to purchase the parametric insurance in the surveyed provinces by crop type

Province	Commodity	Previous insurance purchase	Agri-insurance knowledge and understanding	Average compensation rate (% of loss)	Insurance premium (% of income)
An Giang	Rice	80% purchased health insurance, and 10% each purchased life and social insurance.	20% of the surveyed farmers have previously heard of agriculture insurance, specifically compensation for rice yield loss in the National Insurance Program.	100%	**5-20%** Median: 10%
Kien Giang	Rice	90% purchased health insurance, 20% for social insurance, and 10% for life insurance	20% of the surveyed farmers have previously heard of agriculture insurance, specifically compensation for rice yield loss in the National Insurance Program.	25-100%	**2-10%** Median: 2%
Dong Thap	Mango	70% purchased health insurance, 20% for social insurance, and 10% for life insurance	20% of the surveyed farmers have previously heard of agriculture insurance, specifically compensation for rice yield loss in the National Insurance Program.	100%	**2-7%** Median: 4%
Long An	Dragon fruit	60% have not purchased any kind of insurance, 40% purchased health and 20% each for life and social insurance.	None of the surveyed farmers had heard of agri-insurance.	100% (if required)	Dragon fruit farmers don't see the need for insurance as loss in yield/revenue is low, and does not affect profit significantly.
Vinh Long	Durian	80% purchased health insurance, 20% purchased social insurance.	None of the surveyed farmers had heard of agri-insurance.	100%	**3-5%** Median: 5%

	Orange	70% purchased health insurance, 40% for life insurance, followed by 10% each for social and property insurance.	Half of the surveyed farmers have heard of agri-insurance, specifically indemnity-based insurance for rice yield loss, although they find the process too complicated.	50-100%	**3-10%** Median: 5%
	Pomelo	All of the farmers have never purchased any kind of insurance.	None of the surveyed farmers had heard of agri-insurance.	100% (if require)	Pomelo farmers don't see the need for insurance as loss in yield/revenue is low, and does not affect profit significantly.
Soc Trang	Shrimp	90% purchased health insurance, followed by 43% and 33% purchased social and life insurances.	Majority have heard of the previous National Insurance Program, which described that it was indemnity-based for shrimps—however, pest and diseases must be reported to receive compensation—whereas natural disasters are unlikely to occur. Most farmers prefer insurance being automated; they found the previous program too complex due to pest and disease reporting.	100%	19% of farmers are willing to pay 10% of their income to purchase the insurance. The rest were not sure as the concept of this insurance is too new for them, indicating needs for training and raising awareness.

9. RECOMMENDATIONS

9.1. Rating Potential Commodities for Parametric Insurance Product Design:

Table 32: Key factors for future insurance product design

Commodity and Rating (1-10)	Factors and Weight				Total Weighted Score (highest: 10)	Potential for future Product Design
	Willingness to Pay (25%)	Policy Support (15%)	Commodity Climate Vulnerability (35%)	Impact of Weather Risks on Profitability (25%)		
Rice	6	10	10	8	8.5	**High**
Mango	10	2	10	8	8.3	**High**
Durian	8	2	8	8	7.6	**Medium-High**
Shrimp	4	10	8	8	7.3	**Medium-High**
Orange	4	2	6	6	4.9	**Medium**
Dragon fruit	2	2	4	2	2.7	**Low**
Pomelo	2	2	4	2	2.7	**Low**

Factors: Relevant factors in assessing the market's attractiveness.

- Willingness to Pay: 1 indicating less inclination to pay and 10 indicating a higher likelihood.
- Policy Support: 1 implies an absence of policy backing for subsidies regarding agriculture insurance for specific crop trees and 10 indicates robust policy support (this refers to existing government agri-insurance subsidies, in which only rice and shrimp are supported)
- Commodity's Climate Vulnerability: 1 suggests resilience to climate change and 10 denotes high vulnerability to climate events.
- Impact of Weather Risks on Profitability: 1 signifies minimal impact on profitability and 10 indicates significant reduction in profitability due to weather risks.

Weight (totaling 100%): The higher the weight, the more important the factor.
Rating (1–10): 1 represents low potential, 5 represents high potential.
Weighted Score = Weight x rating

Based on the rating in Table 32 above, the implementation of parametric insurance in the Mekong Delta should place rice and mango as the most crucial commodities, follow by durian and shrimp. These are the commodities that are vulnerable to climate, facing severe impact of weather risks on farmers' profitability. Farmers' willingness to pay is also relatively high in comparison to other crops, with fruit farmers as the most inclined to pay for parametric insurance, indicating a significant need in protecting their crops against weather risks.

For rice farmers in An Giang, the insurance premium can be designated around 10%, mango farmers in Dong Thap at 4%, and durian farmers in Vinh Long at 5%. Rice farmers in Kien Giang is more reserved to this concept as most farmers prefer lower premium at only 2%. Shrimp farmers are more skeptical of insurance as a whole due to the lack of awareness and the persistent idea that insurance can only be indemnity-based. Although some farmers indicate their willingness to pay a high percentage for the premium.

Within the rice and fruits value chains, parametric insurance should target the new-type cooperatives, large-scale farming companies (producer), and agriculture trading companies (distributor). In new-type cooperatives, farmers gather together to form large-scale production areas which will be beneficial for the scalability and dissemination of parametric insurance products, instead of approaching scattered, individual farmers who face more barriers in applying new technology and accessing resources. Some agriculture trading companies also operate as large-scale farming companies, which can also increase the concentration of parametric insurance coverage as their needs to ensure quality output for export is pressing.

In aquaculture value chains, the majority of aquaculture companies are large-scale, playing different roles from producing, processing, to distributing the products. However, parametric insurance companies should not implement a 'catch-all' approach but instead target buy-in from companies that carry out intensive, outdoor farming as they are less likely to have modern technology application in place, creating room for parametric insurance as a measure for mitigating climate and financial risk.

9.2. Grower engagement and capacity building program design by crop and province

Recognizing the vast agricultural sector and susceptibility to climate extremes in the Mekong Delta, coupled with low insurance coverage rates, there is a significant opportunity to create or refine parametric insurance products tailored to the specific climate risks faced by farmers in the region.

In 2011, the government initiated a National Agricultural Insurance Pilot Program, resulting in significant losses for participating insurance companies, primarily attributed to the high compensation ratio and payouts associated with aquaculture insurance. Although the program has since been discontinued, this program has influenced industry perceptions regarding agricultural insurance and discouraged insurance companies from involvement. Parametric insurance holds the potential to address these concerns, particularly when accompanied by industry training and capacity-building initiatives aimed at fostering a comprehensive understanding of this insurance mechanism.

Objectives

- Spread awareness within Vietnam's agriculture community regarding parametric insurance as a tool for managing risks.
- Enhance growers' comprehension of parametric insurance in specific crops and provinces within the Mekong Delta region.
- Promote the adoption of parametric insurance among farmers and aquaculture companies to protect their livelihoods and improve resilience against the impacts of climate change.

Approach and methodology

- Strategic partnership to deliver the grower trainings
- Clearly define the roles and responsibilities of each partner in delivering the training activities, including coordination, resource allocation, and communication channels.
- Prioritize partners who have established trust and credibility within the local farming communities to facilitate acceptance and participation among farmers.
- Ensure alignment of objectives and expectations among all partners to maximize the impact and sustainability of the training activities.

Table 33: Types of partners and their role to implement growers' engagement program

Type	Role
Central-level Government	• Introduction to prominent women-led companies/ cooperatives • Co-host training workshops if applicable
Province-level Government	• Approval of organizing events with farmer participation in the province • Introduction of prominent companies and cooperatives in the province • Co-host training workshops if applicable • Their staff can be trained to advocate for Hillridge product given their daily exposure with farmers
Large-scale farming companies and agriculture/aquaculture trading companies	• Co-host the farmer trainings • Their staff can be trained to advocate for Hillridge product given their close connection with farmers
New-type Cooperatives	• Co-host the farmer trainings • The cooperative lead can be trained advocate for Hillridge product given their close connection with farmers
Development agencies	Leverage their resources and relevant programs in promoting parametric insurance
Financial institution/partner	Leverage their exposure with companies with credibility; they can help advocate for the insurance
Others (e.g. consulting firm on sustainable certification, technology companies, associations, etc)	Leverage their exposure with companies with credibility, they can help advocate for the insurance

Train-the-Trainer (ToT) approach for program sustainability

- Conduct comprehensive ToT sessions for company staff, agriculture department officials, cooperative leaders, and other key stakeholders involved in farmer engagement.
- Provide trainers with ongoing mentorship and support to reinforce their knowledge and confidence in discussing parametric insurance with farmers.

- Our Business Development Manager serves as the primary points of contact for these trainers as well as farmers, addressing inquiries and providing guidance throughout the insurance enrollment process.

Creating a Welcoming Training Environment for Women's Participation

- Involve the Women's Union at both central and provincial levels to ensure women's perspectives are integrated into the planning and execution of training activities.
- Develop gender-sensitive content and materials that highlight the role of women in agriculture and address their specific needs and concerns.
- Select training venues that are accessible and safe for women, with provisions for childcare and other support services as needed.
- Schedule training sessions at times convenient for women, avoiding conflicts with household and farming responsibilities.
- Include women as facilitators, speakers, and discussion leaders to promote gender diversity and representation.
- Implement feedback mechanisms to gather input from women participants and adapt training approaches to better meet their needs over time.

Risk mitigation

Limited Stakeholder Engagement:

- Risk: Inadequate participation and buy-in from key stakeholders, such as corporates, cooperatives, and development agencies, may lead to low adoption rates and insufficient resources.
- Mitigation: We will invest time in engagement activities to identify and involve all relevant stakeholders from the outset. We will also make sure to clearly communicate the value proposition of the project and actively solicit input and feedback to ensure alignment of interests and commitments.

Training effectiveness:

- Risk: The effectiveness of train-the-trainer programs may vary, leading to inconsistent quality of training delivery and limited impact on farmer awareness and understanding.
- Mitigation: We need to develop comprehensive training materials and resources that are user-friendly and adaptable to different learning styles and contexts.

- We will also provide ongoing support and mentorship to trainers, including regular monitoring and evaluation to assess training outcomes and identify areas for improvement.

Gender disparities:

- Risk: Despite efforts to promote women's participation, gender disparities may persist, leading to unequal access to information, resources, and opportunities.
- Mitigation: We will integrate gender considerations into all aspects of project planning and implementation, ensuring that activities are inclusive and accessible to women. Implement targeted outreach strategies, such as women-focused content, childcare support, and flexible scheduling, to overcome barriers and promote women's empowerment.

ANNEX 1: FARMERS' ENGAGEMENT TEMPLATE

Date:
Name:
Gender:
Age:

Address:
Province:
Location:
Farm size:

I. COMMODITY

1. What are the two main crops and its total yield during last seasons?

Main product	Surface (m2)	Season	Crop purpose		Total harvested yield		Total yield	Amount sold	Total revenue
		Dry/rainy	To sell (%)	Others (%)	in units	ton/unit	Ton	Ton	VND

2. What are the costs for each of the two main crops in the last season?

Main crop	Fertilizer cost	Energy cost	Labour cost	Seed cost	Others	Total cost

II. CLIMATE RISKS

3. Which of these climate risk are most likely to occur in your farming area?

High rainfall	Low rainfall	Strong wind	High temperature	Low temperature

4. Which extreme weather can be risky to your main crops?

Main crop	Climate risk	Month	Season	Crop growth stage

III. IMPACT ON FARMERS

5. Has your production ever negatively impacted by an extreme weather event? When did that happen?		
Yes/No	Time/Period:	Weather risk:
6. In what ways did these extreme weather events impact your businesses?		
Increase cost to cover lost	Decrease in productivity	Reduce quality

7. How much income did you lose (VND)?		
8. If the yield were affected, how much was the reduction (ton)?		
Main crop	Yield reduction	Total loss

IV. WILLINGNESS TO PAY

9. Have you ever purchased any types of insurance?	
Yes	No

10. If yes, what type of insurance is it?				
Health	Social	Life	Property	Others

11. Do you implement any risk management tool? If yes, what are they?				
Savings	Reduce farming area	Intercropping	Agri-insurance	Others

12. Have you heard of agri-insurance?	Yes/No
13. If yes, what type of agri-insurance was it?	

14. Can you quickly describe how it works based on your understanding?

15. What is your main reason for buying (or not buying) agri-insurance?

16. What is the compensation rate do you want to be covered by the insurance?

17. How many % out of your income are you willing to use to pay for the insurance premium?

V. TECH READINESS

18. Do you have a smartphone that is connected to the internet?			
Yes	No	Other family members own one	No one in the family owns a smartphone

19. What do you use the smartphone for?			
Follow news	Social media (Facebook, Zalo)	Online purchase	Others

20. Do you have a bank account?	
Yes/No	Other family members own one

21. Have you ever used mobile banking?	
Yes	No

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