POLICY BRIEF

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Chibanga farmer, Royce (left), and Chibanga village leader, Eneless (right), in Eneless' garden. May 2017.

Increasing Access to Affordable Agricultural Microinsurance in Sub-Saharan Africa

By Brenden McKinney

The effects of climate change are causing risk management to become an increasingly essential tool to help farmers anticipate and react to weather-related shocks like droughts and floods. When an efficient risk management system is implemented, it improves the standard of living of those who depend on farming, strengthens agricultural businesses, and supports investment; such a system can decrease the overall risk profiles of individuals and increase the confidence of farmers in their ability to take on risks that could improve their income.[1] While risk mitigation plays a key role in socio-economic development, the system must be affordable in order to successfully reduce poverty levels for those at the base of the economic pyramid.

WHAT IS AT STAKE?

Royce Situnya is a 23-year-old Zambian subsistence farmer and mother of three who lives in Chibanga, a rural village located in the Central Province of Zambia. With a fourth child currently on the way, Royce became a mother at 14, a not uncommon occurrence for women in her village. As one of the more than 58 percent of Zambians living below the international poverty line of $1.90 per day, Royce's life is precarious and defined by incessant worry about providing food for her family through the small-scale maize fields and supplemental garden she maintains with her husband, Joseph.[2]

KEY RESULTS:

- **Climate change is exacerbating the need for affordable risk management solutions for subsistence farmers.**
- **Index-based microinsurance has begun to take flight in many developing countries in the sub-Saharan, but these efforts have been focused at the governmental and institutional level.**
- **Weather index-based microinsurance geared at low-income and subsistence farmers has yet to takeoff, despite it offering tremendous opportunity in mitigating the cycle of poverty that is often brought on by one or more poor harvests, and in increasing the likelihood of farmers making yield-enhancing investments.**
- **Beyond financial literacy, a key hurdle to offering this type of small policy insurance at the micro level – for the price that would make it viable for low-income and subsistence farmers – is financial viability.**
- **Subsidized insurance premiums, provided either by government bodies, as is commonly the case in the United States and other developed markets, or by other means, such as by private benefactors, as described in the case study in this policy brief, is essential for the future development of microinsurance programs built for those at the lowest income levels.**

During an interview on her farm in May 2017, Royce elaborated on the uncertainty faced by her and her family: “One bad harvest often leads to future bad harvests. Not only is your family hungry now, but you also worry that you will not have enough money to buy seed and fertilizer for the next year, which means next year’s harvest will do poorly too.” This situation is all too familiar to the 1.5 million smallholder and subsistence farming households in Zambia; it is equally familiar to the two billion subsistence farmers globally who derive nearly all of their food from their own crops and generate no or only small amounts of income through the sale of what remains of their harvests.[3] During that same interview, Royce explained that the level of uncertainty around her maize crop has increased every year since she began farming at the age of 13, driven by what she called “confused skies”. When elaborating on this, she mentioned the rain did not come like it used to, with intermittent patterns of rain, accompanied by warmer temperatures during the rainy season that “played mischief”, in the words of Royce, with subsistence farmers who lack irrigation and thus depend on historic rain patterns to time their planting.

Climate change is expected to cause further changes in both the average climate conditions as well as the variability and volatility of weather, with more frequent or extreme weather events.[4] Climate change has increasingly wreaked havoc on the small-scale farmers who are most reliant on agriculture for their livelihoods, increasing instances of food insecurity, and impeding socio-economic development by creating cycles of poverty through the negative impact that one bad harvest can have on the next.[5] The vicious cycle reduces child education, increases infant mortality and decreases the willingness of farmers to make investments in technologies that are likely to increase their productivity and yields.[6] When subsistence farmers’ crops fail, they generally lack the funds needed to buy inputs for the following year’s growing season as a result. They are often forced into piecework, which entails working on the land of a more successful farmer in exchange for food for consumption. This, however, does not solve the problem of being unable to afford the seeds, fertilizers, and pesticides necessary for the following planting season, nor does it provide the funds needed to send their children to school, seek out medical care, or provide a stable base to implement new farming methods and techniques.

CURRENT AGRICULTURAL MICROINSURANCE MARKET

Over the last fifteen years, there has been an increase in the use of index-based weather insurance in Africa as a risk management tool to help fight the impacts of climate change. As Binswanger-Mkhize noted in 2012, this form of insurance has been proposed as a compelling solution by both academic researchers and global development financial institutions that can decrease cycles of poverty caused by weather shocks, encourage investment, and increase the adoption of new technologies.[7]

Despite the potential of these risk management products, making them available to those at the subsistence level remains challenging largely due to (1) the unrelenting obstacles of costly premiums fueled by high underwriting costs and (2) inadequate financial literacy. Efforts by both nonprofit and for-profit organizations have been primarily concentrated in what Joanna Syroka, the Director of R&D at the Africa Risk Corporation, refers to as “macro” and “meso” models. Macro index-based insurance models focus on providing insurance for entire governments and countries. Meso models focus on insuring businesses and financial institutions against weather-related vulnerabilities they may face (e.g., a bank whose customer base largely consists of farmers, or a seed or fertilizer manufacturer). Micro models, on the other hand, focus on providing microinsurance policies to individuals and have had far less success, primarily due to the economic and logistical infeasibility of traditional for-profit providers insuring small-scale farmers with very low-premium policies.[8]

INDEX-BASED INSURANCE

Index-based (“IB”) insurance, like any other insurance product, mitigates the potential impact of a negative event by providing financial compensation for losses incurred by the insured in exchange for a paid premium. However, unlike traditional commercial insurance, which typically relies upon case-by-case assessments of policy claims, IB insurance offers policyholders payouts based on an external objective indicator or index, which acts as a proxy for losses and which triggers a payment to insured clients above or below certain pre-determined thresholds. The most essential component of IB insurance is that the indicator or index is as strong of a predictor of actual losses as possible.[9] The strength of the causal relationship

between the proxy and the actual losses is referred to as basis risk. The lower the strength of this relationship, the higher the basis risk, and vice versa. An effective IB insurance product will aim to minimize basis risk.

IB insurance is largely what makes microinsurance feasible for those at the subsistence and low-income level (where low premiums are essential for affordability), as assessing claims on a case-by-case basis is not economically practical for very small policies. It is also worth noting that using an index-based insurance model eliminates the market inefficiencies caused by moral hazard and adverse selection, which accompany traditional insurance. This is a result of payouts being based on a purely objective measure that has no bearing on individual claimant actions.[10]

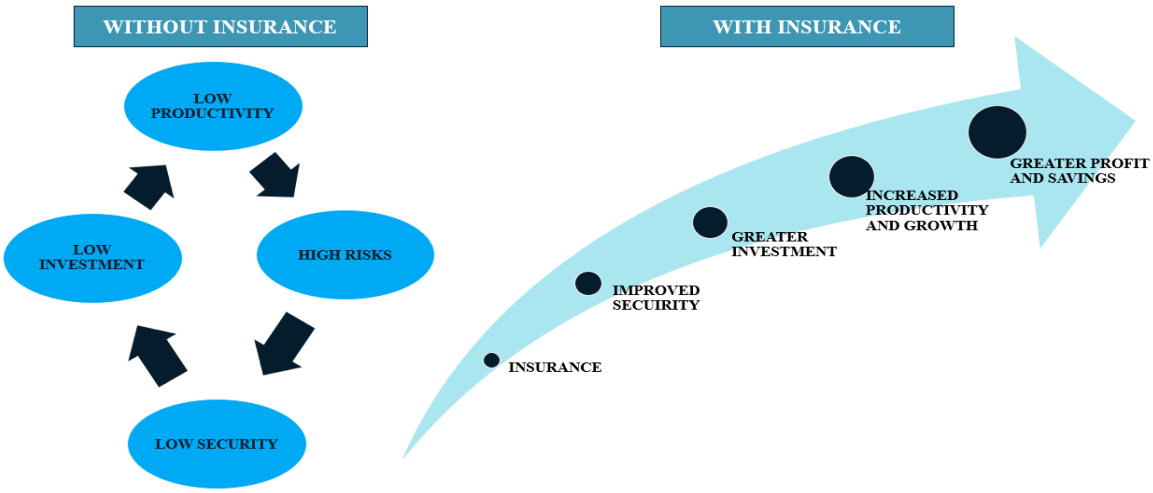
ZUA CASE STUDY

Given the dearth of microinsurance solutions targeted at the micro level, I, along with a team of McGill students set out to test and analyze the efficacy of an index-based insurance product delivered through a nonprofit model – Zua Microfinance ("Zua") – to improve the lives of those at the base of the economic pyramid. More specifically, we founded Zua to accomplish three things: 1) explore the viability of a non-profit index-based microinsurance offering in the sub-Saharan for some of the region's lowest-income farmers, 2) test the ability for agricultural insurance to help stifle the cycle of poverty that is often brought on by a poor harvest, and 3) test the extent to which the following theoretical assumption is substantiated empirically: *providing an insurance safety net decreases overall risks to an individual and their families, thereby increasing their propensity to make yield-enhancing investments that they otherwise would not.*

After extensive field research, a rural village in the province of Central Zambia called Chibanga was chosen as the location to carry out the study. Chibanga, located 35 kilometers east of Kabwe, has more challenges than most rural communities. The residents of Chibanga are largely subsistence farmers, more than 50 percent of which are female. From conversations with villagers, we learned that a large number of the women in the villages were widowed because of the ongoing AIDS epidemic. As a result, Zua observed women as young as 18 and as old as 78 taking on the role of subsistence farmer and primary provider for their children and grandchildren. In order to build connections within the community that would be essential for this work, as well as to ensure the cultural relevance of the project, Zua partnered with a local organization, Impact Community Outreach (ICO), with deep ties to the villages to assist and serve as a trusted connector and advisor.

Research was conducted utilizing farmer surveys, business market surveys, and field observations in central Zambia collected between May 2017 and October 2019, as well as historical weather and crop yield data. The Zua project consisted of 35 farmers (31 female and four male). The average age of the farmers was 46, ranging from 22 to 78 years old. All farmers had children, with the median number of children being 5.5, and the median number of grandchildren being 4.0. The median size of plot for the farmers was 2.0 hectares, ranging from only a quarter of a hectare to 12 hectares. The predominant crop grown in the community was maize, but the farmers also maintained gardens containing sweet potatoes, groundnuts, cow peas, sunflowers, watermelon, and soybeans.

Figure 1. The ideal impact of insurance on the cycle of poverty



We used historical precipitation and temperature data from 28 growing seasons, sub-divided into 10-day periods between 1987 to 2014, as well as observed historical yields by hectare in the region to build a predictive yield model upon which insurance claim payouts would be based.[11] The years with the highest yields per hectare in the Central Province of Zambia over the last 28 growing seasons were averaged to form baseline yields representative of an ideal season. In the case of this research study, rural farmers are the policyholders, maize is the asset for which an insurance policy is being provided, and the external indicators used for the index model are rainfall and temperature levels. Deviation from historical rainfall and temperature patterns is used to determine whether or not claims are triggered.

Given that the goal of the insurance policy was to mitigate the cycle of poverty that is often brought on by one or more poor harvests, Zua selected a simple and forgiving all-or-nothing payout design, in which payouts were triggered and all claims would be automatically paid out if projected yields fell more than five percent below the baseline yield. Otherwise, no claims would be paid.

The claims would be paid out in the form of farming inputs (e.g., fertilizer and seeds). Through interviews with the farmers, nearly every respondent stated their preference for payouts (if they were made) in the form of farming inputs rather than cash. Many farmers spoke of being unable to save money for prolonged periods because if there was another family in the village struggling, any excess money would often be used to assist them. Payouts were set to comprise of enough seed and fertilizer to adequately plant on a quarter of a hectare. No premiums were charged to the farmers for the first season of this research project. In exchange for participating in the project, we asked farmers to allow Zua to collect information about themselves, their families, and their crops over the next two growing cycles. Not charging premiums initially allowed Zua to (1) introduce the concept of insurance to the farmers in a way that eliminated one of the largest barriers to adoption – the inability to afford insurance and (2) test the predictive model without financially jeopardizing the farmers if the model did not adequately capture the reality of their subsequent harvest.

All insurance policies offered were funded entirely through a crowdfunding campaign. Zua operated as a registered Canadian nonprofit organization that provided subsidized insurance by bringing together developmentally conscientious "underwriters" willing to carry the risk without being compensated for doing so (as an alternative form of donation). Individuals would put up funds necessary to cover the claim for a farmer, and if the payout was not triggered during the life of the policy, then the donor/underwriter would have the opportunity to either reinvest those funds to insure another farmer or get their money back. Fifty-six individual underwriters participated in the pilot with a median $25 USD contribution to insure a policy. The majority of these individuals were university students and recent graduates. All operating and travel costs, as well as costs incurred by Zua's ground partner, ICO, which would typically be covered through premium amounts, were covered personally by the researchers for the project.

CASE STUDY RESULTS

Based on the precipitation and temperature data for the 2017-2018 growing season, the model predicted a 2018 harvest yield of just 3.05 tons per hectare, a six percent decrease compared with the baseline yield of 3.23 tons per hectare, therefore triggering the full payout of the insurance claims.

Central Zambia experienced a prolonged drought at the peak of the rainy season in January 2018. Dekads (the 21 ten day periods into which the growing season was divided) 7, 8, and 9 experienced 82 percent, 90 percent, and 81 percent less rainfall compared to the baseline, respectively. During these same three dekads, the temperature was also warmer by three percent, nine percent, and 13 percent, respectively, thereby further decreasing the resilience of the maize crop. This timing had a tremendous impact on the model, since crop yields were most sensitive to rainfall and temperature in dekads 7 and 9 per our model back-testing. From a qualitative standpoint, the 35 farmers in the project reported a median of eight 50kg bags of maize harvested (with an average of eight bags as well), a number that they reported as being approximately 70 percent less on average than what they would have expected in a good year. When asked to what they attributed the poor harvest, 88 percent stated drought, 60 percent stated a lack of fertilizer or untimely fertilizer application, 16 percent reported seed issues (e.g., using recycled seeds, late seed planting), and 16 percent reported having other issues that resulted

in a poor harvest (e.g., child death resulting in a neglect of the crop, medical problems, pests, etc.).

Role of insurance in stifling the cycle of poverty. The data collected during Zua's pilot project highlights the important role that insurance can play in breaking the cycle of poverty. For example, despite the less-favorable weather during the 2018-2019 growing season (relative to both the baseline and to the 2017-2018 season during which the farmers were insured), yields were higher (relative to both the baseline and to the prior season), and, based on farmer interviews, 2018-2019 yields were 125 percent above the levels that farmers would have expected had they been without insurance the prior year, as many would have struggled to afford the inputs needed for the year as a result of the poor harvests seen in the 2017-2018 season. This greater resilience to a weather-related shock following an insured season highlights the potential of microinsurance to alleviate the cycle of poverty and prevent one poor harvest from perpetuating into the next.

Investment propensity. When asked how continual access to insurance would impact their future work behavior, 69 percent of farmers stated they would try new farming techniques and grow their farming businesses, 40 percent said they would plant different crops, nine percent said they would begin keeping animals, and six percent said they would start a new non-farming business. Finally, when asked if they would be interested in purchasing agricultural insurance every year for a modest premium, with payout occurring only if there were droughts or poor weather, and with payouts taking the form of seeds and fertilizer equivalent to what the farmers had received in November 2018, 100 percent said yes. Many farmers also mentioned the desire for crops beyond maize to be insured, such as soybeans and groundnuts. Farmers also requested insurance against pests. While the study indicated an increased propensity of farmers to make future investments, the long-term influence of insurance on substantial business investments likely requires continual multi-year access to insurance and will require additional research.

Viability of a non-profit index-based micro-insurance offering. Finally, the Zua case study demonstrated the feasibility of nonprofit crowdfunding insurance models in delivering a microinsurance offering to individuals at the base of the economic pyramid as an alternative to government-subsidized insurance. The pilot showed an eagerness from development-conscious benefactors in more developed countries to underwrite the risk of subsistence farmers. A viable model also requires that it be culturally relevant, helpful, and well-received by the beneficiaries. Zua's partner ICO reported that over 1,000 farmers in the villages of Chibanga and Katuba expressed interest in such insurance going forward (representing nearly an eighth of the population of the villages).

RECOMMENDATIONS AND CHALLENGES OF PROVIDING AFFORDABLE MICROINSURANCE

The viability of new risk management products that seek to counteract the increasing risks faced by those at the subsistence level will, at a minimum, require that they are economically feasible for the provider and affordable for the policyholder. Index-based models provide some of the most practical means of offering low-cost insurance but come with their own downsides. Since objective measures like rainfall and temperature will never perfectly explain crop yields, there is a risk that payouts are triggered when policyholders' crops are healthy, as well as the possibility that payouts are not triggered when policyholders' crops are failing. As a result, weather index-based microinsurance is only viable in regions that possess very high correlations between weather and crop yields, and even then basis risk would likely be higher than it would be with other, much more costly, index methods like satellite-based vegetation indices. The basis risk inherent in an index model creates the potential for situations in which crop yields are worse than an index-based weather model would predict, leaving farmers who paid premiums for an insurance product that did not adequately protect them worse off than if they had purchased no insurance.[12]

Setting aside the basis risk issues associated with index-based insurance, insurance products in general are much more difficult to sell to individuals at the BOP than other financial products, such as credit. Unlike microcredit, which has penetrated even the most remote villages of sub-Saharan Africa, the concept of insurance is far less familiar, and it further requires additional financial literacy as well as trust in the institution providing the insurance.

Many of the aforementioned hurdles could be overcome by focusing microinsurance products at the

meso level (institutional versus individual level, as described above). Further research is needed to better understand the tradeoffs and impact of the various direct and indirect models. While meso models are simpler to implement, the direct benefits to farmers can often be more limited if the microfinance intermediary is receiving the insurance rather than the farmer directly. For example, if a microlending institution who provides small loans to farmers purchases a weather index-based insurance policy against which a claim is paid, they could decide to forgive farmer loans or continue lending to new farmers, but in no way do they have to extend these or other benefits of the payout to the farmers. In some regions, the scalability of direct-to-farmer microinsurance offerings may be dependent on increases in financial literacy and on cultural changes regarding the trust farmers have in finance organizations. Additional research should also be conducted to assess the degree to which basis risk varies across index-based insurance model structures (e.g., satellite-based vegetation indices) and to examine the differences in operational cost within each model.

Regardless of the model, premium subsidies will be integral to any future development program targeted at reaching those at the lowest income levels. For reference, in the United States, the largest agricultural market in the world, federal crop insurance premium subsidies reach 73 percent of premiums.[13] In addition to premium subsidies taking the form of government subsidies, they can also be effectively provided by private benefactors who subsidize insurance for subsistence farmers as an alternative type of donation, as was the case in Zua's project.

CONCLUSION

Subsistence farmers are susceptible to a trifecta of anti-development attributes: high risks, low security, and low investment. Climate change is increasing the already high inherent risks involved with subsistence farming. Risk management solutions that reach those at the base of the economic pyramid, such as microinsurance, are able to provide an opportunity to decrease risk, decrease cycles of poverty, and promote new investment. Affordable agricultural insurance, when deployed properly, acts as a safety net to provide many low-income farmers the opportunity to fight back against the cycle of poverty often brought on by weather-related shocks. It brings a peace-of-mind to the precarious lives of subsistence farmers and allows them to enjoy their profession in ways that are becoming increasingly rare. Given the benefits, it is essential for governments and development organizations to consider various forms of subsidies that make providing such insurance viable at the subsistence level. The Zua case study helps show the potential of one alternative method that can be used in this effort, but other innovative methods to disperse the increasing risks faced by subsistence farmers should be considered as well.

This policy brief was authored by Brenden McKinney, a former McGill student, and a current research fellow at the McKinsey Global Institute.

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