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187

Research Report

Assessment of Farmers' Willingness to Pay for Bundled Climate Insurance Solutions in Sri Lanka

Mohamed Aheeyar, Upali A. Amarasinghe, Giriraj Amarnath, Niranga Alahacoon, Sangeeth Prasad and Anupa Dissanayake

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Aheeyar, M.; Amarasinghe, U. A.; Amarnath, G.; Alahacoon, N.; Prasad, S.; Dissanayake, A. 2023. *Assessment of farmers' willingness to pay for bundled climate insurance solutions in Sri Lanka*. Colombo, Sri Lanka: International Water Management Institute (IWMI). 37p. (IWMI Research Report 187). doi: https://doi.org/10.5337/2023.222

/ weather index insurance / farmers' attitudes / willingness to pay / assessment / climate resilience / crop insurance / risk transfer / climate services / seed systems / agricultural risks / disaster risk management / strategies / intervention / climate change impacts / drought / flooding / crop damage / smallholders / socioeconomic aspects / land ownership / household income / insurance premiums / gender equality / social inclusion / awareness-raising / institutions / surveys / Sri Lanka /

ISSN 1026-0862
ISBN 978-92-9090-957-6

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Acknowledgements

The authors are extremely grateful to the farming communities in the study areas for their time and for sharing information during the field survey. Officers of Agrarian Service Centers in the study areas are thanked for their contributions to various discussions held, and for sharing data and information and providing logistical support to conduct the field survey. The support provided by Surajit Ghosh (Regional Researcher - Water Risk and Data Sciences Specialist, International Water Management Institute [IWMI], Colombo, Sri Lanka) in preparing the Open Data Kit (ODK) format of the survey questionnaire is much appreciated. The authors also thank Chatura Rodrigo (Component Manager, SME Sector Development Program in Sri Lanka, Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ], Colombo, Sri Lanka), Sachith Lokugamage (Digital Transformation Advisor, SME Sector Development Program in Sri Lanka, GIZ, Colombo, Sri Lanka) and Avinandan Taron (Researcher - Investment and Institutional Analyst for Resource Recovery and Reuse (RRR) Business Development, IWMI, Colombo, Sri Lanka) for reviewing the first draft of this report and providing valuable comments and feedback.

The support provided by the research team led by Prasanna Wijesinghe of Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI), Colombo, Sri Lanka, in field data collection is greatly appreciated. Special thanks go to Mr. Malinda Seneviratne (Director, HARTI, Colombo, Sri Lanka) for the collaborative support provided.

Project

This research study was undertaken as part of the *Development of a Universal Weather Index Insurance Portal for Scaling Bundled Solutions in Sri Lanka* project implemented by the International Water Management Institute (IWMI) with funding support from Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Colombo, Sri Lanka, during the period January to June 2022.

Collaborators

International Water Management Institute (IWMI)

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Donors

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Colombo, Sri Lanka.

This publication was produced with the financial support of the European Union and the German Federal Ministry for Economic Cooperation and Development. Its contents are the sole responsibility of the authors and do not necessarily reflect the views of the EU or the Federal Ministry for Economic Cooperation and Development.

This work is partially supported by the CGIAR Initiative on Climate Resilience, which is grateful for the support of CGIAR Trust Fund contributors (https://www.cgiar.org/funders).

Contents

Acronyms and Abbreviations

ac	Acre
BICSA	Bundled Solutions of Index Insurance with Climate Information and Seed Systems to manage Agricultural Risks
FO	Farmer organization
GESI	Gender equality and social inclusion
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HARTI	Hector Kobbekaduwa Agrarian Research and Training Institute
IWMI	International Water Management Institute
KII	Key informant interview
WII	Weather index insurance
WTP	Willingness to pay

Summary

In Sri Lanka, the increasing frequency and intensity of climate-related disasters is resulting in enormous damage to crop cultivation, livestock and property. Affecting population exposure, climate-induced disasters are also jeopardizing the life and livelihoods of the people. With climate risks on the rise, a growing number of social protection and livelihood resilience tools have been tested with the aim of reducing agricultural risks. Various studies have highlighted that the lack of education and technical skills, risks inherent to agricultural investment and lack of financial literacy can hamper the adaptative capacity to climate change.

This study, supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), is based on the initial bundled climate insurance solutions pilot conducted in five districts in Sri Lanka (Anuradhapura, Vavuniya, Monaragala, Kurunegala and Ampara) in 2021. The intervention was designed to enhance agricultural resilience and production risks of diverse farmer groups. This is carried out through the roll-out of an index insurance product bundled with hybrid seeds and mobile-based weather and agronomic advisories. The objective of the project is to evaluate the scaling opportunities of bundled climate insurance choices, including product design and implementation among smallholder farmers and reduction of production risks in designing and implementing weather index insurance (WII) products. This report assesses WII with bundled choices as a risk transfer tool and farmers' willingness to pay (WTP) for WII solutions with due consideration to the diversity and heterogeneity of the farming population.

The report is informed by the findings of the research conducted in the five districts—Anuradhapura, Gampaha, Hambantota, Kurunegala and Monaragala—between April and May 2022. The survey results indicate that climate risk perception is high for majority of the farmers, but the degree of risk is variable across the areas and different segments of people. The average value of disaster-related crop damage per annum during the last 5 years equals over 25% of the total household income for 29% of the farmers. Farmers' age, gender, farming experience, levels of education, land size operated, and household income form the major factors characterizing the diversity and risk exposures. Although the majority of farmers possess a basic knowledge or awareness of climate change-related agricultural risks, they have seldom received support (technical or otherwise) from formal and informal sources. Attention to gender and social equity issues is important in the design and delivery of insurance products so that the benefits of the interventions reach the majority of the farming population; this can ensure achievement of the wider development objectives.

The majority of farmers are experiencing high or very high levels of variability in crop yield, input prices and output prices. Almost half of the farmers are willing to experiment with innovations to minimize the risks while one-third agreed that risk-taking is the way to minimize production risks and strengthen livelihood resilience. Therefore, insurance product design and the associated awareness creation must consider this dynamic to ensure sustainable interventions. Most farmers in the districts of Gampaha, Hambantota and Kurunegala report a WTP LKR 500/acre[1] of paddy land as the insurance premium, which is 1% of the sum insured. The majority of farmers in Anuradhapura and Monaragala have a WTP of up to 2% of the sum insured. About 80% of the farmers are willing to enroll in crop insurance programs, but a major inhibiting factor is a lack of trust in insurers.

Bundling insurance with farm support services is considered one of the primary strategies for transitioning insurance programs to be financially sustainable and to be upscaling. The findings indicate that about 58% of the farmers have selected the bundle with fertilizers/agrochemicals or hybrid seeds as their first choice for bundling with WII. Notably, Sri Lanka's scarcity of fertilizers during the survey period may be an influence in the farmers' preference for bundles with fertilizers.

[1] 2.47 acres = 1 ha

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Introduction

Climate-related disasters in Sri Lanka account for 96% of all types of natural disasters with respect to the number of people affected between 1974 and 2008 (DMC and UNDP 2009). Since the country is predominantly dependent on agriculture, the livelihoods of majority of the population are more susceptible to be impacted by climate-related disasters. These disasters could affect crop production in several ways—increasing the cost of cultivation by increasing irrigation costs and higher pest and disease management costs, reducing yield quantitatively and qualitatively, and contributing to a loss of secondary income during the disaster and post-disaster periods. Floods and droughts are regular events, and among the most devastating natural hazards in the country, causing enormous damage to crop cultivation, livestock and property as well as jeopardizing lives and livelihoods more than any other natural disaster. About 90% of the people affected by various disasters are either impacted by floods (48%) or droughts (42%), excluding the 2004 Asian Tsunami (Zubair et al. 2006; Chithranayana and Punyawardena 2008).

According to the Emergency Events Database EM-DAT,[2] the cumulative damage of floods and drought since 2000 exceeded USD 2.4 billion. In light of the same, adaptation to climate change and disasters (including the increased intensity of floods and drought) is necessary to mitigate the impacts. Disaster risks are unavoidable; however, they can be managed through risk transfer tools. Risk transfer through crop insurance is a major adaptation response to losses due to weather variability and associated disasters. To better encourage and empower farmers, it is important to deliver practical risk management products such as climate insurance. In this context, Sri Lanka's 2021 National Agricultural Policy (NAP) has identified the designing and adoption of weather index-based climate risk management tools as a policy action under the thematic area of climate resilience and risk management (Ministry of Agriculture 2021).

Weather index insurance (WII) is gaining attention as one such viable tool. However, it has not yet penetrated the farming community on a large scale (Carter et al. 2014, 2017; Fonta et al. 2018; Sibiko et al. 2018); only a small percentage of the agricultural population has participated in crop insurance programs. Neglecting these trends can impact socioeconomic inequities by maintaining or even aggravating them; if WII programs are not implemented with caution, there is a potential danger of excluding the poorest and most disadvantaged farming groups by design (Fisher et al. 2019).

The overall objective of this study is to assess WII with bundled choices as a risk transfer tool and farmers' willingness to pay (WTP) for WII solutions using digital surveys. The specific objectives are given below:

i. Understand farmers' constraints and barriers to the adoption of WII and bundled choices.

ii. Assess farmers' WTP for WII and bundled solutions.

iii. Study the constraints on institutions in implementing WII bundled solutions.

The 'inclusive insurance' is increasingly presented as an important component of climate agendas—including the United Nations Framework Convention on Climate Change (UNFCCC) processes, the Sendai Framework for Disaster Risk Reduction and the UNFCCC Conference of the Parties (COP21) Paris Agreement—as well as development initiatives such as the Sustainable Development Goals (SDGs) (Fisher et al. 2019). Therefore, an investigation of WII from the gender equality and social inclusion (GESI) perspective through a gendered lens is vital to understanding the barriers to inclusive WII and to better address GESI issues in WII programs.

The information presented in this report may be useful for insurance companies, development organizations and planners to design appropriate interventions for scaling as well as to target climate adaptation investments for building resilience among smallholder farmers and improving agricultural production.

[2] https://www.emdat.be/

Bundled Solutions of Index Insurance with Climate Information and Seed Systems to Manage Agricultural Risks (BICSA) Piloted by IWMI

The International Water Management Institute (IWMI) piloted Bundled Solutions of Index Insurance with Climate Information and Seed Systems to manage Agricultural Risks (BICSA)[3] in the Anuradhapura district in the 2020/21 wet season (November to February in the *Maha* season) and Ampara, Anuradhapura, Kurunegala, Monaragala and Vavuniya districts in the 2021/22 wet season. The product was designed to provide compensation to the farmers for the losses that could occur due to both low and excess rainfall. The project was rolled out in collaboration with the Department of Agrarian Development and a local insurer (Sanasa General Insurance Co. Ltd.) to improve the resilience of farming communities by promoting bundled insurance solutions. The bundle introduced in 2020/21 consisted of index-based insurance, context-specific local weather alerts disseminated twice a week (at intervals of 3-4 days) and weekly agronomic advisories provided throughout the wet season. In 2021/22, in addition to the above, the bundle was also supplemented with drought-tolerant maize and hybrid seeds such as rice varieties. The provision of weather and agronomic advisories was designed to build the farmers' climate resilience and capacity to understand climate variation, as well as enhance knowledge of standard agronomic practices. In summary, the BICSA product has been tested with thousands of farmers and a payout of over LKR 3.6 million has been compensated to the eligible farmers.

Study Sites, Data and Methodology

This report is based on findings of a structured questionnaire survey (see Annex 1) conducted in five districts—Anuradhapura, Gampaha, Hambantota, Kurunegala and Monaragala—during April-May 2022. The selected study villages are illustrated in Figure 1. The field survey was carried out by a team of researchers from HARTI[4] under the supervision of the IWMI research team. The enumerators were provided with the necessary training before conducting the field data collection. The survey was conducted using an open-source mobile data collection platform called 'Open Data Kit (ODK)'. A pilot survey was conducted in the Maho Divisional Secretariat Division, Kurunegala, before implementing the large survey. The survey results are also complemented by the information collected through Key Informant Interviews (KIIs) with officials from the Department of Agrarian Development and the farmer organization (FO) leaders.

The sample survey was conducted among 252 farmers from the selected villages in the five districts. Sample frames were prepared with the assistance of FOs in the respective areas. The sample households were selected randomly but with attention to include female farmers, small and marginal farmers, and landless farmers. The details of the selected sites and the rationale are given in Table 1.

[3] https://www.iwmi.cgiar.org/2019/09/solutions-for-those-managing-risk-in-climate-disasters/
[4] HARTI was selected to be the third-party data collection entity under a competitive selection process.

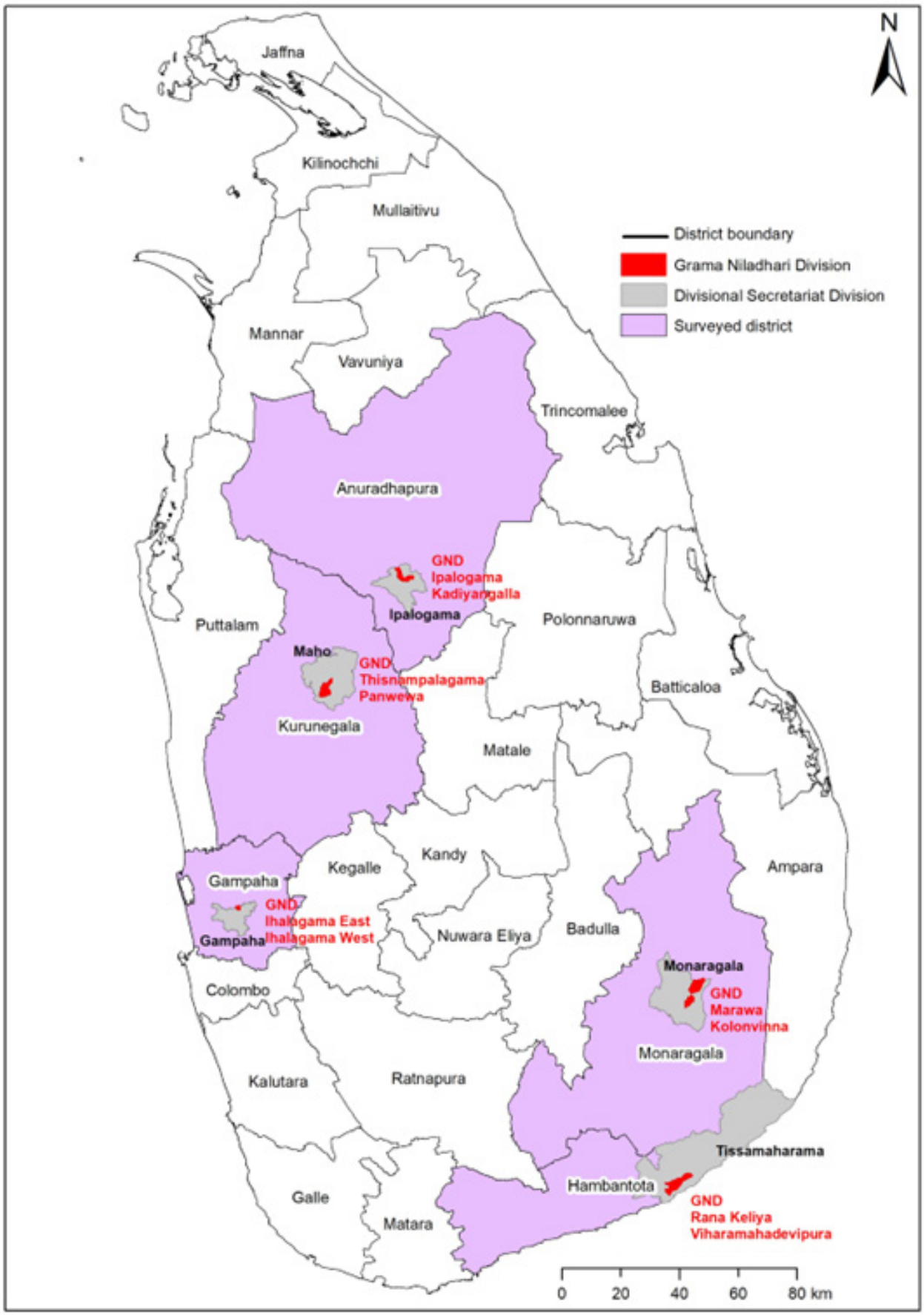

Figure 1. Drought hazard map derived using the composite Integrated Drought Severity Index (2001–2019).

Source: IWMI.

Note: GND – Grama Niladhari Division.

Table 1. Study sites and sample sizes.

District	Divisional Secretariat Division	Grama Niladhari Division	Sample size	Climatic zone/ water regime
Kurunegala	Maho	1. Thisnampalagama 2. Panwewa	50	Dry/intermediate zone, rainfed/minor irrigation system
Gampaha	Gampaha	1. Ihalagama East 2. Ihalagama West	50	Wet zone, major/minor irrigation system
Anuradhapura	Ipalogama	1. Ipalogama 2. Kadiyangalla	50	Dry zone, minor irrigation system
Monaragala	Monaragala	1. Kolonvinna 2. Marawa	50	Dry zone, rainfed/minor irrigation system
Hambantota	Tissamaharama	1. Rana Keliya 2. Viharamahadevipura	52	Dry zone, major irrigation system

Initially, farmers' preferences for willingness to pay for crop insurance was explored and followed by a two-stage sampling process to assess the preferences for insurance and premiums. Of those willing to pay, the first stage probed farmers' preferences for different premiums, which include 1%, 2%, 5% or 8% of a sum insured (LKR 50,000), i.e., LKR 500, LKR 1,000, LKR 2,500 and LKR 4,000. The bid values were determined using the KIIs and the premium values of past insurance interventions. The second stage ascertained any deviations preferred from the premiums selected. The sequence to explore the deviations is listed below:

- If the response for the second stage is LKR 500, a bidding question followed asking whether the farmers prefer to pay the next level of premium of LKR 1,000. Those who do not prefer LKR 1,000 were then asked whether they prefer to pay LKR 600, LKR 800 or LKR 900.

- If the response for the second stage is LKR 1,000, a bidding question followed asking whether they prefer to pay LKR 2,500. Those who do not prefer LKR 2,500 were then asked whether they prefer to pay LKR 1,500, LKR 2,000 or LKR 2,250.

- If the response for the second stage is LKR 2,500, a bidding question followed asking whether they prefer to pay LKR 4,000. Those who do not prefer LKR 4,000 were then asked whether they prefer to pay LKR 3,000, LKR 3,500 or LKR 3,750.

- If the response for the second stage is LKR 4,000, a bidding question followed asking whether they prefer to pay LKR 4,200, LKR 4,500 or LKR 4,750.

We used a sequential logit model to assess the factors influencing their preferences, because the willingness to pay for increased premium was probed in a sequential manner. The dependent variables in logit regressions in stages 1, 2 and 3 are given below:

Stage 1: Y_1 – Willingness to pay for crop insurance (= 1 if yes, = 0 (zero) if no)

Stage 2: Y_2 – Preference for maximum premium (= 1 if premium is LKR 500, = 2 if premium is LKR 1,000, = 3 if premium is LKR 2,500 and = 4 if premium is LKR 4,000)

Stage 3: Y_{3i} – Deviation of preferences for iI = 1(LKR 500), 2(LKR 1,000), 3(LKR 2,500), and 4(LKR 4,000)

Y_{31} = 1 if premium is LKR 600, = 2 if premium is LKR 800, and = 3 if premium is LKR 1,000

Y_{32} = 1 if premium is LKR 1,500, = 2 if premium is LKR 2,000, and = 3 if premium is LKR 2,500

Y_{33} = 1 if premium is LKR 3,000, = 2 if premium is LKR 3,500, and = 3 if premium is LKR 4,000

Y_{34} = 1 if premium is LKR 4,200, = 2 if premium is LKR 4,500

The influencing factors of preferences (or independent variables) include categorical and continuous variables. The categorical variables are farmers' gender (male, female), education (no education, primary, secondary and post-secondary), farming type (part-time or full-time), water source (only rainfall, or rainfall and irrigation), access to credit (yes or no), experience

of insurance (yes or no), and the primary disaster (floods, droughts, high rainfall, variable rainfall, and pest attack or plant diseases). Additionally, another categorical variable indicates the districts in different climatic zones (1 = Gampaha in the wet zone, 2 = Kurunegala in the intermediate zone, 3 = Monaragala in the intermediate and dry zones, and 4 = Anuradhapura and 5 = Hambantota in the dry zone). The continuous independent variables are farmers' age, total income, land area, the land extent with legal rights, and average crop damage.

The model for the logit/multinomial logit model for J outcomes and N individuals/cases are given in Equation (1):

$$P(Y_{ij} = 1) = p_{ij}(x_i) = \frac{exp(\alpha_j + \beta'_j X_i)}{1 + \sum_{h=1}^{J-1} exp(\alpha_h + \beta'_h x_i)} \text{ for } i=1,..,N,\ j = 1,..,J. \quad (1)$$

where: $Y_{ij} = 1$, when j^{th} outcome occurs for i^{th} individual, and equals 0 otherwise; p_{ij} is the probability or risk of outcome j.

Socioeconomic Features of the Farmers: An Inclusive Perspective

From an intersectional perspective, the promotion of WII invites due consideration of several farmer identities such as race, age, disability, class, ethnic groups and levels of literacy, etc., in accessing and benefitting from such interventions (Aheeyar et al. 2020; Darby 2021). In addition, legal impediments such as lack of documents to demonstrate land ownership or tenancy, and the reluctance of female and small-scale farmers to participate in community mobilization meetings also hinder inclusive insurance interventions (Hellin and Fisher 2018). In this regard, the survey expounds on equity issues that should be considered for socially inclusive WII interventions. This is critical in the context of index insurance being noted to consider the farming community as a 'homogeneous group' and to be unobservant of equity matters (Müller et al. 2017; Hellin and Fisher 2018; Johnson et al. 2019).

The survey findings show that about 31% of the respondents are female and 85% of the farmers are involved in agriculture as full-time employment. The source of water for cultivation is seasonal rainfall for 38% of the farmers; the others depend on irrigation water from major or minor reservoirs, despite problems in reliability for many minor irrigation farmers. Therefore, climate risk is high for majority of the farmers, but the degree of risk is variable across the areas. The majority of farmers are over 45 years of age; young farmers comprise less than 20% of the total farmers (Figure 2). The findings also reveal that the mean value of the farming experience is 13 years with a standard deviation of 2 (Table 2). Over 80% of the total farmers have more than 15 years of farming experience.

The findings on education levels indicate that all the farmers in the study areas are literate and able to read and write. While the majority have received schooling up to secondary levels, there are differences in education levels (Figure 2). Lower levels of educational achievements result in difficulties in understanding the WII product. According to previous research, the level of financial literacy of the farming community is one of the key elements determining access to index insurance and can accelerate purchasing by improving the understanding of index insurance (Gine et al. 2013; Amare et al. 2019).

A little more than 20% of the farmers have a monthly household income of less than LKR 10,000,[5] while 37% receive more than LKR 75,000 (Figure 2). The income data also indicate that about 36% of the farmers are fully dependent on lowland cultivation for their household income, while over 50% of the households generated more than 50% of their income from lowland cultivation (Figure 3). Therefore, lowland paddy cultivation is the primary income source of majority of the farmers; any unexpected income loss can have negative consequences on their day-to-day lives.

[5] USD 1 = LKR 319.44 in April 2022.

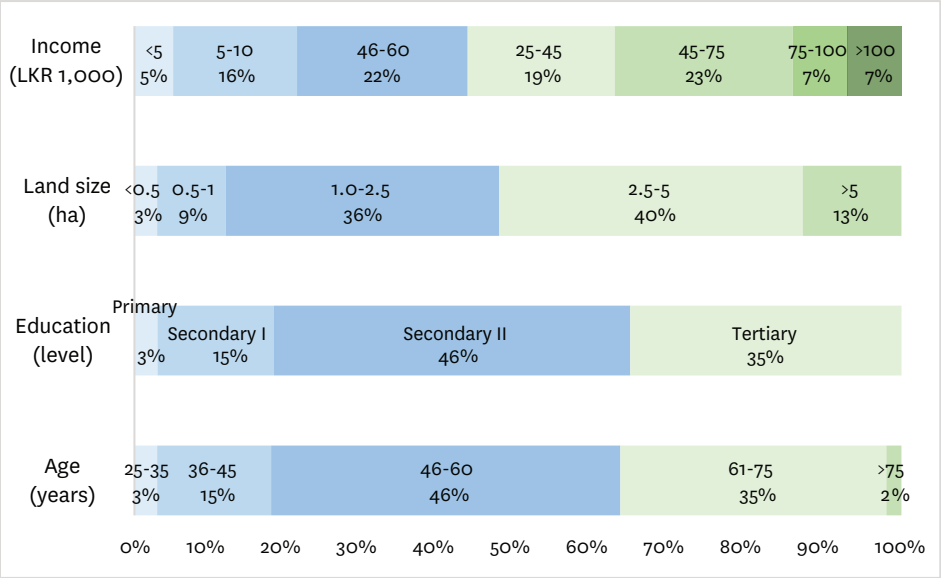

Figure 2. Age, education, land size and income of sample farmers.
Source: Authors' survey, 2022.

Table 2. Summary of descriptive statistics – age, education, land size and income of sample farmers.

Variable	Average	Standard deviation	Range
Age (years)	56	11	25–85
Education (years)	10	3	1–17
Land size owned (acres)	2	2	0.14–10
Total land including tenure lands (acres)	3.18	3.155	0.25–25.5
Income (LKR/month)	41,688	48,786	400–380,833

Source: Authors' survey, 2022.

The relationship between household income and insurance adoption has been reported in many studies. According to Carter and Chiu (2020), the majority of the early insurance adopters are well-off farmers. Farm income, household savings, and the size of the family have also been observed to have a significant positive impact on the demand for purchasing insurance (Ntukamazina et al. 2017). However, farmers' desire and ability to pay may not always be synonymous: wealthier farmers capable of affording insurance schemes may possess other means of cheaper self-insurance, while poorer farmers may lack the necessary resources to avail of its benefits (Binswanger-Mkhize 2012). These cases highlight the significance of considering context-specific socioeconomic factors (wealth and other intersectionality) to achieve social equity in index insurance schemes.

About 82% of the farmers have legally owned land parcels, 18% are pure tenants and 23% operate both owned land and tenure/encroached land without any legal documents (Figure 4). The total land operated by the farmers including owned and tenure lands varies from 0.25 to 25.5 ac with an average of 3.186 ac (Table 2). The majority of landowners own less than 2.5 ac of land, with 44% of the farmers owning more than 1 ha. About 60% of landless/tenant farmers operate on less than 1 ha of land. A study (Ntukamazina et al. 2017) revealed that ownership and the land size operated have a significant positive impact on the demand for purchasing insurance. Similarly, Hellin and Fisher (2018) support the notion that legal impediments such as documents to demonstrate land ownership or tenancy create substantial barriers in accessing index insurance. Consequently, if the

land ownership document is an eligibility criterion for insurance enrollment, then an appropriate approach is vital to accommodate smallholders and landless farmers in insurance interventions.

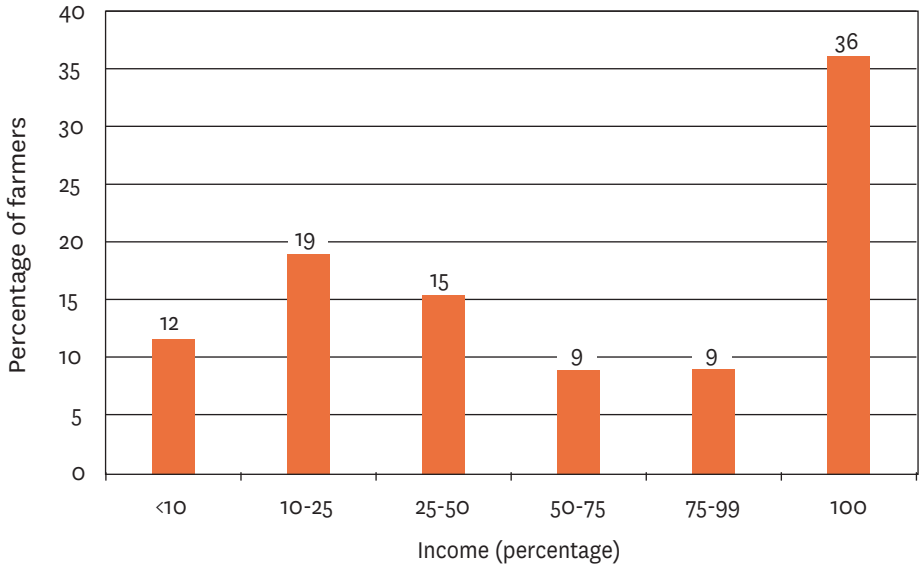

Figure 3. Percentage of income from lowland cultivation to total household income.
Source: Authors' survey, 2022.

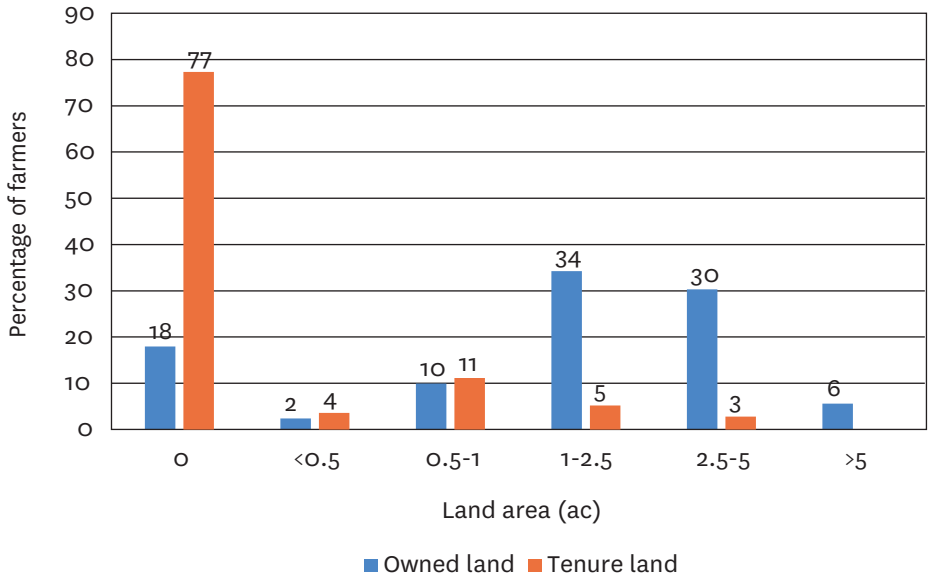

Figure 4. Land extent operated by farmers.
Source: Authors' survey, 2022.

Climate Risks and Risk Perceptions

While the farmers in the study area experience various climate-related disaster risks (droughts, floods, pest and disease outbreaks, and excess rains), the majority note floods and droughts to be the most important disasters followed by damage caused by wildlife to their crops (Figure 5). Pest and disease attacks were identified as the second most important risk.

Farmers perceived the range of disaster-related crop damages during the last 5 years to vary from LKR 10,000 to over LKR 150,000 per year with an average value of LKR 61,693. The majority have incurred a loss of LKR 20,000 to 60,000 (Table 3). Findings show that the incurred loss annually is a substantial amount equal to over 25% of the total household income for 29% of the farmers.

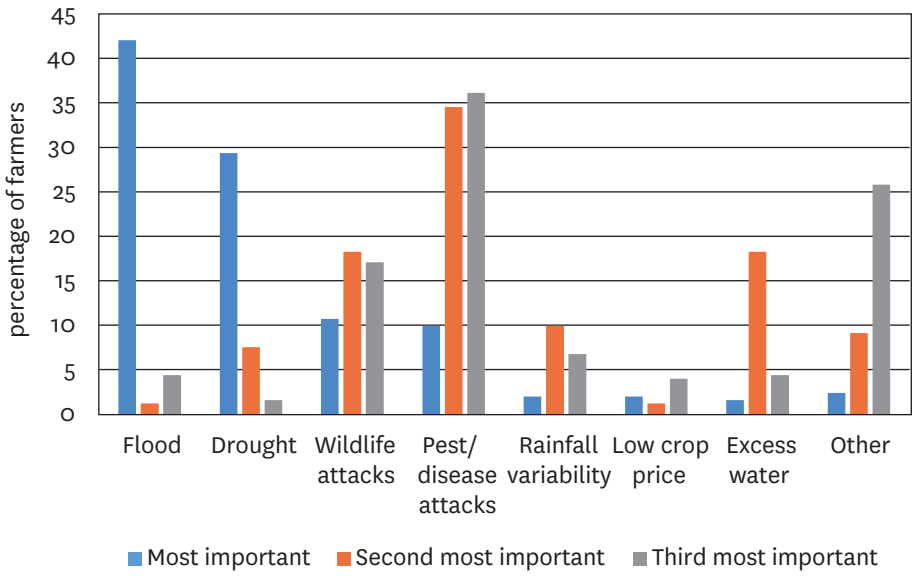

Figure 5. Major disaster risks as prioritized by farmers.
Source: Authors' survey, 2022.

Table 3. Average cost of the damage caused by extreme weather events during the last five years (LKR/year).

Average value of damages (LKR)	Percentage of farmers (N=252)
<10,000	2
10,000-20,000	5
20,000-40,000	35
40,000-60,000	24
60,000-100,000	19
100,000-150,000	9
>150,000	5
Sample mean–61,693 Standard deviation–89,396 Range–2,000 to 1 million	

Source: Authors' survey, 2022.

In this context, the majority of farmers possess a basic knowledge or awareness of climate change-related risks to agriculture (Figure 6). However, many have not received any technical or other type of support either from formal sources (extension services/disaster management officers, print and electronic media) or informal networks (friends, relatives or informal groups) during the last 12 months. Therefore, farmers need technical support and tools to transfer disaster-related risks.

As per their past experience, farmers were asked to rate the level of potential risks to farm income caused by yield variability, input price variability and output price variability. The risk perception of majority of the farmers was very high or high (Figure 7), indicating the enormous risk exposure in crop cultivation for the farmers living in these areas.

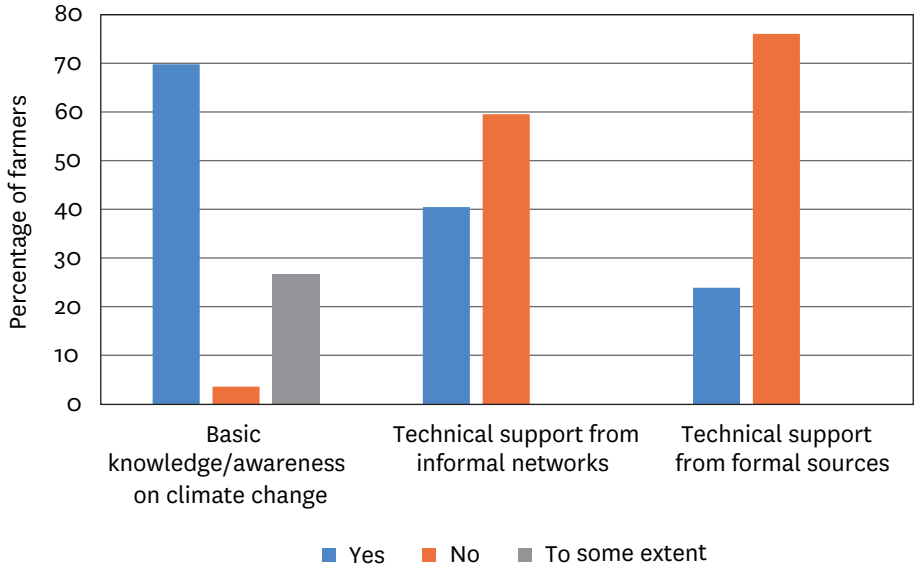

Figure 6. Awareness of climate change and technical support received.
Source: Authors' survey, 2022.

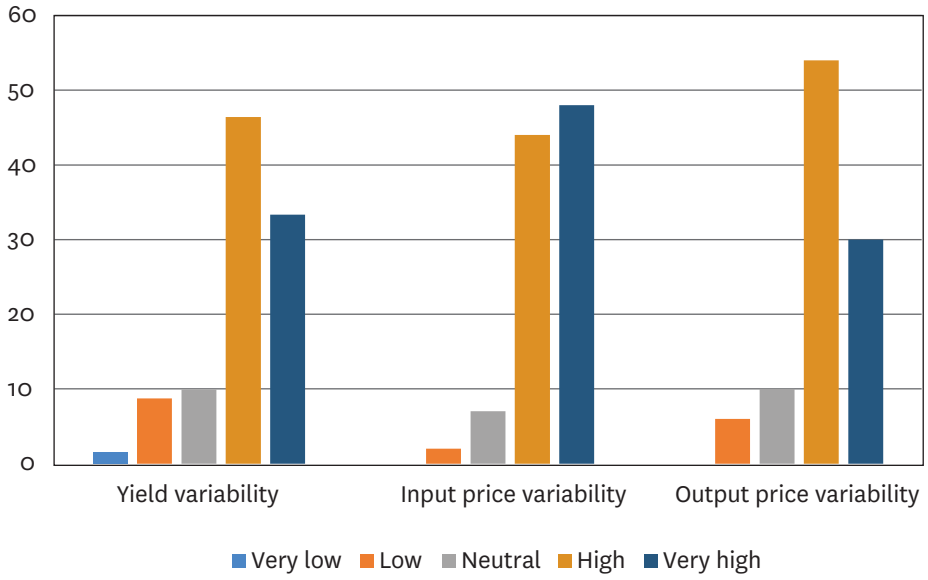

Figure 7. Levels of potential risks to farm income by yield, input price and output price variability.
Source: Authors' survey data, 2022.

Farmers' Attitudes Towards Climate Risks

In the context of a very high or high level of risk exposure, the study attempted to understand farmers' attitudes towards climate risks by examining their perceptions of the following statements:

i. Willingness to experiment with bundled solutions, e.g., agricultural inputs, climate services, etc.

ii. Need to take risks to realize higher returns.

iii. The only way to make money is by taking more risks.

The findings (Table 4) reveal that about 35–40% of the farmers agree or strongly agree with the statements while a similar number of farmers neither agree nor disagree (neutral).

Table 4. Farmer attitudes towards risks (percentage of perceptions).

Perception	Wish to experiment with innovations	Need to take more risks to realize higher returns	Only way to make money is to take more risks
	Percentage of farmers (%)		
Strongly disagree	1	0	1
Disagree	10	23	23
Neutral	41	41	36
Agree	46	34	39
Strongly agree	2	2	2

Source: Authors' survey, 2022.

Experiences of Past Crop Insurance Schemes as a Risk Transfer Tool

According to the survey findings, about 60% of the farmers are aware of past crop insurance schemes operated in their areas/vicinities, but only 36% have insurance experience.[6] Among the farmers with insurance experience, 92% had indemnity insurance experience while the remaining had index insurance or both indemnity and index insurance experience. Notably, Takahashi et al. (2019) argue that the propensity of buying insurance schemes is greater among users who have bought them once due to their familiarity with the product.

About 79% of the farmers have expressed their willingness to purchase insurance for crop cultivation, while 12% were indecisive. The major reasons for the willingness to invest were to transfer risk in crop cultivation to a third party and the belief that crop insurance is a good way of securing income during disasters (Figure 8). The primary reason expressed by unwilling farmers is a lack of trust in insurers (Figure 9). Akter et al. (2015) and Greatrex et al. (2015) found that farmers' preference for insurance is related more to their trust in insurers. Another reason noted by the unwilling farmers was the payout being very small. Takahashi et al. (2019) similarly noted the hesitance in joining insurance schemes again after insurance either fails to trigger sufficient payouts or is impeded. Therefore, insurance product design and the associated awareness creation should consider this to ensure sustainable interventions.

[6] Previous insurance programs are mainly the WII pilot rolled out by IWMI in 2021 and the crop insurance programs implemented by the Agriculture and Agrarian Insurance Board.

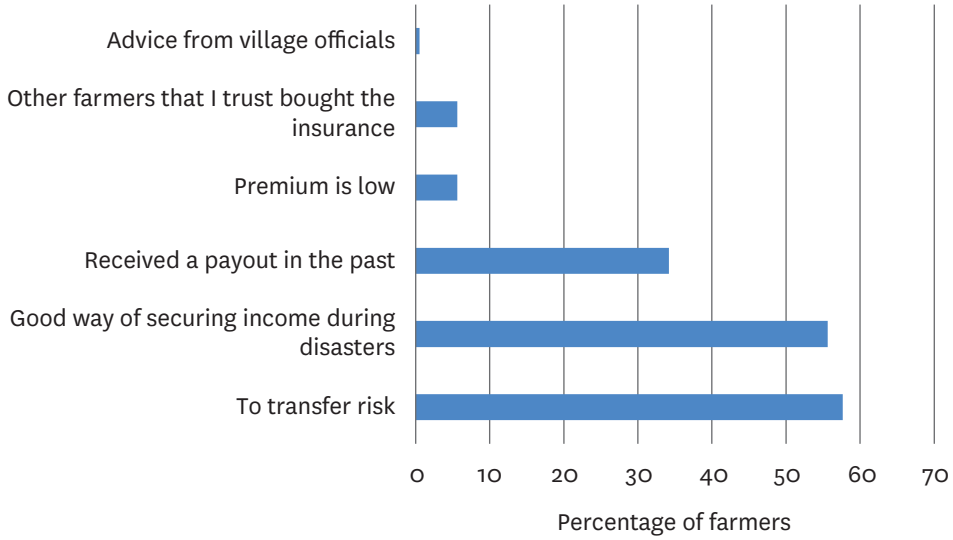

Figure 8. Reasons for willingness to enroll in crop insurance schemes in the forthcoming seasons.
Source: Authors' survey, 2022.

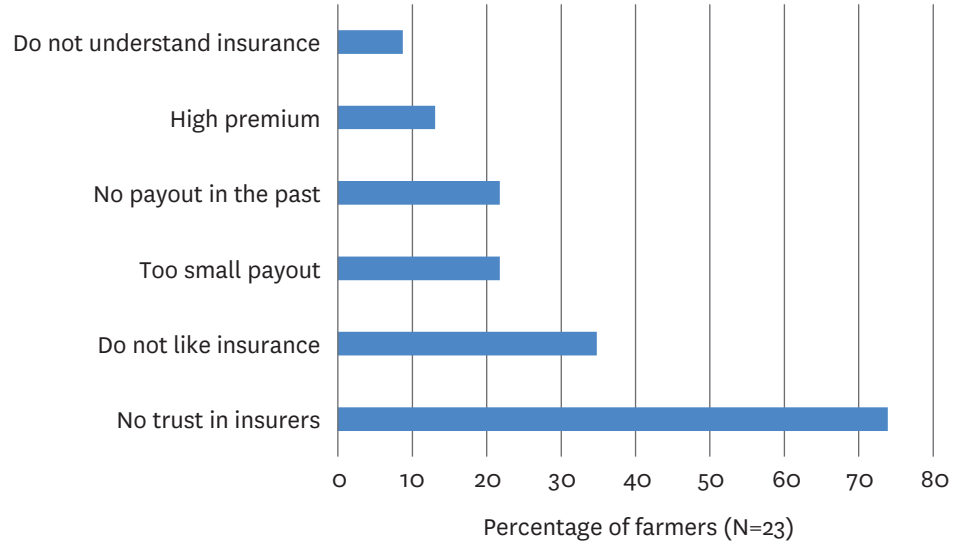

Figure 9. Reasons for unwillingness to engage in crop insurance programs.
Source: Authors' survey, 2022.

Willingness to Pay for Crop Insurance

The estimates of willingness to pay (WTP) indicate the economic value of a good for an individual while providing crucial information for assessing the economic viability of projects, policy alternatives, financial sustainability and designing socially equitable subsidies (Brookshire and Whittington 1993). There are several valuation techniques to measure WTP for index insurance products. Of these, the Contingent Valuation Method (CVM) is the most common approach adopted in recent studies on index insurance. The CVM uses a carefully designed questionnaire (Annex 1) to elicit WTP value for index insurance from the respondents.

Figure 10 shows farmers' preferences for crop insurance in different stages with sample sizes. About 86% of the surveyed farmers are willing to pay for crop insurance. The choice for the maximum premium among those who would pay for insurance is LKR 500 for 65% and LKR 1,000 for 32%. Only 3% opted to pay LKR 4,000, while none chose the LKR 2,500 option. The farmers who had opted to pay LKR 4,000 had the past experience of paying a premium of 8% of the insured value.

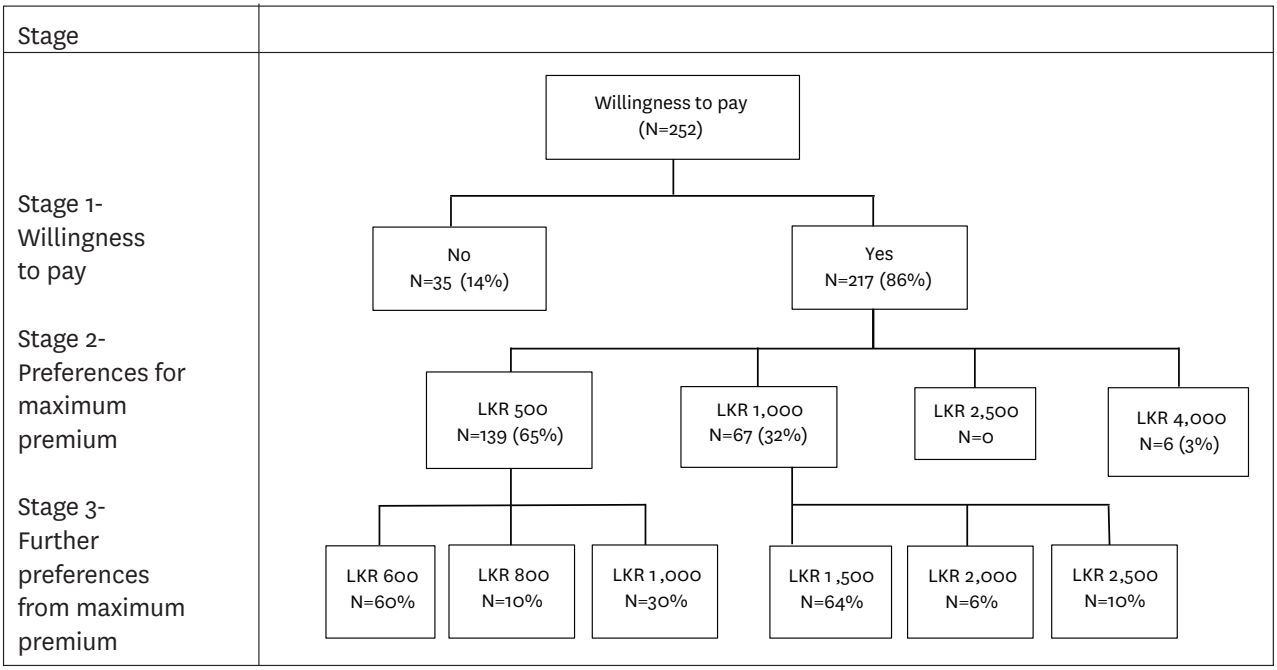

Figure 10. Sequential logit model.
Source: Sample survey, 2022.
Notes: USD 1 = LKR 360 in June 2022 (at the time of the survey).

The summary results of the survey across the five districts have been illustrated in Table 3. Some of the key disaster-related observations of the study areas are given below:

- Almost all farmers in the Gampaha and Hambantota districts perceived floods as the primary disaster since Gampaha is located in the wet zone, while selected villages in the Hambantota district are fed by a major irrigation scheme.

- Floods are also the primary disaster for the majority in the Monaragala district, but 28% of the farmers also consider droughts to have impacts.

- Farmers in Anuradhapura district suffer from multiple disasters that include excess rainfall, rainfall variability, drought, and pest and disease attacks.

- Droughts and pest and disease attacks are noted to be the major disasters in the Kurunegala district.

Most farmers prefer to pay for crop insurance in all districts. Of those willing to pay, the first response of preferred premium was LKR 500 or LKR 1,000. However, no farmers are willing to pay a premium of LKR 2,500. Only six farmers, three each from Monaragala and Hambantota districts, identified LKR 4,000 as their preferred premium. These six farmers were prompted for their preferences for paying a higher bid of LKR 4,200 and LKR 4,500 but opted to pay LKR 4,000. These are full-time farmers operating large landholdings under irrigation (Table 5). The small sample size prevented a logit/multinomial logit analysis from being conducted for this group.

Stage 1 of the sequential logit regression (Table 6, columns 2 and 3) shows the following:

- Several factors (gender, age, education, water source, farmer type, total land) positively influence WTP for crop insurance. However, only gender has a statistically significant relationship.

- Few factors (prior insurance experience, land with legal rights, and crop damage) have a negative influence, but without statistically significant coefficients.

- Among the disasters, droughts and pest attacks have a bigger influence on WTP for insurance.

- Among the locations, farmers in the Gampaha district have a less positive response to WTP than those in the other districts. This is largely due to the majority being part-time farmers in the urbanized wet zone region and therefore not practicing high-input paddy cultivation.

Table 5. Summary results of the survey across districts.

Variable	Gampaha	Kurunegala	Monaragala	Anuradhapura	Hambantota	Total
Sample size (N)	50	50	50	50	52	252
Willingness to pay[a] - %	74	90	92	80	94	86
- LKR 500	69	84	36	47	86	65
- LKR 1,000	30	16	57	53	8	32
- LKR 4,000	0	0	7	0	6	3
Gender - Male (%)	82	58	72	60	75	69
Education (%)						
- Primary	0	10	12	24	12	12
- Secondary	90	90	86	72	88	85
- Post-secondary	10	0	2	4	0	3
Farmer type - full-time (%)	36	90	84	94	94	80
Water source - irrigation (%)	62	62	30	58	100	63
Access to credit - Yes (%)	70	24	54	80	63	58
Insurance experience - Yes (%)	44	24	44	40	29	36
Primary disaster (%)						
- Floods/excess rainfall	100	20	66	34	100	64
- Droughts	0	38	28	20	0	17
- Rainfall variability	0	34	0	20	0	11
- Plant diseases/pest attacks	0	36	0	26	0	8
Farmers' age (years)	54	58	51	50	60	56
Total land size (ha)	2.07	2.75	4.13	3.16	3.72	3.17
Land area with legal rights (ha)	1.22	2.14	2.41	2.45	1.76	1.99
Farming experience (years)	27	33	31	25	33	30
Total monthly household income (LKR)	60,598	21,876	48,217	48,986	31,903	
Annual average crop damage in the last 5 years (LKR)	60,440	52,620	54,332	75,616	54,634	59,489

Source: Authors' survey, 2022.

Note: [a] WTP expressed is based on the sum insured value for one acre of paddy cultivation.

The sequential logit model assesses the WTP for increased premium in each stage. The second stage logit regression shows a more detailed description of factors influencing the WTP for higher premium preferences. This analysis included only those who responded positively to WTP in the first stage. Due to insufficient data, we included only two preferences (LKR 500 and LKR 1,000) in a binary logit analysis. Results (Table 6, columns 4 and 5) indicate the following:

- Farmers with secondary and post-secondary education compared to farmers with primary education, and farmers with land with legal rights compared to tenant cultivators, have significantly higher odds of selecting LKR 1,000 for WTP than LKR 500. Based on a study conducted in India, Senapati (2020) also recommended that rainfall insurance schemes should take into consideration the education and awareness level of the households in the designing of the product.
- Farmers with large landholdings, prior insurance experience, and experiencing higher rainfall than floods have a negative influence on WTP values and hence have lower odds of selecting LKR 1,000 for WTP than LKR 500.
- Monaragala and Anuradhapura districts have significantly higher odds than the Gampaha district of choosing LKR 1,000 for WTP than LKR 500.

The third stage logit analysis assesses the potential deviation of premium from the first preference in the second stage. An adequate number of observations for the logit analysis are available only when LKR 500 premium was selected in the second stage. The application of multinomial logit analysis for this group shows that none of the independent variables are significant (non-significant chi2) for explaining the alternative premiums selected (LKR 1,000, LKR 800 or

LKR 600) over the LKR 500 premium level. However, the experience of insurance has a statistically significant influence on the selection of LKR 1,000 after the initial choice of LKR 500.

Table 6. Factors influencing the amount that farmers are willing to pay – Results of sequential logit analysis.

Dependent variable – Willingness to pay for insurance						
	Stage 1 WTP for insurance Y1 = 1 if Yes Y1 = 0 if No		Stage 2 WTP premium (if $Y_1 = 1$) $Y_2 = 0$ if LKR 500 $Y_2 = 1$ if LKR 1,000		Stage 3 WTP premium (If Y_2 = LKR 500); $Y_{31} = 1$ if LKR 600; $Y_{31} = 2$ if LKR 800; $Y_{31} = 3$ if LKR 1,000	
Explanatory variables	Coefficients	Odds ratio	Coefficients	Odds ratio	Coefficients	Coefficients
	C1	C2	C3	C4	C5 LKR 600- LKR 800	C6 LKR 600- LKR 1,000
Constant	-0.56	0.57	-2.75	0.06	-30.6	1.13
Farmer gender (female)						
- Male	1.45*	4.29*	0.57	1.77	0.40	0.10
Education (primary)						
- Secondary	0.33	1.38	1.27***	3.58***	16.7	0.83
- Post-secondary	1.27	3.58	2.20***	9.09***	39.0	19.5
Water source (rainfall)						
- Irrigation	0.63	1.98	0.51	1.66	-0.03	0.04
Farmer type (part-time)						
- Full-time	0.51	1.66	-0.28	0.75	16.6	-0.13
Access to credit						
- Yes	0.44	1.55	0.43	1.54	0.39	-0.81
Insurance experience						
- Yes	-0.60	0.54	-1.26*	0.28*	0.88	1.63*
Location (Gampaha=0)						
- Kurunegala	1.83	6.24	-0.15	0.10**	-1.45	-1.24
- Monaragala	1.83	6.28	2.43*	0.03*	-1.53	-1.73
- Anuradhapura	1.08	2.95	2.18**	0.09*	-0.49	-0.69
- Hambantota	1.50	4.49	-1.20	0.01*	-0.37	-0.54
Primary disaster (floods)						
- Droughts	0.25	1.72	0.002	0.85	2.27	-0.84
- Rainfall variability	-1.24	0.35	-0.27	0.14	1.11	0.47
- High rainfall	-0.74	0.54	-1.90***	0.76	1.61	0.69
- Plant diseases/pests	0.26	1.48	-0.19	0.81	-14.9	-1.50
Farmer age	0.003	1.00	0.01	1.01	-0.05	-0.04
Total income (in LKR '000)	-0.001	0.99	0.0001	1.00	-0.02	-0.006
Total land (ha)	0.01	1.01	-0.18***	0.83***	-0.42	-0.05
Land with legal rights	-0.27	0.97	0.32**	1.37**	0.39	0.24
Crop damage (in LKR '000)	-0.0001	0.99	0.0004	1.00	-0.0001	-0.003
Farming experience (years)	-0.01	0.98	0.03	0.97	0.004	0.02
PR > chi^2	0.04		0.000		0.12	
Pseudo R^2	0.17		0.28		0.26	
Hosmer-Lemeshow goodness of fit	0.90		0.23			
Sensitivity P (+/ WTP=1)	98%		63			
Specificity P (-/ WTP=0)	20%		91			
Correctly classified (%)	87%		83			

Source: Authors' survey, 2022.

Notes: *, ** and *** indicate 0.01, 0.05 and 0.1 probability significance levels, respectively.

Logit regression analysis of the WTP of farmers in Gampaha and Hambantota—districts where flood is the primary disaster—shows that gender (male over female), education (secondary and post-secondary education over primary education) and water source (irrigation over rainfall) have a significant positive influence on WTP. Other variables have no statistically significant influence.

The survey results highlight the significant influence of gender on farmers' WTP for crop insurance, irrespective of the type of primary disasters they experienced. However, factors such as the size of landholding, absence of legal land ownership, and prior insurance experience describe a lower propensity for choosing a higher premium. However, the influence of land size on flooding as a major disaster is not significant. The negative influence of prior insurance experience perhaps indicates farmers' lack of trust in dealing with insurance companies in the past. Land tenure is important in deciding the insurance premium, with landowners often opting for higher premiums. The tendency of large farmers to select low premiums may be informed by their production levels being sufficiently large enough to compensate for the disaster-induced losses or having to earmark a large amount as insurance premiums.

Secondary or post-secondary education and legal ownership of lands are significant factors positively influencing higher premiums. For the farmers in Kurunegala, Monaragala, and Anuradhapura districts, mixed disasters are prevalent and the vulnerability to disasters is quite high. A logit analysis of the farmers' responses in these three districts shows a positive and significant relation between the preference for crop insurance for gender (male over female) and landholding size. A positive correlation of farm size with WTP for crop insurance in vulnerable areas has also been reported in many past literature (Arshad et al. 2016; Islam et al. 2021).

Preferences for Bundled Choices and Willingness to Pay for Different Bundles

Bundling insurance with farm support services has been observed to be one of the primary strategies for transitioning insurance programs from donor-funded pilot stages to financially independent commercial models (Binswanger-Mkhize 2012). It is also considered an integrated risk management strategy. Carter and Chiu (2020) express that bundling risk management instruments along with index insurance schemes can create a more effective product. As Adegoke et al. (2017) explain, bundling insurance schemes with farm inputs such as seeds and credit facilities, etc., has effectively garnered farmers' attention and persuaded them to purchase insurance products. Simultaneously, Makaudze (2018) suggests that bundling insurance with agricultural inputs such as credit facilities, seeds and fertilizers can intensify the adoption of WII products.

Ward et al. (2020) found that the uptake of bundled insurance is comparatively higher than standalone insurance as the bundled product is not subsidized with monetary stimulus. For example, index-based livestock insurance bundled with a credit facility was implemented in Ethiopia; it was advantageous for underprivileged pastoralists to be a part of the index insurance (Amare et al. 2019). In a separate case, bundling insurance with credit yielded a return 5.5 times higher than standalone index insurance (Erena et al. 2019).

Given the inclusive features of bundled insurance products listed in the literature, we investigated the farmers' preferences for different bundling choices. The results are illustrated in Figure 11. About 58% of the farmers have chosen the bundle with fertilizers/ agrochemicals or hybrid seeds as their first choice. The scarcity of fertilizers that prevailed in the country during the survey period may have influenced the farmers' preference for fertilizer bundles.

The WTP by farmers for different bundled choices in addition to WII are summarized in Table 7. Farmers are willing to pay extra in the range of LKR 100–2,600 per acre for the various bundled choices. However, the average additional amount they are willing to pay for instruments bundled with chemical fertilizers, bundled with crop advisories, bundled with weather advisories and bundled with hybrid seeds are LKR 515, LKR 448, LKR 433 and LKR 425, respectively.

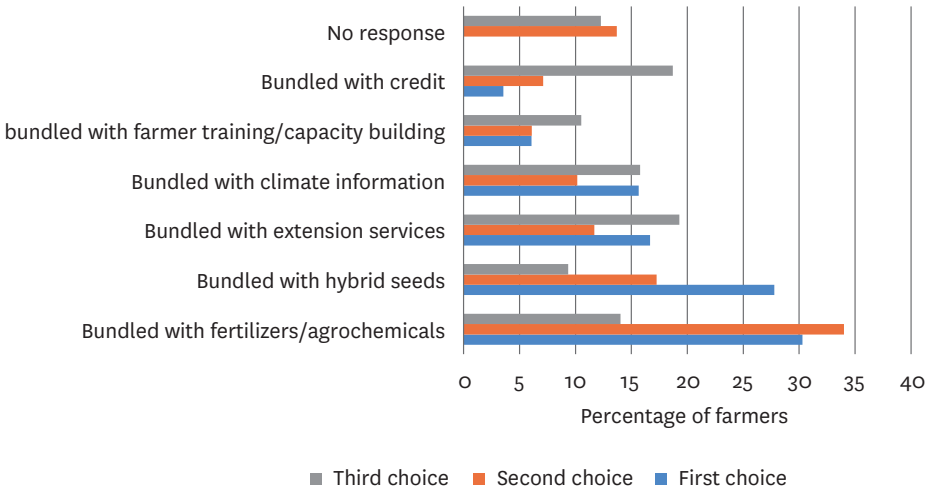

Figure 11. Preferences for different bundling options with WII as ranked by farmers.

Source: Authors' survey, 2022.

Notes: First choice N=198, Second choice N=197, Third choice N=171.

Table 7. Willingness to pay for bundled products in addition to WII (LKR).

Type of the bundle	WTP amount (values in range) (LKR)	WTP amount (weighted average value) (LKR)
Bundled with chemical fertilizers	100–2,600	515
Bundled with crop advisories	100–1,600	448
Bundled with weather advisories	50–1,600	433
Bundled with hybrid seeds	100–1,600	425

Source: Authors' survey, 2022.

Constraints to and Opportunities for Institutions to Implement Inclusive WII Solutions

The findings show that there is great potential for insurers to upscale the promotion of WII among smallholder rice farmers in Sri Lanka, especially in the dry and intermediate zones. One of the challenges for insurance providers in adopting inclusive WII interventions is understanding the heterogeneity of the farmers at the outset, which can enable the insurers to give due attention to the diversity of the farmers (gender, education, age, type of land ownership, landholding size, and other intersectional issues). Such insights into the nature of social stratification and its implications for WII adoption by different social strata can inform product design and the rollout approach. The socioeconomic factors of the farm households and the contextualized risk perceptions shape their crop insurance adoption decision.

Reaching poor and marginal farmers is a complex challenge that requires conscious and systematic effort and investments in strategies to help overcome context-specific barriers to their inclusion. The insurers have to shift their traditional predominant technocentric approach which must be incorporated with more socially oriented interventions. This is necessary to interact with existing inequities and unequal power relations among local populations, as well as the differential effects of existing vulnerabilities to climatic variability. Not merely resources, but new capacities for insurance providers are also needed to drive the change. Partnering with local nongovernmental organizations/microfinance institutions can be a cost-effective way of gaining the skills needed to engage meaningfully with target communities.

Lack of trust in insurers and insufficient knowledge on risk transfer through insurance are major challenges in upscaling WII products. Private insurance companies have to carry out the rollout and building of trust among farmers. However, limited field data and other crop-related information pose a challenge for the private sector in designing reliable insurance products. Therefore, it is important to build weather data services to support the promotion of bundled insurance solutions with climate information advisories. This is vital in the long term to build climate resilience strategies and encourage higher involvement of the private sector in promoting WII products.

Even if the farmers are catalyzed to enroll in WII, the affordability of the insurance premium and the eligibility criteria adopted by the insurers may hinder smallholders' engagement. Therefore, the eligibility criteria adopted should account for the landless, while stakeholder engagement should consider varying degrees of illiteracy and access to digital information while ensuring the identification of financial mechanisms to help poorer stakeholders afford the premium. Premium payments can also be eased through installment payment schemes and linking WII with community savings groups, where these exist.

Despite these challenges and barriers for insurers, inclusive WII intervention is seen as an innovative approach that offers a win-win situation, helping both smallholder farmers (by enhancing their resilience) and insurance providers (by helping to expand the customer base). WII is seen as a potential strategy for enhancing climate resilience in the context of increasing extreme climatic events, especially for smallholders and marginal farmers. A great majority of the farmers in the study areas perceived enormous risk exposures in crop cultivation in terms of yield variability, input price variability, and output price variability. The affordability of insurance premiums by poorer groups could be substantially reduced through digital innovations, since many digital farming technologies have become more affordable and accessible. Such technologies can allow farmers in Sri Lanka to bypass the digital divide and transfer the risks of crop failures and yield losses, thereby improving the livelihoods of smallholder farmers. Bundling the insurance with agricultural support services, and the application of aggregator models through a partnership with a trusted local organization have been successfully noted to engage more farmers with in-built trust.

Conclusions and Recommendations

Sri Lanka is a country largely having an agrarian economy with a majority of subsistence farmers who are highly vulnerable to climate shocks. Farmers are diverse, based on the gender, ethnicity, age, education, land ownership, land size operated, and income levels. WII is a potential solution to provide a safety net and a risk mitigation strategy for marginalized and vulnerable farmers, though they are often at risk of being excluded from WII and facing further marginalization. The root causes of exclusion reflect both the intersection of these marginal social identities together with gender as well as a failure to adequately recognize and explicitly account for these social differences in WII design and implementation. Reaching them is a complex challenge that requires special effort and investments in strategies to help overcome context-specific barriers to their inclusion.

The results of the WTP signal the potential insurance market and affordable premium levels for rice crops cultivated by smallholders to the policy makers and insurance companies. The findings are also useful to make an estimation of the subsidies to be provided and the preferred bundling options with WII products. The analysis indicates that farmers in the dry and intermediate zones are more likely to select higher premiums. These are the districts with either high rainfall variability or having irrigation facilities, factors that support higher insurance premiums. The majority of the farmers in Anuradhapura and Monaragala are willing to pay up to 2% of the sum insured. One limitation of the analysis is inadequate data in higher premium categories. It is unclear whether there are similar trends of preference deviations among the farmers who selected higher premiums at the onset, e.g., LKR 1,000 or LKR 4,000. Nevertheless, the study shows that enhancing knowledge and awareness of insurance and the benefits of higher premiums, especially in the context of climate change, is necessary for many farmers. The findings also suggest the importance of considering inclusive strategies and approaches by the insurance companies to allow all segments of farmers to benefit from crop insurance. There is a case for WII based on variable rainfall, but more data are necessary before generalizing to all farmers preferring crop insurance.

Addressing gender and social equity issues is important to ensure the benefits of insurance interventions reach the majority of the farming population. This can also ensure that wider development objectives are met while providing a larger client base for insurers. The GESI framework developed by IWMI (Aheeyar et al. 2019) provides a roadmap for the involvement of different stakeholders in the design, implementation and post-implementation aspects of WII to address issues of inclusion (Annex 2). The key challenges in adopting this framework are a dearth of reliable and affordable data in terms of weather, crop and socioeconomic data, and lack of awareness, skills and capacity among stakeholders on how best to integrate more inclusive approaches in WII (Surie et al. 2021). A milestone towards the adoption of the framework could be the willingness to pilot it, which could allow for learnings, refinement and assessments of its efficacy in promoting inclusion in comparison to additional implementation costs. The IWMI/Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) project has developed an Earth Observation for Agricultural Risk Management (EO4ARM) portal which is expected to provide improved access to weather and climate information, knowledge products on floods and drought, and crop conditions that help insurance companies to ameliorate the insurance product, design and implementation. The portal helps multi-institutional partners—including seed companies and agricultural extensions—in the promotion of bundled climate solutions to de-risk agricultural production risks. Stakeholders can access the portal to design WII with due consideration to gender and social inclusion perspectives for enhancing farmers' resilience against climate change impacts.

Based on findings of the study, the following recommendations are provided, specifically for insurers, development partners and policy makers.

- Understanding the contextual issues and challenges at the outset of the interventions helps the insurers to identify strategies and rollout processes to reach diverse groups of farmers to access the WII product. It is recommended to adopt the framework proposed for GESI in implementing WII.

- It is important to ensure eligibility criteria to reflect local realities in target communities.

- Understanding the context and designing the product and process should be facilitated by access to information and data across all levels of institutions to develop better products and tools.

- Access to the platform, e.g., EO4AI, addresses information gaps and promotes better transparency, efficiency and trust, specifically among smallholder farmers.

- Awareness creation programs to strengthen financial literacy and understanding insurance as a risk transfer tool along with the removal of the insurer mistrust among farmers should be an integrated component of WII interventions.

- It is important to promote bundled climate insurance solutions rather than standalone parametric products to de-risk production risks. Bundling insurance with farm support services was found to be one of the primary strategies for transitioning insurance programs to be financially sustainable and to upscaling.

- The findings show that about 58% of the farmers have chosen the bundle with fertilizers/agrochemicals or hybrid seeds as their first choice for bundling with WII. The scarcity of fertilizers that prevailed in the country during the survey period may have influenced farmers' preference for fertilizer bundles.

- The primary reason for the unwillingness of farmers to adopt crop insurance is a lack of trust in insurers and an insufficiently small payout triggered in the past in the previously implemented insurance programs. Therefore, insurance product design and the associated awareness creation should consider context-specific strategies to build the trust of the farmers in insurance interventions.

- Capacity building among re(insurers) to improve insurance products and access to near-real time data in building trust among product users is vital in scaling viable insurance solutions.

References

Adegoke, J.; Aggarwal, P.; Rüegg, M.; Hansen, J.; Cuellar, D.; Diro, R.; Shaw, R.; Hellin, J.; Greatrex, H.; Zougmoré, R. 2017. *Improving climate risk transfer and management for climate-smart agriculture: A review of existing examples of successful index-based insurance for scaling up*. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO). Available at http://www.fao.org/3/a-bu216e.pdf (accessed on September 29, 2023).

Aheeyar, M.; de Silva, S.; Senaratna-Sellamuttu, S.; Arulingam, I. 2019. Unpacking barriers to socially inclusive Weather Index Insurance: Towards a framework for inclusion. *Water* 11(11): 2235. https://doi.org/10.3390/w11112235

Aheeyar, M.; de Silva, S.; Sellamuttu, S.S. 2020. *Ex-post evaluation of the second pilot of the Index-Based Flood Insurance in Bihar, India: Reflections for upscale*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE). 24p. https://hdl.handle.net/10568/109893

Akter, S.; Krupnik, T.J.; Rossi, F.; Khanam, F. 2015. *Mind the gender gap in farmers' preferences for Weather-Index Insurance*. CSISA Research Note 7. Cereal Systems Initiative for South Asia (CSISA). Available at https://csisa.org/wp-content/uploads/sites/2/2014/09/CSISA-Research-Note-7.pdf (accessed on September 29, 2023).

Amare, A.; Simane, B.; Nyangaga, J.; Defisa, A.; Hamza, D.; Gurmessa, B. 2019. Index-based livestock insurance to manage climate risks in Borena zone of southern Oromia, Ethiopia. *Climate Risk Management* 25: 100191. https://doi.org/10.1016/j.crm.2019.100191

Arshad, M.; Amjath-Babu, T.S.; Kächele, H.; Müller, K. 2016. What drives the willingness to pay for crop insurance against extreme weather events (flood and drought) in Pakistan? A hypothetical market approach. *Climate and Development* 8(3): 234–244. https://doi.org/10.1080/17565529.2015.1034232

Binswanger-Mkhize, H.P. 2012. Is there too much hype about index-based agricultural insurance? *The Journal of Development Studies* 48(2):187–200. https://doi.org/10.1080/00220388.2011.625411

Brookshire, D.S.; Whittington, D. 1993. Water resources issues in developing countries. *Water Resources Research* 29(7): 1883–1888. https://doi.org/10.1029/92WR02988

Carter, M.; de Janvry, A.; Sadoulet, E.; Sarris, A. 2014. *Index-based weather insurance for developing countries: A review of evidence and a set of propositions for up-scaling*. Development Policies Working Paper 111. Clermont-Ferrand: Fondation pour les études et recherches sur le développement international. Available at https://ferdi.fr/dl/df-kLB5hYBaUiR2Vysm2cH5DfCP/ferdi-p111-index-based-weather-insurance-for-developing-countries-a-review.pdf (accessed on September 29, 2023).

Carter, M.; de Janvry, A.; Sadoulet, E.; Sarris, A. 2017. Index insurance for developing country agriculture: A reassessment. *Annual Review of Resource Economics* 9: 421–438. https://doi.org/10.1146/annurev-resource-100516-053352

Carter, M.R.; Chiu, T. 2020. *Microinsurance & disaster risk finance*. Evidence Brief 1. From Innovation to Learning: Creating a CDRFI Evidence Roadmap, Munich Climate Insurance Initiative (MCII). Available at https://basis.ucdavis.edu/sites/g/files/dgvnsk466/files/2020-09/MRR%20Discussion%20Paper%20-%20Microinsurance%20Evidence%20Review%20-%20Sept%202020_0.pdf (accessed on April 30, 2022).

Chithranayana, R.D.; Punyawardena, B.V.R. 2008. Identification of drought prone agro-ecological regions in Sri Lanka. *Journal of the National Science Foundation of Sri Lanka* 36(2): 117–123. https://doi.org/10.4038/jnsfsr.v36i2.143

Darby, L. 2021. Back to basics: Gender equity and social inclusion in flood resilience. *Flood Resilience Portal, July 15, 2021*. Available at https://floodresilience.net/blogs/gender-equity-and-social-inclusion-in-flood-resilience/ (accessed on September 29, 2023).

DMC (Disaster Management Centre); UNDP (United Nations Development Programme). 2009. *Sri Lanka national report on disaster risk, poverty and human development relationship (draft report for review)*. Colombo, Sri Lanka: DMC and UNDP.

Erena, G.; Popova, V.; Vakaki, E.; van der Woerd, J.; Zewdie, Y. 2019. *Overcoming challenges to deliver agricultural weather-index insurance*. CTA Technical Brief 25. Wageningen, The Netherlands: Technical Centre for Agricultural and Rural Cooperation (CTA). https://hdl.handle.net/10568/100885

Fisher, E.; Hellin, J.; Greatrex, H.; Jensen, N. 2019. Index insurance and climate risk management: Addressing social equity. *Development Policy Review* 37(5): 581–602. https://doi.org/10.1111/dpr.12387

Fonta, W.M.; Sanfo, S.; Kedir, A.M.; Thiam, D.R. 2018. Estimating farmers' willingness to pay for weather index-based crop insurance uptake in West Africa: Insight from a pilot initiative in Southwestern Burkina Faso. *Agricultural and Food Economics* 6(1): 1–20. https://doi.org/10.1186/s40100-018-0104-6

Gine, X.; Karlan, D.; Ngatia, M. 2013. *Social networks, financial literacy and index insurance*. Washington, DC: World Bank. Available at https://openknowledge.worldbank.org/handle/10986/21814 (accessed on December 12, 2022).

Greatrex, H.; Hansen, J.; Garvin, S.; Diro, R.; Le Guen, M.; Blakeley, S.; Rao, K.; Osgood, D. 2015. *Scaling up index insurance for smallholder farmers: Recent evidence and insights*. CCAFS Report No. 14. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). https://hdl.handle.net/10568/53101

Hellin, J.; Fisher, E. 2018. Index insurance, climate risk management & gender equality. In: *The state of microinsurance 2018: The insider's guide to understanding the sector*. Microinsurance Annual Journal, 4. Luxembourg: The Microinsurance Network. pp.14–16.

Islam, M.D.I.; Rahman, A.; Sarker, M.S.R.; Luo, J.; Liang, H. 2021. Factors affecting farmers' willingness to adopt crop insurance to manage disaster risk: Evidence from Bangladesh. *International Food and Agribusiness Management Review* 24(3): 463–479. https://doi.org/10.22434/IFAMR2019.0190

Johnson, L.; Wandera, B.; Jensen, N.; Banerjee, R. 2019. Competing expectations in an index-based livestock insurance project. *The Journal of Development Studies* 55(6): 1221–1239. https://doi.org/10.1080/00220388.2018.1453603

Makaudze, E.M. 2018. Malawi's experience with weather index insurance as agricultural risk mitigation strategy against extreme drought events. In: Sallis, P.J. (ed.) *Extreme weather*. IntechOpen Book Series. https://doi.org/10.5772/intechopen.77106

Ministry of Agriculture. 2021. *National Agricultural Policy (NAP)*. Colombo, Sri Lanka: Ministry of Agriculture. Available at https://www.agrimin.gov.lk/web/images/20.10.2022-1/Final%20English%20Document%2007.02.2022%20pdf.pdf (accessed on September 10, 2022).

Müller, B.; Johnson, L.; Kreuer, D. 2017. Maladaptive outcomes of climate insurance in agriculture. *Global Environmental Change* 46: 23–33. https://doi.org/10.1016/j.gloenvcha.2017.06.010

Ntukamazina, N.; Onwonga, R.N.; Sommer, R.; Rubyogo, J.C.; Mukankusi, C.M.; Mburu, J.; Kariuki, R. 2017. Index-based agricultural insurance products: challenges, opportunities and prospects for uptake in sub-Sahara Africa. *Journal of Agriculture and Rural Development in the Tropics and Subtropics* 118(2): 171–185. Available at https://www.jarts.info/index.php/jarts/article/view/2017042052372

Senapati, A.K. 2020. Insuring against climatic shocks: Evidence on farm households' willingness to pay for rainfall insurance product in rural India. *International Journal of Disaster Risk Reduction* 42: 101351. https://doi.org/10.1016/j.ijdrr.2019.101351

Sibiko, K.W.; Veettil P.C.; Qaim, M. 2018. Small farmers' preferences for weather index insurance: Insights from Kenya. *Agriculture & Food Security* 7: 53. https://doi.org/10.1186/s40066-018-0200-6

Surie, M.D.; Aheeyar, M.; de Silva, S.; Raut, M. 2021. Virtual regional dialogue on options to promote more inclusive weather index insurance. Workshop summary report, October 27-28, 2021. 35p. https://hdl.handle.net/10568/117585

Takahashi, K.; Noritomo, Y.; Ikegami, M.; Jensen, N.D. 2019. *Understanding pastoralists' dynamic insurance uptake decisions: Evidence from four-year panel data in Ethiopia*. GRIPS Discussion Papers No. 19-22. Tokyo, Japan: National Graduate Institute for Policy Studies. Available at https://ideas.repec.org/p/ngi/dpaper/19-22.html (accessed on September 30, 2023).

Ward, P.S.; Makhija, S.; Spielman, D.J. 2020. Drought-tolerant rice, weather index insurance, and comprehensive risk management for smallholders: Evidence from a multi-year field experiment in India. *The Australian Journal of Agricultural and Resource Economics* 64(2): 421–454. https://doi.org/10.1111/1467-8489.12342

Zubair, L.; Ralapanawe, V.; Tennakoon, U.; Yahiya, Z.; Perera, R. 2006. Natural disaster risks in Sri Lanka: Mapping hazards and risk hotspots. In Arnold, M.; Chen, R.S.; Deichmann, U.; Dilley, M.; Lerner-Lam, A.L.; Pullen, R.E.; Trohanis, Z. (eds.) *Natural disaster hotspots case studies*. Disaster Risk Management Series No. 6. Washington, DC: World Bank. pp.109–136. Available at https://www.gfdrr.org/sites/default/files/publication/Natural%20Disaster%20Hotspots%20Case%20Studies.pdf (accessed on September 30, 2023).

Annex 1. Questionnaire - Willingness to Participate in a Bundled Insurance Program.

Surveyor Details

Name of the enumerator:

ENUMERATOR: TAKE PHOTOGRAPH OF THE RESPONDENT FROM YOUR DEVICE. Also, record the geographical position of the respondent's homestead; make sure the Global Positioning System (GPS) signal is stable before recording.

Take a photo of the landscape (Mandatory):

Click here to upload file. (< 5 MB)

Take another photo of the landscape (Optional):

Click here to upload file. (< 5 MB)

A. Basic information of the farmer:

A.1. Name of the farmer:

A.2. Phone number for future communication:

A.3. District:

i. Kurunegala
ii. Anuradhapura
iii Monaragala
iv. Hambantota
v. Gampaha

A.4. Divisional Secretariat Division (DSD) Name:

i. Maho
ii. Ipalogama
iii Monaragala
iv. Tissamaharama
v. Gampaha

A.5. Grama Niladhari Division (GND) Name:

i. Thisnampalagama
ii. Panwewa
iii. Ipalogama
iv. Kadiyangalla
v. Kolonvinna
vi. Marawa
vii. Rana Keliya
viii. Viharamahadevipura
ix. Ihalagama East
x. Ihalagama West

A.6. Farmer National Identity Card (NIC) number (Optional):

B. Socioeconomic information of the farmer:

1. Gender of farmer:

i. Male
ii. Female

2. Age (years):.....

3. Ethnicity:

i. Sinhalese ii. Tamil iii. Muslim iv. Other

4. School education (No. of years - [Ordinary level completed = 11 years, Advanced level completed = 13 years]):

5. Is the responding farmer the household head?

i. Yes ii No

6. If no, relationship to the household head:

i. Husband/wife
ii. Son/daughter
iii. Brother/sister
iv. Brother-in-law/sister-in-law
v. Son-in-law/daughter-in-law
vi. Other

7. No. of members in the household:

8. Farmer information:

8.1. No. of members involved in farming.....
8.2. No. of dependent family members (no. of members less than 15 years and over 65 years).....

9. Type of farmer:

i. Full time
ii. Part time

10. Farming experience (No. of years):.....

11. Income information:

11.1. What is household income from lowland cultivation both *Maha* and *Yala* (LKR/year):.....
11.2. What is household income from upland/home garden cultivation (LKR/year):.....
11.3. What is monthly income from livestock/fishery (LKR/month):.....
11.4. What is household income from non-farm activities (average)? (LKR/month):.....
11.5. Other incomes (salaries/remittances/subsidies, etc., LKR/month):.....

C. Property ownership:

12. Do you have cultivatable land with property rights certificate/permit/legal documents?

i. Yes
ii. No

13. If yes, what is the area of land with property rights (in acres):

14. What is the land area cultivated without a legal ownership document? (in acres):

14.1. Source of water for paddy cultivation?

i. Irrigated by major irrigation
ii. Irrigated by minor irrigation
iii. Rainfed
iv. Rainfed and minor irrigation

15. Does the farmer have access to formal credit facilities?

i. Yes
ii. No

16. Annual average estimated cost of weather-related crop damage to household during the last 5 years (in LKR/acre/year):.....

D. Climate change:

17. Do you (farmer) have a basic knowledge or awareness about climate change-related risks (i.e., change in the average conditions of weather patterns such as temperature and rainfall in your area over a long period of time) to agriculture?

i. Yes ii. No iii. To some extent

18. Do you or any individual in the household receive any technical or other support (advisory, early warnings) from friends, relatives, or through group membership to cope with climate risks in the last 12 months?

i. Yes ii No

19. Do you or any individual in the household receive any technical or other support (advisory, early warnings) from print and electronic media, social media, extension officers, or the disaster management center to cope with climate risks in the last 12 months?

i. Yes ii No

20. What were the three most important risk factors that you faced in agriculture during the last 5 years? (ranking of risk factors: Most Important; second most important; third most important)

i. Flood
ii. Drought
iii. Variability in rainfall
iv. Excess rain
v. Pest attack
vi. Plant disease
vii. Wildlife damage
viii. Fire
ix. Inadequate/surplus/untimely irrigation
x. Decline in crop prices
xi. Failure of new technology
xii. Loss of livestock/disease
xiii. Any other

21. In terms of the potential to affect your farm income, how would you (farmer) rate the following sources of risk? (Select the number which best represents your answer from (i. Very low, ii. Low, iii. Neutral/no change, iv. High, v. Very high)

21.1. Crop yield variability ( )
21.2. Crop price variability ( )
21.3. Changes in input (seed, fertilizers, pesticides, etc.) costs ( )

22. Attitude towards risk: How much do you agree with the following statements? (Select the number which best represents your answer from (i. Strongly disagree ii. Disagree iii. Neutral iv. Agree vs Strongly agree)

22.1 I like experimenting with new ways of doing things ( )
22.2 I am willing to take a higher risk than others ( )
22.3 I have to take a risk in order to realize higher returns ( )
22.4 The only way to make money is to take more risks ( )

E. Agricultural insurance schemes:

23. Are you aware of any Agriculture Insurance Scheme operating in your area/vicinity?

i. Yes ii. No

24. Past insurance experience:

i. Yes ii. No

24.1 If yes, what was the type of insurance enrolled?

i. Index insurance ii. Indemnity insurance iii. Both

25. Given the opportunity, will you buy insurance for your crop cultivation in the forthcoming season?

i. Yes ii. No iii. No idea

25.1. If not, why will you/your household not buy the insurance next season? (Tick all relevant):

i. Insurance is expensive
ii. Insurance is not required
iii. No cash/credit to pay the premium
iv. Payouts are too small
v. Not satisfied based on past experiences
vi. Bought insurance in the past, but didn't get payout or insufficient payout
vii. Don't understand the product
viii. Don't trust insurers
ix. Do not like insurance
x. No lack of legal land documents
xi. Others

25.2. If yes, why will you/your household buy the insurance for next season? (Tick all relevant):

i. Received a payout
ii. Good way of securing income if it doesn't rain or there is excess rain
iii. Premium is low
iv. Advice from village officials
v. Other farmers that I trust bought the insurance
vi. To transfer risk
vii. Other

26. Would you prefer an agricultural insurance scheme for drought/floods?

i. Yes ii. No

27. Suppose a private/government insurance company is to introduce a risk transfer mechanism for paddy cultivation, which is known as Weather Index Insurance (WII) or crop insurance. The traditional indemnity insurance schemes are based on the context-specific character of crop damage assessing losses individually to calculate the compensation for damage which can be expensive and subject to many administrative problems. However, in WII programs, policyholders receive a pay-out based on the pre-determined triggers (for example, deficit of rainfall or excess rainfall), which triggers a payment to all insured clients within a geographically defined space. Under this proposed WII scheme, the sum insured is LKR 50,000 per acre of paddy land. WII provides adequate compensation for rainfall above or below the pre-determined value. The objective of this insurance scheme is to provide compensation for deficit of and excess rainfall that might potentially damage the crop. The high and low rainfall trigger values are decided at the beginning of the cultivation season based on the difference of the accepted suitable rainfall value for paddy cultivation and the rainfall data obtained from satellites throughout the cultivation season. The level of the payouts will be dependent on the amount of deficit, or excess rainfall received to the village in each month against the set value ideal for paddy cultivation.

If the above agricultural insurance scheme is rolled out in your area, do you wish to participate with a contribution for premium in the next season (*Maha*/*Yala*)?

i. Yes ii. No iii. No idea iv. Not related to crop cultivation

If the response to the previous question (Q27) is yes, continue Q 27.1 along with other follow-up questions. If the answer is (2), (3) or (4), please go to question 30.

27.1 What is the maximum premium you are willing to pay for crop insurance as a percentage of sum assured (Assume sum insured in LKR 50,000 per acre):

i. 1% (LKR 500/ac) iii. 5% (LKR 2,500/ac)
ii. 2% (LKR 1,000/ac) iv. 8% (LKR 4,000/ac)

Instructions to the enumerator - Ask the following questions based on the answer provided to 27.1. If the answer to Q 27.1 is (1), ask 27.2.a, 27.2.b and 27.2.c and go to question 27. Similarly, if Option (2) is selected in Q 27.1, ask Q 27.3.a, 27.3.b, and 27.3.c, and go to question 27. Likewise, ask Q 27.4.a, 27.4.b and 27.4.c, if Option (3) is selected and ask 27.5.a, 27.5.b and 27.5.c, if Option (4) is selected

27.2.a. If you are willing to pay 1% of the sum insured, will you agree to pay 2%?

i. Yes ii No

27.2.b. If No, what is the maximum premium you are willing to pay in LKR for an acre of paddy crop (or specify the crop)?

i. Up to LKR 600 ii. LKR 800 iii. LKR 900

27.2.c. How much are you sure about your answer?

i. Very low iv. High
ii. Low v. Very high
iii. Neutral

27.3.a. If you are willing to pay 2% of the sum insured, will you agree to pay 5%?

i. Yes ii. No

27.3.b. If no, what is the maximum premium you are willing to pay in LKR for an acre of paddy crop (or specify the crop)?

i. Up to LKR 150 ii. LKR 2,000 iii. LKR 2,250

27.3.c. How much are you sure about your answer?

i. Very low iv. High
ii. Low v. Very high
iii. Neutral

27.4.a.If you are willing to pay 5% of the sum insured, will you agree to pay 8%?

i. Yes ii. No

27.4.b. If No, what is the maximum premium you are willing to pay in LKR for an acre of paddy crop (or specify the crop)?

i. Up to LKR 3,000 ii. LKR 3,500 iii. LKR 3,750

27.4.c. How much are you sure about your answer?

i. Very low
ii. Low
iii. Neutral
iv. High
v. Very high

27.5.a. If you are willing to pay 8% of sum insured as premium, are you interested in buying flood/drought insurance, if the premium is 10% of assured sum?

i. Yes
ii. No

27.5.b. If No, what is the maximum premium you are willing to pay in LKR for an acre of paddy crop (or specify the crop)?

i. Up to LKR 4,200
ii. LKR 4,500
iii. LKR 4,750

27.5.c. How much are you sure about your answer?

i. Very low
ii. Low
iii. Neutral
iv. High
v. Very high

F. Minimize the loss of crops / livestock due to floods / droughts:

28. Would you take steps to reduce loss from floods/droughts in your crops/livestock, even if you have purchased insurance policy?

i. Yes
ii. No

29. Crop insurance can be provided bundled with better inputs or services needed to improve crop productivity. If the insurance is bundled with input or service, what kind of bundle would suit you? (Rank in order of choice -1st, 2nd and 3rd preference):

i. Insurance bundled with hybrid seeds
ii. Insurance is bundled with climate information
iii. Insurance bundled with extension services/agricultural information
iv. Insurance is bundled with farmer training/capacity building
v. Insurance bundled with fertilizers/agrochemicals
vi. Insurance bundled with credit
vii. Other bundles

30.If the insurance is bundled with climate and crop advisories, pest and diseases control advisories:

30.1 What is the maximum premium you are willing to pay in LKR for an acre of paddy crop if the bundle is with agronomic advisories (Please remind the WTP value agreed by the farmer in question 27 and the value to be expressed is in addition to the price given to the question 27)?

30.2 What is the maximum premium you are willing to pay in LKR for an acre of paddy crop if the bundle is with weather advisories (Please remind the WTP value agreed by the farmer in question 27 and the value to be expressed is in addition to the price given to the question 27)?

30.3 What is the maximum premium you are willing to pay in LKR for an acre of paddy crop if the bundle is with hybrid seeds (Please remind the WTP value agreed by the farmer in question 27 and the value to be expressed is in addition to the price given to the question 27)?

30.4 What is the maximum premium you are willing to pay in LKR for an acre of paddy crop if the bundle is with fertilizers (Please remind the WTP value agreed by the farmer in question 27 and the value to be expressed is in addition to the price given to the question 27)?

30.5 What is the maximum premium you are willing to pay in LKR for an acre of paddy crop if the bundle is with agricultural credit (Please remind the WTP value agreed by the farmer in question 27 and the value to be expressed is in addition to the price given to the question 27)?

Location Info:

latitude (x.y °)

longitude (x.y °)

altitude (m)

accuracy (m)

Other information:

Remarks (if any):

Annex 2. A Framework for a Systematic Approach to Inclusive Weather Index Insurance Schemes.

This framework is based on insights from IWMI's fieldwork and literature providing experiences from other insurance programs. It provides a systematic approach to how future WII could address issues of inclusion and equity. The framework uses a process-oriented approach, making clear that inclusion and equity considerations run through the entire process of WII design, implementation and post-implementation. It is structured around five primary steps (Table A2) that would broadly constitute the development and implementation of a WII product. In this manner, the framework is meant to help incorporate inclusion and equity considerations from the outset,through the design, implementation and post-payout stages. It emphasizes the centrality of a sound contextual analysis to unpack farmers into landless, marginal/small and large farmer classes. It also recognizes the importance of consistently being sensitive to the specific interests of and challenges faced by marginal groups across these farmer classes. The framework further makes clear that the process does not stop with the insurance payout, since managing unmet expectations of farmers post-payout will be necessary if the long-term demand for the product is generated. Although the application of the suggested framework is likely to involve significant additional upfront costs to the insurance program in the initial years, this investment is expected to help increase and sustain the client base.

Table A2. Steps involved in the development and implementation of an inclusive weather index insurance product.

Steps	Key considerations
Step 1: Team constitution	
Include local partner institution(s) with appropriate knowledge, skills and trust in target communities	These partner(s) will be central to (i) ensuring product design is conscious of social heterogeneity and includes the more vulnerable farmer classes; (ii) ensuring implementation supports marginal farmers, including women, in understanding the product and prepare all documentation for eligibility; and (iii) enhancing risk management post-payout to ensure misunderstandings do not undermine the long-term demand for the product.
Step 2: Contextualization and assessment of challenges to developing an inclusive product	
Disaggregate male and female farmers into farmer classes (landless, marginal, small, large) to: o Explore correlation between farmer class and vulnerability to climate risks, and interest in WII. o Identify how men and women are able to know about, understand and afford the product. o Identify other barriers that may exist among each farmer class. o Identify local institutions and their de jure and de facto roles, and how these may support or hinder product implementation. o Identify any community-based organizations and their activities. Savings groups could help marginal men and women, in particular, to purchase insurance.	
How will existing inequalities affect different farmers' awareness of a WII product, and to understand and afford it? How can WII best serve these groups, including female farmers?	• How many farmers are landless? o What are the specific challenges for landless and marginal/small farmers, in particular, in terms of understanding the product, meeting eligibility criteria and affording the product? • What is the vulnerability due to literacy among men/women of different farmer classes? • Will mobility prevent women from learning about the WII product? • How do household dynamics across farmer classes influence decisions on whether to purchase the WII product? • Where there is out-migration of men, are the women in these households empowered to take decisions on purchasing the WII product? • What additional challenges may women-headed households face (e.g., meeting eligibility criteria, filling forms accurately, accessing information or obtaining signatures from local government, etc.)?

Continued >

Table A2. Steps involved in the development and implementation of an inclusive weather index insurance product. (Continued)

Steps	Key considerations
Step 3: Product development	
How can product development respond to the heterogeneous local context (farmer needs and capabilities) while maintaining a business case?	• How can the WII product be designed to make it more understandable? • How can eligibility criteria minimize burdens on the most marginal groups, including landless and women? • How can payment for the product be made flexible to make it affordable to marginal groups? • Can the use of mobile transfers be used to minimize transaction costs for the insurer and payout recipients alike?
Step 4: Product implementation	
	• How can trust in the product be built? For example: o Through clear and inclusive communication strategies (see below). o Providing sufficient time for awareness to be created, recognizing that messages may need to be repeated several times. o By training local-level leaders about the product and potential benefits, if their word is a source of confidence among farmers. • How can post-payout misunderstandings be minimized to ensure long-term demand for the product is not undermined? o All awareness material should clearly emphasize payout trigger points, perhaps using scenarios to make clear the uncertainties involved. o Explain what data links to the trigger points and how these are collected. o Explore whether farmers have options to verify all/some of these data. o Make farmers aware of variations in climatic events such as floods across several years, and that the value of insurance to cover the variability in the long term. • What strategies can address differences in literacy? For example: o Using written, visual and auditory media o Training staff of local partners about the product • How can landless farmers be assisted if the eligible criteria includes proof of a land title or access to farmland? o Will landowners verify the lease of their land to their tenants? o Can village leaders/local government perform this function? • How can women's lack of mobility be overcome? For example: o Using communication tools that reach women in the house such as radio, television and social media. o Showing videos or organizing street dramas close to the homesteads. o Employ female mobilizers who may have greater access to women and be more trusted by women.
Step 5: Post-payout risk management and adaptation	
What activities are needed to assess farmers' experiences with the product, resulting views about it and how this may affect future demand for it?	• Understand farmers' experiences, perceptions and responses to the intervention. o Targeting gaps. o Understand root causes of issues. o Improve the product and design of the process.

Source: Aheeyar et al. 2019.

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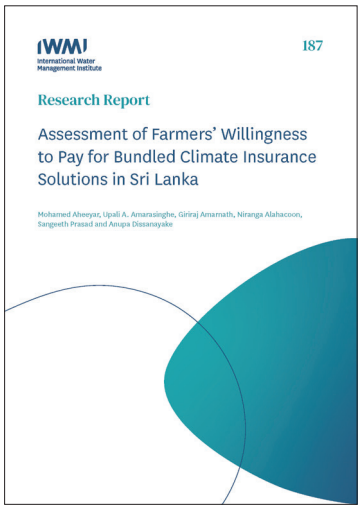

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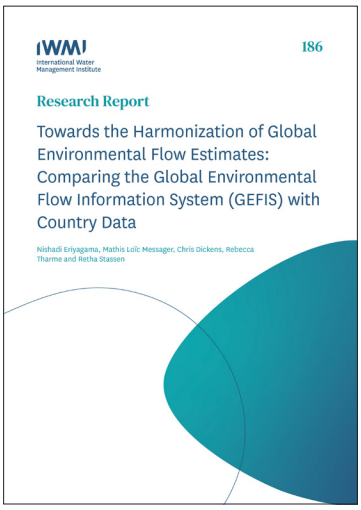

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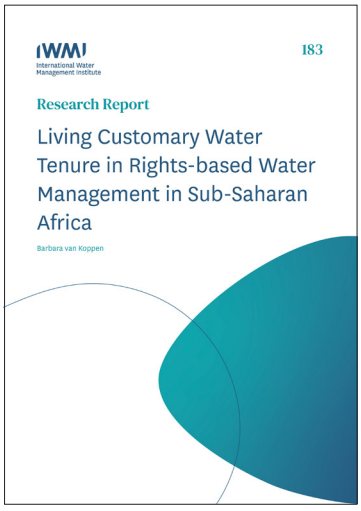

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IWMI is a CGIAR Research Center

ISSN 1026-0862
ISBN 978-92-9090-957-6