

Short communication

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Adoption and preferences for coffee drought index-based insurance in Uganda

Micro-insurance can be an effective approach to smoothening income in adverse times and potentially a way to contribute to the financial inclusion of vulnerable populations. However, direct sales to individual smallholders remains a challenging task without an easily scalable solution. The current research seeks to find the determinants of adoption of a stand-alone coffee index-based insurance product in Uganda marketed by a farmer cooperative, and elicited preferences for improving the design and delivery model. A stratified household survey was conducted among 614 farmers, of which 40% adopted insurance and 62% were member of a farmer cooperative. In odds ratio terms, adopters perceived themselves to be 3.09 times more likely to receive a pay-out than non-adopters ($P < 0.01$), and those having better access to extension services were 2.47 times more likely to adopt a policy ($P < 0.01$). Yet farmers perceiving the design as complex were approximately half as likely to adopt ($P < 0.05$). Farmers preferred the option of premium payments proceeds on delivery, mobile premium payments and delivering insurance through cooperatives/associations. Deepening insurance uptake among coffee farmers will therefore require a strong focus on communication and information sharing facilitated by cooperatives/associations (e.g. farmer cooperates, village and saving associations, or women's associations).

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Introduction

Micro-insurance can be an effective approach to smoothening income in adverse times and potentially a way to contribute to the financial inclusion of vulnerable populations. As such, adopting a climate insurance coverage aims to adapt in reducing the vulnerability associated with anticipated negative impacts of climate change. Moreover, giving smallholders access to micro-insurance enables them to invest in improved agricultural inputs to enhance farm production and ultimately household income (Karlan *et al.*, 2014; Marr *et al.*, 2016). Key to success with this is to streamline claim handling and marketing efforts in order to minimise transaction costs (i.e. delivering a solution to a low-cost and at a large-scale). Emerging index-based insurance across Africa has proven to enable efficient claim handling. However, direct sales to individual smallholders remains a challenging task without an easily scalable solution (Carter *et al.*, 2014).

Adoption studies in the field of crop (index-based) insurance often focus on one-off field experiments ignoring often the insurance delivery channel (see for example a systematic review by Marr *et al.*, 2016). Yet those insurance programmes that are currently running are frequently marketed via aggregators. To reach the necessary scale it is essential to cooperate with aggregators in the agricultural value chain that have an extensive outreach and shared interests. Such organisations include the financial service industry (e.g. insurers, brokers, banks and micro-finance institutions), input providers (e.g. seeds and fertilisers), traders, the processing industry, and farmer-based organisations.

The current research seeks to find the determinants of adoption of a stand-alone coffee index-based insurance product in Uganda marketed by a farmer cooperative, and to elicit preferences for improving the index-based design and delivery model. Uganda is proving a particularly interesting context in which to develop the agricultural insurance market since recently public policy has begun supporting crop insurance by providing a premium subsidy (Van Asseldonk *et al.*, 2019). Moreover, droughts are the main cause of crop failure in rain-fed production in Uganda and climate change is exacerbating the impact of drought events (Platform for Agricultural Risk Management, 2015). The findings can be valuable to guide the scale up phase by enhancing the design and delivery model.

Methodology

Index-based insurance design

Index-based insurance enables low-cost insurance since there is no need for on-site loss assessment. It simplifies and speeds up underwriting and claim handling through pre-underwritten index products and real-time satellite-based loss monitoring. In Uganda, the index-based insurance under research here is based on Relative Evapotranspiration (RE). Since evapotranspiration is proportional to CO₂ uptake, and consequently to plant growth and crop yield, RE is an accurate measure of drought and a suitable index for agricultural drought insurance (Von Negenborn

et al., 2018). RE index insurance designs allow flexibility in commodity, season and level of coverage. Design options include target premium rates, frequency of small and large pay-outs and different possible levels of spatial aggregation. These features aim to support low prices and to simplify sales and policy administration, whilst maintaining a sufficient pay-out level in dry years as has been rolled-out in for example Mali (Duchoslav and van Asseldonk, 2018).

The Ugandan government has made funds available to subsidise 30% of the premium for commercial farms and 50% for small-scale farms, and even up to 80% in 33 of the most disaster-prone districts of the country, where higher premium rates are needed to provide adequate coverage. Basic premium rates on all subsidised products are limited at 5% (10% in the disaster-prone areas). Whilst this ensures affordable prices and adequate coverage, it is a consequence of actual climatic risks that farmers in more high-risk areas still have to bear part of the drought risk themselves (Van Asseldonk *et al.*, 2019). Public support with a view to increasing the uptake of insurance in agriculture is a very important driver in the upscaling success. By subsidising insurance premiums, the Ugandan government is providing an effective incentive for farmers to address weather risks and climate change-related disasters such as droughts, ultimately to help build a more sustainable and resilient agricultural sector.

Since 2014, several RE based products have been developed and marketed in Uganda. Currently, crop specific (Arabica and Robusta coffee, beans and maize) as well as a generic drought coverage is marketed. Crop specific coverage is based on a crop's specific growing season characteristics and drought sensitivity, whereas generic drought coverage aims to provide general protection during the rainy seasons and is for example suited to intercropped smallholder gardens. These products are delivered through several distribution channels of insurers, banks, brokers and aggregators such as the National Union of Coffee Agribusinesses and Farm Enterprises (NUCAFE). In 2017, sales of index-based insurance, being either credit-linked or stand-alone, reached approximately 45,700 smallholders. The largest scale has been achieved with the generic drought index, distributed as a compulsory element in the bundle for obtaining seasonal agricultural credit. Because it is compulsory and sold via large banks with a large portfolio, the credit-linked sales scale very well (Van Asseldonk *et al.*, 2019). In the current study we focus on the niche coffee index-based insurance product sold via NUCAFE. Since it is a stand-alone product, not mandatory bundled with credit, we are able to study demand for the insurance product, rather than for the credit-insurance bundle as a whole. Coffee is a valuable cash crop and the sector is relatively organised. NUCAFE is a farmer owned organisation and is committed to leveraging its organisational infrastructure and existing transactional relationship with its members to provide drought coverage to its members. Selling voluntary stand-alone insurance in this manner requires the active engagement of hub managers and field staff in promotion, awareness raising and sales. To overcome liquidity constraints affecting smallholders at the onset of the growing season, the option to pay a premium in kind at the moment of harvest is a valuable solution. The premiums are paid

through NUCAFE and then remitted to the insurance company. Any insurance pay-outs are balanced out with the reimbursement for the processed coffee beans after they have been sold by NUCAFE on behalf of the farmers. This approach is only an option in more organised value chains, where aggregators are closely linked to the producers and can leverage their organisational capacity and existing trust relationships.

Sampling design

A household survey among coffee farmers was conducted in July and August 2018. Respondents were selected in three districts of Central Uganda (namely, Buikwe, Masaka and Rakai) because in these locations the highest number of coffee farmers under the NUCAFE insurance scheme were present. In each district, five sub counties and subsequently 15 parishes were selected to randomly identify respondents. The study involved 614 respondents of which 245 (40%) purchased insurance, while 369 (60%) were not insured. Moreover, 383 (62%) were member of NUCAFE, while 230 (38%) were not. For obvious reasons, following the targeted sampling design, insurance participation was low for non-members (8%).

Household survey design and estimation

The household survey included both demand and preference indicators. Demand is hypothesised to be influenced by numerous explanatory variables including household characteristics, coffee production and annual income indicators, perceived customer value of insurance, risk experience and perceptions, preferences, insurance literacy and extension, coping strategies and credit access. Household characteristics include age of the household head (years), gender, education (years) and number of household members. Agricultural production in the previous season and annual income indicators encompassed land ownership (acre), area coffee (acre), coffee yield (kg/acre), total coffee production (kg), total coffee sales (US\$), total other crop sales (US\$), total livestock sales (US\$) and other sources of income (US\$). Binary perceived customer value of insurance indicators included complexity (0 if product is simple to understand versus 1 if complex to understand), perceived basis risk (0 if product appropriately indemnify losses versus 1 if not), and trust in the institution offering insurance (1 if trustworthy versus 0 if not). Risk experience captured whether (1) or not (0) a respondent had faced a climate-related disasters threatening their assets in the past, while risk perceptions elicited the likelihood of crop losses and pay-out (both measured by means of a three point scale from low up to high). Preferences were elicited based on a series of hypothetical lotteries to deduct risk aversion, ambiguity aversion and time preferences. Insurance literacy and extension captured whether respondents had access to extension (1) or not (0). Finally, respondents rated their ability for self-protection from shocks by means of for example savings, assets, other sources of income (measured by means of a three-point scale ranging from low up to high), and access to credit (1) or not (0).

By means of a stepwise logistic regression analysis, we obtain the significant determinants of adoption of aforementioned set of independent variables. Models were estimated for the sample as a whole as well as a sub-sample comprising only NUCAFE members to determine the robustness of the estimates. Furthermore, the key stated and inferred preferences to enhance insurance design are determined among NUCAFE members and those not a member, as well as insured and non-insured (and t-tests were applied to determine statistical difference between the sub-samples).

Results

Descriptive statistics

Overall, descriptive results indicated that the respondents were generally old (47 years) and this perhaps is related to the traditional way of coffee farming in Uganda (Table 1). The study comprised 59% males while 41% were females, and the respondents had attained on average 7 years of basic education. The average household comprised 6 members. Farmers grew coffee on 1.87 acres and produced 540 kg (average yield of 314 kg/acre) enabling a total sale of US\$ 934. Other important sources of income were derived

from sales of other crops such as beans, maize, banana and ground nuts (\$1,525), other (non-farm) income (\$390) and livestock sales (\$70). The sample was most heterogeneous with respect to the total other crop sales as measured by the coefficient of variation.

Note that the average sum insured was less than average total sales and amounted \$300 with corresponding average gross premiums of \$18 per coffee farmer (and net premium rates before VAT averaging 5% after deducting eligible premium subsidy).

Adoption analysis

By means of a stepwise multi-variate logistic regression, the odds ratios of insurance adoption were estimated (Table 2). In the total sample, adopters perceived themselves to be 3.09 more likely to receive a pay-out than non-adopters ($P < 0.01$). Households with on average a better access to extension services than non-adopters were 2.47 more likely to adopt insurance ($P < 0.01$). Those respondents perceiving the design as complex were approximately half as likely to adopt ($P < 0.05$). These independent variables were also significant in the sub-sampling including only NUCAFE members. In the total sample also those participating in coffee drought indexed based insurance had relatively larger area under coffee production ($P < 0.01$).

Table 1: Characteristics of respondents involved in the index-based insurance study.

	Mean	Standard deviation	Coefficient of variation
Age (years)	47	14	29
Gender (male=0)	0.41	0.49	120
Education (years)	7	4	57
Family size (number)	6	2	26
Land ownership (acre)	5.06	5.18	102
Area coffee (acre)	1.87	1.90	102
Coffee yield (kg acre)	314	235	75
Total coffee production (kg)	540	695	129
Total coffee sales (\$)	934	3,328	356
Total other crop sales (\$)	1,525	23,686	1,553
Total livestock sales (\$)	70	129	182
Other income (\$)	390	1,183	303

Source: own composition

Table 2: Regression analysis index-based insurance adoption.

	Total			NUCAFE		
	Odds ratio	Standard error	P-value	Odds ratio	Standard error	P-value
Likely pay-out	3.09		<0.01***	2.64	0.76	<0.01***
Extension	2.47		<0.01***	2.43	0.86	<0.01***
Complexity	0.49		0.03**	0.40	0.17	0.04**
Area coffee	1.20		<0.01***			
District 1	0.12	0.05	<0.01***	0.12	0.06	<0.01***
District 2	0.14	0.05	<0.01***	0.19	0.09	<0.01***
Constant	0.51	0.19	0.07*	1.71	0.82	0.26
R ² _{adj}	0.17			0.14		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: own composition

In the univariate analysis, interestingly all three customer values of insurance indicators (namely, perceived complexity, perceived basis risk and trust in institution offering insurance) were all significant ($P<0.01$). Respondents who perceived a higher degree of basis risk were 0.57 times less likely to adopt, while those with more trust were 2.81 times more likely to adopt. Because of a high correlation between these indicators, and problems with multi-collinearity, only the complexity indicator was included in the final model. Moreover, respondents who experienced a shock in the past were 1.62 times more likely to adopt ($P<0.05$).

Preference analysis

Stated and inferred preferences are elicited among NUCAFE members and those not a member, as well as insured and non-insured (Table 3). Approximately half of all the respondents state that the existing design is fine because the fixed lump sum pay-out is easy and can be trusted. Yet the other half indicate that the existing design would need (some) modification should they be invited to represent the farmers in their area when contributing to the design of a better insurance product.

Both the option of premium payments proceeds on delivery coffee (as promoted by NUCAFE, whereby premiums are paid through coffee sales and then remitted to the insurance company) as well as mobile premium payments are preferred by the majority of the respondents. This also holds for delivering insurance through associations like NUCAFE and others (e.g. village and saving associations, or women associations). Approximately half of the respondents prefer that pay-out are cross-referenced with historical delivery volumes (which indirectly states that a hybrid insurance approach should include some kind of indemnity-based approach). The majority rejects a mandatory approach.

Preferences are also inferred from the reasons why respondents did not purchase insurance. The major reason advanced by the non-insured is lack of information or unavailability of a seller (67%), stressing the importance of awareness campaigns and further developing sales channels.

The other major hindrance is the lack of understanding the insurance products currently on the market, stressing the importance of providing extension services to enhance financial literacy. Furthermore, lack of cash hampers insurance uptake. Any innovation that would enable farmers pay for insurance without the need to pull cash would drive adoption. The approach of using farmers' products could drive premium payments for agricultural insurance in Uganda.

Discussion and Conclusions

The major factors influencing purchase of insurance are linked to access and information availability with respect to the inherent pay-out characteristics of index-based insurance design. Farmers who purchased coffee drought index-based insurance under NUCAFE had better access to extension services, perceived more frequent pay-outs and perceived the index design as less complex than non-adopters.

Deepening insurance uptake among coffee farmers will therefore require a strong focus on communication and information sharing. This would involve well targeted messages that address fears of farmers and improve trust among beneficiaries. Furthermore, introducing innovative ways of charging for premiums on commodities supplied would improve premium payments. Large-scale insurance adoption hinges on the cooperation of participating aggregators and an effective outreach to the market. These aggregators are crucial as intermediaries in order to channel brokerage services to a vast number of farmers that are otherwise too difficult to reach individually. They allow scale in outreach and transactions (since they are well-ramified distribution network in the countryside), and provide much needed trust between all parties involved, from the index service provider to the insurance companies and smallholders. Nevertheless, value-chain actors have to convince farmers to purchase stand-alone insurance products. A major challenge, both for these aggregators and for the agricultural sector in general, is to increase awareness and understand-

Table 3: Preferences index-based insurance design.

	Not member NUCAFE	Member NUCAFE
Needs improvements	49%	53%
Preferences improvements		
Option mobile premium payment	69%	72%
Premium payments proceeds on delivery coffee	66%	61%
Offering index-based insurances through associations	60%	56%
Pay-out cross referenced with historical delivery volumes	49%	53%
Mandatory premiums for all members in the association	25%	25%
	Not member NUCAFE not insured	Member NUCAFE not insured
Reason not buying insurance		
Insufficient information and/or no seller was available	67%	49%***
Difficult to understand the insurance product	31%	24%*
Lack of cash/credit to pay the premium	29%	56%***
Limited trust insurance providers	6%	6%
Fear of cumbersome administrative procedures during pay-out	3%	7% **

* $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Source: own composition

ing among smallholders about their risk exposure and the possible ways to reduce it, transfer it via insurance, or otherwise cope with the risks they face. As a step forward, further upscaling would require use of, for example, insurance champions in rural communities to demonstrate added value in order to encourage farmers to appreciate the benefits of holding insurance. This will improve the trust levels of clients, and hence drive penetration levels among farmers.

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