NBC Working Paper[1]

Managing Climate Risk in Agriculture in Cambodia: The Role of Crop Insurance

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Abstract

Agriculture is the main source of income for Cambodian farmers, most of whom are rural smallholders, who are largely reliant on rain-fed system for rice cultivation. Rice subsector, in particular, has been hit hard by climate change, especially extreme weather such as drought and flood. Crop insurance has potentials to help lessen post-disaster burden, accelerate recovery, and increase resilience in agriculture. This paper shed light on the development of crop insurance for rice and its role in climate risk management in agriculture in Cambodia. Crop insurance creates a safety net for Cambodian small and marginal farmers even though its coverage remains narrow. Nevertheless, it is still in the developing phase, driven by private sector with significant support from development partners. This paper calls on promoting trust building among farmers, involvement of government through public-private partnership, exploring innovative risk transfer model, and further studies to provide insight to support policy formulation.

Keywords*: agriculture, Cambodia, climate change, crop insurance*

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I. Introduction

Agriculture remains an important sector for Cambodia's economic development despite its relatively declining contribution to the country's gross domestic product over the last decade. This sector employed more than 3 million people or equivalent to more than one third of the total workforce in Cambodia (National Institute of Statistics, 2022). Nevertheless, agriculture is the main source of income for Cambodian farmers, most of whom are rural smallholders and produce rice across all agro-ecological zones in the country (National Institute of Statistics, 2021). Additionally, this sector is the main source of food security.

However, cultivation in this sector remains largely reliant on rain-fed system (World Bank & Asian Development Bank, 2021). This puts agriculture and rural population in a disadvantaged position amidst the emergence of climate change. As a result, agriculture sector become vulnerable to extreme weather events such as flood and drought almost every year. According to data from the Ministry of Agriculture, forestry, and fisheries (MAFF), for the last ten years, more than a million hectares of rice field was reported damaged by drought and flood.

Climate change risk coping strategies in Cambodia are well documented but lack of discussion on emerging mechanism like insurance. Agriculture can adapt to climate change through adaptation means such as insurance to reduce its negative effects (Mccarl, Thayer, & Jones, 2016). Crop insurance has potentials to help lessen post-disaster burden, accelerate recovery, and increase resilience in agriculture. It is generally recognized as a tool of disaster risk management especially in agriculture sector (ADB, 2021). Crop insurance promotes farmers' adaptation behaviour and increases adaptive capacity to climate change (Yoshioka, 2017). This paper discusses the development of crop insurance for rice and its role in climate risk management in agriculture in Cambodia.

II. Literature Review

Defining agricultural insurance is indifferent from conventional insurance – that is a transfer of a risk of loss from one entity to another in exchange for a guaranteed and quantifiable small loss to avoid possible devastating loss (Iturrioz, 2009). However, agricultural insurance is considered as a special type of insurance business because it requires expertise and skills

for underwriting to overcome difficult features in agriculture such as risk diversification, asymmetries of information, geographical dispersion of agricultural production, and complexity in agriculture (Iturrioz, 2009).

Agricultural insurance products cover crops, livestock, fisheries, forestry, and greenhouses (Iturrioz, 2009). Nonetheless, World Bank (2010) described features of existing agricultural insurance products. Based on pay-out measurement, agricultural insurance products can be classified into three types as shown in Table 1. First, the indemnity-based insurance covers actual loss of agricultural production and yield. Second, the revenue-based insurance whose pay-out bases on revenue loss due to reduction of yield and crop prices. And third is the index-based insurance. This particular type of insurance product uses an index measurement to determine pay-outs.

Table 1: Summary of agricultural insurance products based on pay-out measurement.

Type	Description
Indemnity-based	Pay-out is calculated by measuring the percentage actual damage or yield loss. Insured yield is calculated based on historical average yield of the insured farmer. Indemnity-based insurance that covers actual damage and yield loss are called Named Peril and Multiple Peril, respectively.
Revenue-based	This insurance product protects against yield loss and loss of market price at the time of sale of the crop.
Index-based	Pay-out is based on establishments of index measurements such as Area-yield index, Weather index, and Normalized difference vegetation index.

Source: Author based on (World Bank, 2010)

In Asian region, crop insurance schemes, either indemnity and index based or both, are available in many developing countries (ADB, 2021). Most are voluntary and subsidized like those in major rice producers China and India. In China, crop insurance started in 1982 and has been partly subsidized by the government at different rates depending on provinces

(FAO, 2011). In India, there are two national crop insurance schemes known as National Agricultural Insurance Scheme – NAIS (since 1999) and Weather Based Crop Insurance Scheme – WBCIS (since 2007) (Nair, 2010). By 2018, crop insurance insured 70 percent of crop cultivated in China and a quarter of total crop area in India (Hazell, Jaeger, & Hausberger, 2021). Similar stories can be traced in countries in ASEAN region.

Indonesia, Philippines, and Thailand have achieved high uptake of crop insurance (Stutley, 2022). These countries are scaling up commercial indemnity-based insurance and piloting weather index insurance. In Thailand, the government has provided premium subsidies of up to 100 percent for its mandatory crop insurance since 2016 (Stutley, 2022). Despite the successful cases, Cambodia, Myanmar, and Vietnam have been slow to scale up their pilot crop insurance while Brunei, Lao, Malaysia, and Singapore were reported absence of crop insurance provision by 2021 (Stutley, 2022).

A study by UNDP (2013) examined microinsurance need for Cambodia's poor and vulnerable people as well as assessed their knowledge and perception on microinsurance. The study found that crop insurance, amongst other microinsurance products, was highly potential in Cambodia as the country frequently faced natural disaster like drought and flood. However, farmers' knowledge of crop insurance was very low. Similarly, Wang et al (2023) interviewed rice and cassava farmers in Battambang province revealed that their awareness of crop insurance was very low.

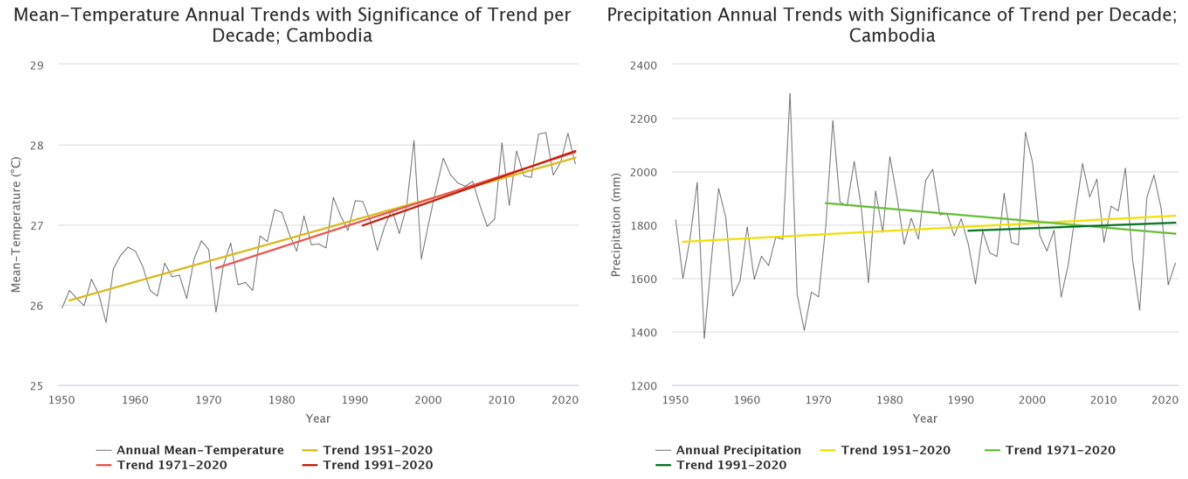
III. Methodology

This study relied solely on desk review. The comprehensive review of available document helped in navigating the process of this study from identifying crop insurance scheme in Cambodia, understanding crop insurance product design, and the compilation of secondary data. The secondary data were obtained from the Ministry of Agriculture, Forestry, and Fisheries (MAFF), and the Climate Resilient Rice Commercialization Sector Development Program (Rice-SDP). Annual reports of MAFF contain statistics of annual cultivated rice field and affected and damaged rice field caused by disasters. Last but not least, progress reports of the Rice-SDP informed the development of piloted weather index crop insurance program in three provinces. Key output indicators of crop insurance were analyzed to inform its development and its role in climate risk management in agriculture in Cambodia.

i. Overview of Climate Change Risk in Agriculture in Cambodia

Cambodia has gotten warmer over the past 70 years. Figure 1 shows that average annual temperature increased 1.8 degree between 1950 and 2020. For the same period, countrywide precipitation was highly volatile. However, precipitation was between 1,480 mm to 2,145 mm for the past decade. This apparently reflects the impact of climate change in Cambodia. Li, Wang, & Chun (2017) suggested that climate change would lead to reduction in rice yields in Laos, Myanmar, Thailand, Vietnam, and especially a large decrease of that in Cambodia. The study predicted that rising seasonal mean temperature and the interaction of rainfall and temperature would potentially decrease rice yield in Cambodia by 11.5 – 20 percent and 17.3 – 27.2 percent for the 2020s and 2040s, respectively. Moreover, rising rainfall and heat can have adverse impact on irrigated crops (Alvar-Beltran, et al., 2022).

Figure 1: Average annual temperature and precipitation in Cambodia (1950-2020)

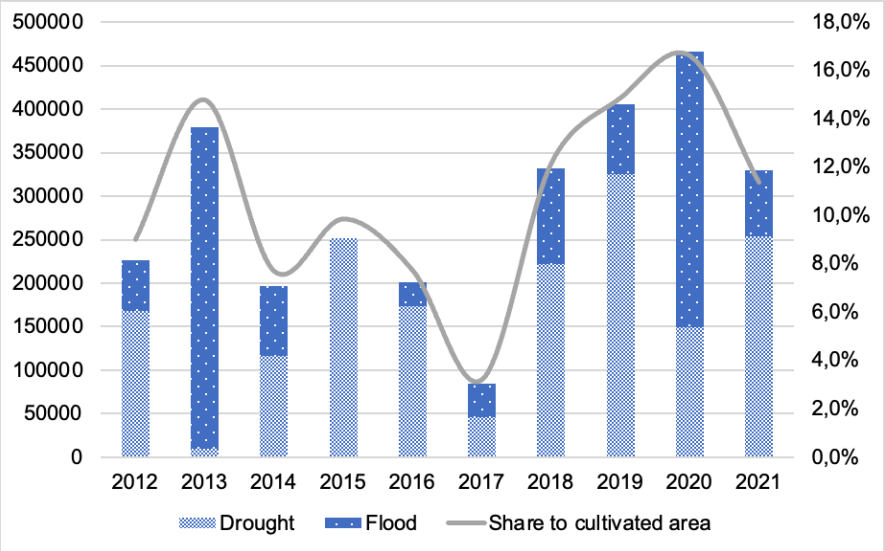


Source: (World Bank, 2023)

Climate change has hit agriculture in Cambodia hard. According to Cambodia Agriculture Survey 2020, farmers reported drought and flood as the most severe shocks to their production (CAS, 2019). This is because Cambodia's agriculture is heavily reliant on rain-fed system that is vulnerable to both lack and excess of water (World Bank & Asian Development Bank, 2021). Every year, flood occurs in Tonle Sap and Mekong Plains areas

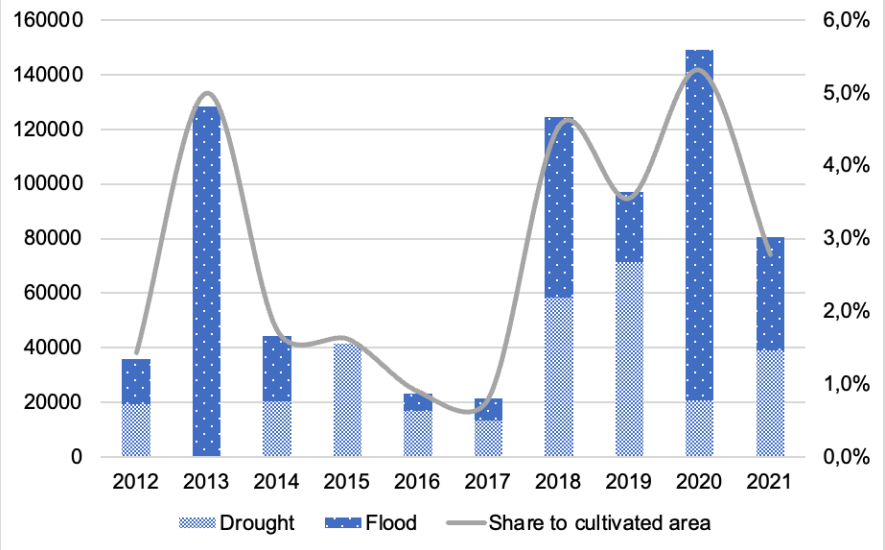
several months while drought occurs in the middle of wet season, causing serious damages to agricultural crops, livestock, and fisheries (Ros, Nang, & Chhim, 2011).

Figure 2: Affected rice fields (in hectares)



Source: Various Annual Reports of MAFF

Figure 3: Damaged rice fields (in hectares)



Source: Various Annual Reports of MAFF

Rice is the main agricultural crop for Cambodian farmers across all agro-ecological zones (CAS, 2019). From 1996 to 2001, 90 percent of rice production loss was caused by flood and

drought, 70 percent of which was due to flood (Mekong River Commission, 2009). Figure 2 shows that rice fields affected by drought and flood during 2012 – 2021 were substantial. In 2012, more than 200 thousand hectares of rice field were affected. The impact extended to about 300 thousand hectares in 2021. The extent of affected rice fields was notable in 2013 and 2020. Approximately 15 percent and 16 percent of cultivated rice fields were affected in 2013 and 2020, respectively, largely by flood. Devasting effect of flood was prevalent in 2013 whereas drought effect was dominant in 2015. This can be explained by the El Nino effect. UNDP et al (UNDP, ESCAP, OCHA, RIMES, APCC, 2017) established that El Nino had high impact on enhanced drought in Cambodia during 2015 – 2016. Furthermore, figure 3 shows that the impact of flood is hardly mitigated and resulted in, along with drought, substantial damage to rice field.

For those whose livelihood depends on agriculture, climate change challenges their agricultural productivity and survival. Severe drought and flood resulted in lack of water for irrigation and crop damaged (Nong, 2021). Nevertheless, there are several documented common risk coping strategies that farmers use to respond to climate change impact, such as water management, changing cultivation practice, diversifying crops, and diversify sources of income (Nang, Sam, Lonn, & Ouch, 2014; Nong, 2021). Furthermore, they migrate to find non-farming job to earn some money to sustain income, especially those who cannot find alternatives to continue farming (Nang, Sam, Lonn, & Ouch, 2014).

ii. Crop Insurance Development in Cambodia

Crop insurance in Cambodia can be traced back to 2015. Local NGOs piloted indemnity-based crop insurance. For example, Life with Dignity (LWD) implemented crop insurance program, where indemnity was measured by actual crop loss, with 28 farmers in Kampong Spue province. In this program, insurance premium was 800 KHR per 1,600 square meters of rice field. In 2017, the program insured 11.25 hectares and collected 821,600 KHR in premium, 85 percent of which was used to cover payout amount. Payouts were made to 24 farmers who incurred losses. Similarly, the Cambodian Center for Study and Development in Agriculture (CEDAC) implemented crop insurance with 155 farmers in Kampong Chhnang, Takeo, and Kampong Spue provinces through Cambodia Micro Agriculture Insurance Scheme funded by Achmea Foundation. Index-based insurance has so far piloted by private sector.

Forte Insurance Company has provided index-based insurance in some districts in Battambang, Kampong Thom, Prey Veng, Pursat, Siem Reap, and Banteay Meanchey provinces since 2015. Indemnity is determined by indexes. From 2015-2017, indemnity was determined by weather index that measures level of rainfall or number of dry days. Whereas from 2018-2019, Forte used satellite soil moisture index, measuring excess and deficit of soil moisture, to determine payouts. During this period, insurance premium ranged from 25 to 35 USD per hectare, depending on level of risk exposure, while sum insured was between 300 to 400 USD. On average, farmers bought this insurance policy to cover 1.5 to 2 hectares of their paddy fields (UNESCAP, 2020). However, Forte struggled to achieve high penetration of its crop insurance product. From 2015-2019, Forte's crop insurance insured 477 farmers and 838 hectares of rice fields (Stutley, 2022).

Until recently, crop insurance has drawn renewed interest from development partners. Since 2021, the Asia Development Bank (ADB) has funded implementation of pilot testing of weather index crop insurance (WICI) in Battambang, Kampong Thom, and Prey Veng through the Climate Resilient Rice Commercialization Sector Development Program (Rice-SDP). Forte and Ly Hour Insurance formed a pool and jointly implemented WICI. Local micro financial institutions, agribusiness, and agricultural cooperatives such as AMK, LOLC, Nileda Agribusiness, and the Cambodia Agricultural Cooperative Alliance (CACA) are distribution channels. The WICI aims to protect wet season rice crop against excessive rainfall and drought. Automatic rain gauges have been installed to measure rainfall index to determine crop yields. The Sale of WICI is conducted between early April and late June and insurance coverage period is between May to October. Farmers pay premium of 10 USD per hectare for a sum insured of 100 USD at the beginning of cultivation to cover the farming period. The Rice-SDP program provides 50 percent premium subsidy to small and marginal farmers.

Table 2: Weather Index Crop Insurance Calendar

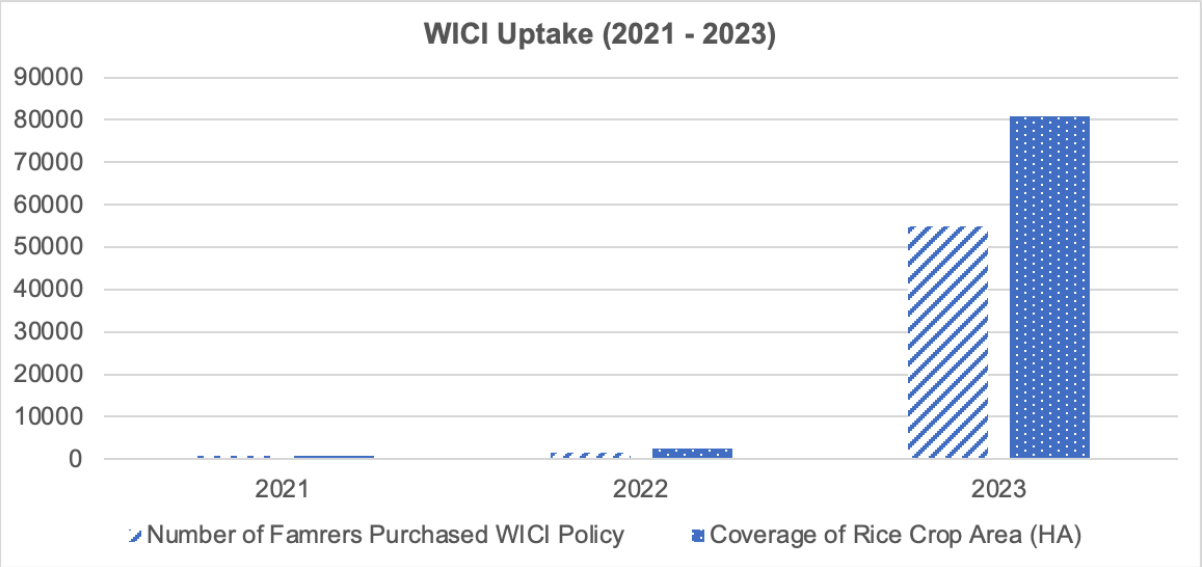
Type of planting	**Duration of crop variety**	**Insurance Coverage Date**		**Coverage Duration**
		Start	**End**	
Early (April or earlier)	105 – 120 days	1 May	31 Aug	120 days
Normal (1 May – 31 May)	105 – 120 days	1 June	30 Sep	120 days

Late (1 June onwards)	105 – 120 days	1 July	31 Oct	120 days
Early (April or earlier)	150 – 180 days	1 May	31 Oct	180 days

Source: Rice-SDP

Figure 4 shows uptake of WICI was low in the first two years of implementation. Number of farmers purchased WICI policy in 2021 was 675 covered 887 hectares of rice field. The number of farmers and coverage of rice field increased to 1,620 and 2,424 respectively in 2022. However, these figures increased greatly in 2023. The number of farmers accounted to 54,800 and coverage area expanded to 80,962 hectares. On average, farmers purchased WICI for 1.5 hectares of rice field.

Figure 4: Weather Index Crop Insurance Uptake



Source: Rice-SDP

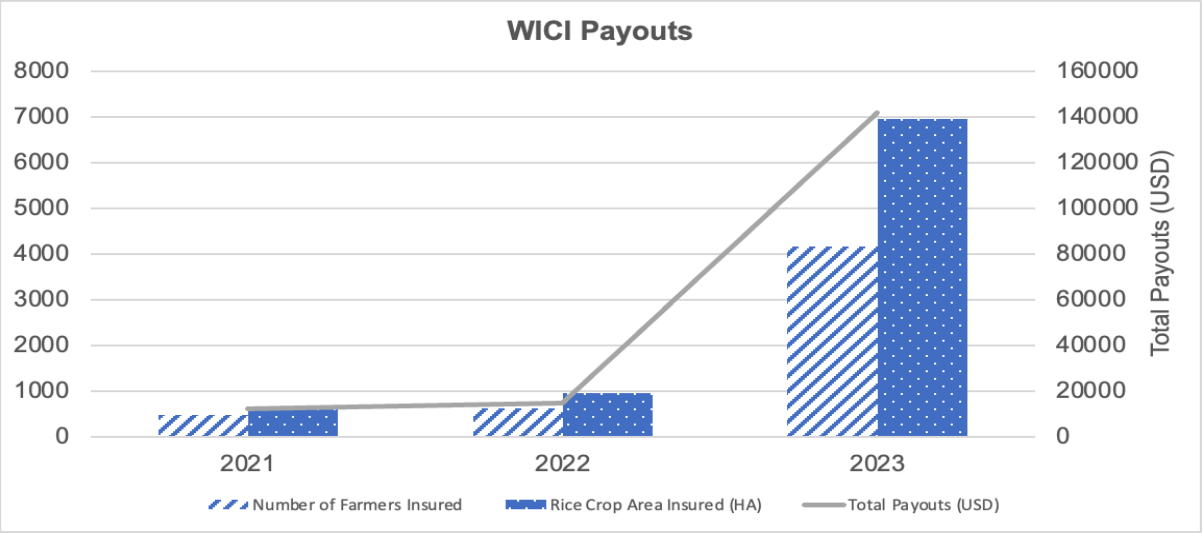
iii. Role of Crop Insurance in Climate Change Risk

Crop insurance in Cambodia provides farmers a means of transferring loss caused by extreme weathers like drought and flood to insurers. Crop insurance calendar covers potential risk of drought in the middle of wet season and flood at the end of the season. Premium rate stands at 10 percent, suggesting that, without subsidy, farmers spend on premium one-tenth of the maximum amount of money they could receive to compensate their losses due to drought and

flood. However, the 50 percent subsidy for premium can help small and marginal farmers to afford crop insurance.

According to Bunthan, Takahashi, & Izumida (2018), average farm budget was around 490 USD per hectare in Battambang province. Thus, the sum insured can recover 20 percent of the cultivation cost. Figure 5 shows that total payouts in 2023 accounted for about 141,813 USD to 4,167 farmers for 6,949 hectares of rice field affected. On average, each affected farmer received compensation of approximately 28 USD. The figure suggests that on average, farmers received about three time the premium on which they would have spent per hectare without subsidy. This ratio to comparable to China and India. Pay-outs are about three to four times what farmers paid for premium in China and India respectively (Hazell, Jaeger, & Hausberger, 2021).

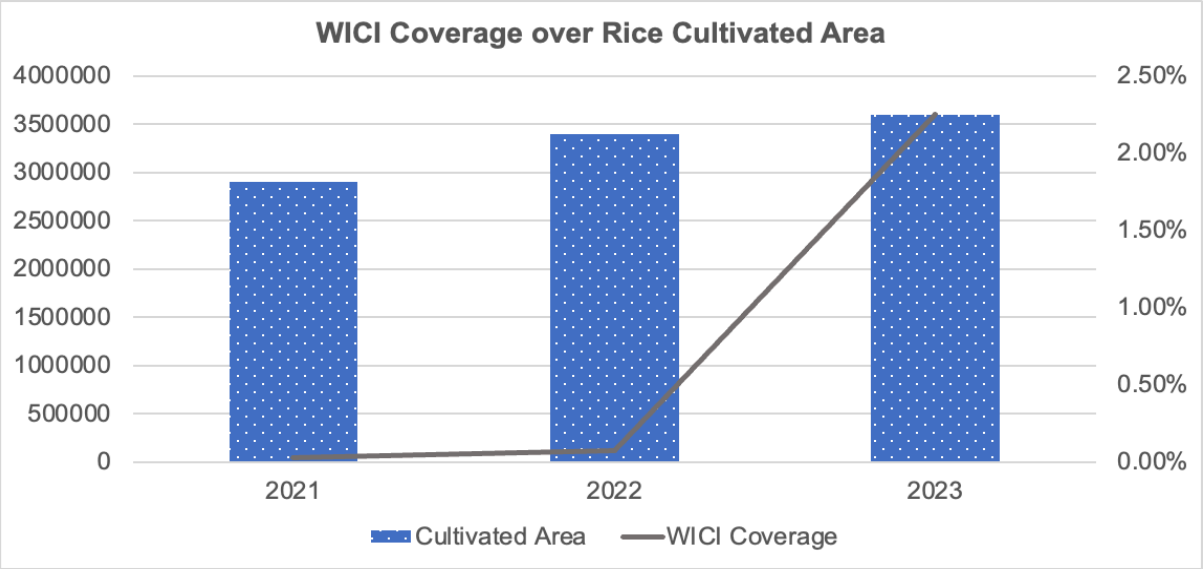
Figure 5: Weather Index Crop Insurance Payouts



Source: Rice-SDP

Figure 6 shows that Cambodia grew rice over 2.9 million hectares of land in 2021, 3.4 million hectares in 2022, and 3.6 million hectares in 2023. However, insurance coverages were marginal in the last three years. Total area insured over total rice cultivated land was less than one percent in 2021 and 2022 but increased to about 2 percent in 2023.

Figure 6: Weather Index Crop Insurance Coverage over Rice Cultivated Area



Source: Author's calculation based on data from GDA/MAFF and Rice-SDP

IV. Recommendation

The current study attempts to provide early analysis of crop insurance development and its role in climate change risk in agriculture in Cambodia. Over the course of seven years, crop insurance in Cambodia is in the developing phase, driven by private sector with significant support from development partners. Therefore, recommendations are provided below to contribute to sustainable development of crop insurance and enhancing its role in climate risk management in agriculture.

- **Trust Building:** not many Cambodian rural farmers have experienced crop insurance thus trust building is important for them to buy crop insurance. Crop insurance implementation must be transparent and regulated especially in term of compensation in order to build confidence among farmers on the product.
- **Public-Private Partnership:** private sector involvement alone is not enough to sustain crop insurance implementation in Cambodia. While development partners have been supporting crop insurance initiative, Cambodian government has a role to play to help provide enabling environment for the initiative to grow. Successful crop insurance implementations in China and India are evident of public sector support through heavy premium subsidy. This can be an option for Cambodian government to consider. Alternatively, the government can support private sector through fiscal incentives.

- **Explore Innovative Risk Transfer Model:** Insurance-linked securities is an innovative model that involves a transfer of insurance risk to capital markets. This offers an alternative solution to transfer risk in agriculture to capital markets where investors collect premium in exchange of taking on the risk of extreme weathers like flood and drought.
- **For Further Studies:** further study should look into impact and spill-over effects of crop insurance on farmers behaviour, for example risk taking attitude, productivity, and livelihood. This will shed light on the importance of crop insurance and possible adverse effects. Farm-level analysis should be carried out to inform these objectives.

V. Conclusion

Agriculture in Cambodia, particularly in rice subsector, has been hit hard by climate change, especially natural disasters such as drought and flood. Crop insurance is a risk management mechanism for farmers to transfer risk of rice cultivation affected by drought and flood. It creates a safety net for small and marginal farmers even though its coverage remains narrow. Nevertheless, crop insurance in Cambodia is still in the developing phase, driven by private sector with significant support from development partners. This paper shed light on the development of crop insurance for rice and its role in climate risk management and calls on promoting trust building among farmers, involvement of government through public-private partnership, exploring innovative risk transfer model, and further studies to provide insight to support policy formulation.

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