Sustainability in Index-Based Weather Insurance
The Lessons from the small scale Tea Planters in Southern Province

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ABSTRACT

Weather risk is an inherent in agriculture. Crops may be destroyed by drought or over rain. In many cases, farmers also confront the risk of natural catastrophe. Assets and lives may be lost due to severe droughts, hurricanes, earthquakes and floods. The type and severity of the risks confronting farmers are particularly burdensome to small-scale farmers. Index-Based Weather Insurance (WI) products for agriculture represent an attractive alternative for managing catastrophic weather risk that confront by small-scale planters in Sri Lanka. This paper presents the main lessons from WI programs implemented in Southern province for the small-scale tea planters (STPs), and examines the prospects for the extension and the scaling up of index-based weather insurance products to mitigate the risks in small-scale tea plantation. Data was obtained through Focus Group Discussions conducted in Galle and Matara districts. A personal interview survey was also conducted with STPs. A total of 176 (GL n=61; MT n=115) usable responses were obtained on five-point Likert scale ranging from "*Strongly Disagree*" (1) to "*Strongly Agree*" (5). A number of quantitative methods, including correlation analysis and ANOVA were applied to analyze the data using the SPSS statistical software. The main findings show that the majority of STPs are satisfied with the existing WI (mean 4.2, SD=.9044). Yet differences were found to exist between STPs of Galle and Matara in the importance that respondents attach to the different aspects of WI (Wilks Lambda = 0.548, p = <0.001).

Keywords: index-based weather insurance, risk, agricultural industry, tea planters, southern province

Introduction

The weather has always presented a challenge to those whose livelihoods depend on it. When the rains fail or temperatures climb, it can provide a bumper crop one season and a dismal crop the next (Burke *et.al,* 2010). Unpredictable fluctuates in prices for both farm inputs and outputs can further amplify or decline farm income dramatically, threatening household welfare. This risk materializes at two levels: the direct effects of a weather shock, and the indirect effects due to the threat of a weather shock (Hellmuth *et.al*, 2009).

When a weather shock occurs, small-scale planters (STPs) are highly vulnerable; they may have to cope with its consequences by using methods that can create long run irreversibility on welfare such as selling productive assets, reducing child nutrition, and taking children out of school. As a result, an increasing number of programmes have tested an innovative idea in managing weather risk in agriculture, which can help STPs' smooth incomes in bad years. Principal among these innovations is *index-based weather insurance* (or weather insurance), which links indemnity payments to easily and publicly observed outcomes (such as rainfall) instead of to individual farmer yields, as is typical in traditional insurance (Burke *et.al,* 2010).

Index-based Weather Insurance

Index-based weather insurance (WI) is a financial product linked to an index highly correlated to agricultural yields. Hellmuth *et.al* (2009) define WI as an insurance that is linked to an index, such as rainfall, temperature, humidity or crop yields, rather than actual loss. It is more compatible with reinsurance practices worldwide, which make primary insurers to cover their local / regional risks by reinsuring themselves with international reinsures (Reddy, 2004).

Despite the fact that WI supports STPs manage their weather risk, many private and public organizations around the world are selling or experimenting with index insurance are reporting puzzling failures. Moreover, since concept of WI is in its relative infancy, there exist only a handful of careful studies that attempt to systematically answer questions such as why a particular approach did not work, which farmers purchase index insurance, and which factors affected their decision to purchase. This study attempt to explore a broad set of lessons from the index insurance program designed for the smallscale tea planters in Southern province, Sri Lanka.

The main objective of this research was to empirically examine the perception of smallscale tea planters towards the index-based weather insurance programs implemented in Southern province. Further, it evaluates the prospects for extension and scaling up of index-based weather insurance products to mitigate the risks in small-scale tea plantation.

Methodology

The data for this study are gathered from weather insurance reports of SANASA insurance company, focus group discussions and personal interviews had with STPs (n=162), insurance agents (n=12), and insurance managers (n=02). These data are not nationally representative; the survey included the data only from two districts located in southern province of the country (Galle and Matara). A total of 176 (GL n=61; MT n=115) usable responses were obtained on five-point Likert scale ranging from *"Strongly Disagree"* (1) to *"Strongly Agree"* (5).

Index based weather insurance ties indemnity payments to the behavior of relevant weather indicators that are correlated to crop yields. Indemnities are therefore based on verifiable weather variables (e.g., rainfall or temperature) instead of direct economic losses suffered by farmers (Burke *et.al,* 2010; Ruth *et.al,* 2011). Because the large majority of smallholder agriculture in Sri Lanka is rain-fed, most index insurance schemes use rainfall as an index. This study used rainfall data published by 07 weather stations; 3 located at Galle district (*Hiniduma, Kottawa,* and *Badegama*) and 4 located at Matara district (*Mawarala, Dhampahala, Anilkanda,* and *Mapalana*).

Primary data was collected during the impact assessment carried out by the SANASA Insurance Company Limited (SICL), together with the International Labour Organization (ILO) to explore the prospects for extension and scaling up of index-based weather insurance products to mitigate the risks in small-scale tea plantation in Southern Province. Selected *Sanasa Societies* operate in Galle and Matara districts were requested to organize few focus group discussions to get the views of small-scale tea planters towards the existing index-based weather insurance scheme and its products.

Small-scale tea planters' data collected on demographic characteristics, assets they have, occupation, cropping patterns, nonagricultural income, and experiences with weather shocks and claiming procedures. Burke *et.al,* (2010) set out a model of demand for WI products. They indicated that demand for index products will be based on premium affordability (price) (PAFD), farmer trust (FTRS), financial literacy (FLIT), basis risk

(BRIS), and expected weather risk (EWRS). This implies that farmers must be able to afford the premiums, trusting enough in the system, capable of understanding the contracts, and be aware of both basis risk and expected weather risk to make initial premium payments in exchange for uncertain future payouts. Hence, these variables were taken as independent variables in the research model, while respondents' satisfaction towards the existing WI (CSWI) is considered as the dependent variable. Accordingly, the model used for the research is shown below:

$$Y_{CSWI} = \square + \square X_{PADF} + \square X_{FTRS} + \square X_{FLIT} + \square X_{BRIS} + \square X_{EWRS} + \square$$

A number of quantitative methods, including correlation analysis and ANOVA were applied to analyze the data using the SPSS statistical software.

Results and Discussion

Table 01 presents a variety of descriptive statistics of the sample. On average, respondents were youngers (i.e. 36 year-old) and more educated, with the highest education level being just equal to G.C.E. (Advanced Level). The average household size was about five members.

Table 01: Household descriptive statistics

Demographic characteristics	Mean	SD
Age	36.4	5.22
Gender (male = 1, female = 0)	0.67	0.31
Household size	4.71	2.31
Education (up to grade 10=1, O/L =2, A/L=3, Degree=4)	3.11	1.02

Respondents' satisfaction towards the existing WI (CSWI)

To get a sense of whether the respondents are happy about the index-based weather insurance available for the small-scale tea planters in Sri Lanka, they were asked to indicate their views on existing weather insurance scheme. Findings reveal that most of the STPs are happy about the existing WI (mean=4.1975, SD=0.9044) (Table 02).

One-way ANOVA was run to compare the means between respondents selected from Galle and Matara districts. Result shows that STPs in two districts have different satisfaction level towards to WI (MS=3.932, F=4.892, p=0,002).

Table 02: Satisfaction of STPs towards WI

Proportion providing	"agreed" response*
Weather insurance provides adequate cover for weather risk in tea plantation	0.87
Easy to understand the terms and condition of WI contract	0.72
When need it you can easily purchase a WI policy	0.94
Simple mechanism available for premium payments and claims for damages	0.81
In overall, you happy about the WI available for STFs	0.93

* value between 3.5 – 5.0 in Likert scale

Respondents (i.e. STPs) were then asked if they would be willing to purchase weather insurance, how much they would like to pay as a monthly premium. The majority express their agreeableness towards the existing premium payment plan of WI (Table 03).

Table 03: Monthly Installment plan for WI

1st Installment	Balance Installments	Proportion providing "agreed" response*
Rs. 408	Rs. 306	0.21
Rs. 510	Rs. 408	0.13
Rs. 612	Rs. 510	0.30
Rs. 714	Rs. 612	0.09
Rs. 816	Rs. 714	0.12

Rs. 918	Rs. 816	0.07
Rs. 1,020	Rs. 918	0.04
Rs. 1,122	Rs. 1,020	0.04

Secondary data gathered from the insurance industry reveals that, from 01st April 2014 to 31st March 2015, a total of 11,573 new WI policies were sold to STPs in Galle and Matara districts. This evidenced STPs willingness to purchase WI and their satisfaction towards the existing WI polies.

Determinants of WI demand

To understand the reasons that persuade respondents to purchase WI, a series of questions was asked. Findings reveal that when STPs trust that the insurance provider will make good on the contract, and there is little legal recourse to reclaim the payments, farmers will be unlikely to purchase insurance (mean=4.0062, SD=0 .99998). This is followed by premium affordability (Table 04).

Table 04: Determinants of Weather Insurance Demand

Variables	Mean	Standard Deviation
Farmer trust	4.0062	0.99998
Premium affordability	3.7469	1.17061
Expected weather risk	3.7284	0.72253
Basis risk	3.6049	0.88716
Financial literacy	3.5000	0.68932

In total, all 05 variables in the model are found to be statistically significant ($p<.001$) in explaining farmers' satisfaction towards weather index

insurance. Small-scale tea planters are typically price sensitive. Hence, premium affordability appears to contribute directly to their willingness to purchase index insurance, and in turn their satisfaction (r=.558, p=.000). This is followed by farmers trust (Table 05).

Table 05: Correlations between CSWI and other variables

Variables	Pearson Correlation	Sig. (2-tailed)
Farmer trust	.541**	.000
Premium affordability	.558**	.000
Expected weather risk	.216**	.000
Basis risk	.408**	.000
Financial literacy	.389**	.006

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

A regression was run to measure the influence of selected variables on STPs satisfaction. The model was well fitted ($R^2 = .854$) for the study. Table 06 shows the standardized beta for each variable and their significant levels. These findings confirm that the premium affordability is the most influential factor for consumer satisfaction in weather insurance ($\beta=.357$, $p<.001$).

Table 06: Standardized Beta of Independent Variables

Variables	Standardized Coefficients	t	Sig.
Farmer trust	.334	6.117	.000
Premium affordability	.357	5.857	.000
Expected weather risk	.098	4.105	.000
Basis risk	.197	3.102	.002
Financial literacy	.225	2.583	.005

The standardized beta coefficients for each variable are placed in the regression model given below:

$$Y_{CSWI} = 261 + .357X_{PADF} + .334X_{FTRS} + .225X_{FLIT} + .197X_{BRIS} + .098X_{EWRS} + \varepsilon$$

Conclusion and Recommendations

Weather shocks seemed to have adverse effects on small-scale tea planters (STPs) in Southern province, Sri Lanka. The descriptive data indicate that most STPs understood the importance of weather insurance product to mitigate their climate risks.

Weather risk management in the broad sense has long been practiced. This study examined the satisfaction level of STPs towards the weather insurance product available for tea planters. Moreover, it examined the relationship between the satisfaction of STPs and premium affordability (i.e. price), farmer trust (i.e. understanding insurance contracts), financial literacy (i.e. awareness of informal risk-sharing tools), basis risk, and expected future weather risk in light of the models developed.

Findings reveal that most of STPs are happy with the existing WI for tea industry. Further, results confirm that affordability of the premium is a strong determinant of STPs satisfaction toward WI. Since, small-scale planters are typically price sensitive and cash constrained, premium price appear to contribute directly to their willingness to purchase index insurance. Further, small-scale tea planters will be likely to purchase WI if they can trust the insurance provider. Hence, maintain trust among the STPs is must in marketing WI.

STPs might be unwilling to purchase index insurance products because the contracts are often hard for them to understand. Hence, financial literacy among the STPs also might impact on STPs' satisfaction towards WI. Basis risk (*the possibility that index-calculated payouts won't match individual farmer losses*) and expected future weather risk also found to significantly contributory factors of STPs willingness to purchase WI.

In addition to the direct benefits that STPs can gain from WI, there are considerable amount of indirect benefits of WI. For instance, when lenders know that borrowers are covered by insurance, they may be more likely to extend credit to them. Yet, index insurance is comparatively new concept for STPs in Sri Lanka, and can be difficult for stakeholders to understand – time and resources must be invested in explaining how it works.

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