

## INCLUSIVE INNOVATIONS

# Increasing Smallholder's Productivity and Food Security through Index-Based Microinsurance

*Data-based claims mechanism provides automatic pay-outs following a disaster*

### HIGHLIGHTS

- Linking agricultural insurance to an index is more cost-effective than tying it to actual incurred losses.
- Mobile banking can make indexed insurance more affordable, increase availability, and speed pay-outs.
- Insurance allows farmers to invest more confidently and manage losses better, helping to improve their productivity.



### Summary

Farmers in developing countries are highly vulnerable to risks, but most cannot afford commercial insurance. Schemes in which pay-outs are based on objective criteria, such as rainfall, are less expensive than traditional insurance, because individual claims are not assessed. Making these products available to smallholders can increase their productivity, by allowing them to engage in higher-risk/higher-return strategies.

### Development Challenge

Millions of smallholders in developing countries lack irrigation systems and are unable to access or afford high-quality inputs, such as seeds and fertilizer, leaving them particularly vulnerable to weather-related risk. Unable to afford traditional insurance, they respond by curbing their investment and investing in low-risk/low-yield crops, which lock them into a vicious cycle of poverty. Affordable microinsurance products could help break this cycle.

### Business Model

Index-based agricultural microinsurance is a type of microinsurance in which pay-outs are based on publicly observable indexes rather than actual incurred losses. Compared with traditional agricultural microinsurance, the index mechanism substantially reduces transactions costs and spares low-income farmers the trouble of having to go through the onerous process of filing claims.

Farmers purchase coverage for risks related to their crops or livestock, paying their premiums in cash or via mobile banking. The most common risks are drought, excessive rainfall, storms, and pest infestation.

Pay-outs are made automatically made when objective criteria—such as rainfall, based on data from weather stations—exceed a certain value. Not having to assess losses on a case-by-case basis substantially reduces administrative costs, allowing insurers to charge lower premiums. Automatic

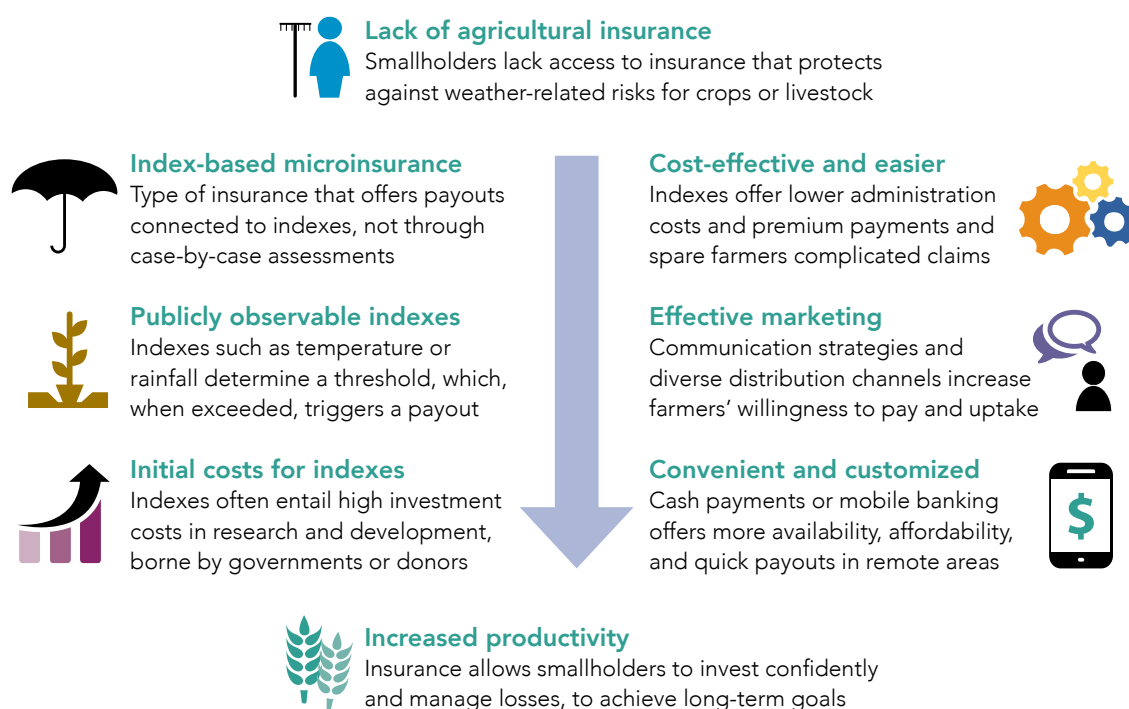
pay-outs also eliminate the complicated and time-consuming claims process, which in the past caused farmers in developing countries to distrust insurance.

The design of robust indexes that reflect smallholders' as well as insurers' risk is vital to both the impact and the financial viability of the business model. The design of such indexes often entails high initial investment costs in research and development. Basing an index on rainfall, for example, requires a dense network of weather stations, which many developing countries lack. Private insurers often find developing the tools that model agricultural risk (such as catastrophe risk simulation techniques) too complex and expensive (World Bank 2010). These costs are therefore often borne by governments or international donors.

Insurers often reinsure their products. Reinsurance is particularly crucial in the agricultural sector to manage covariant risk, especially in developing countries, where insurers often operate in small areas with limited product portfolios.

## Components of the Model

Figure 1. Index-based agricultural microinsurance



## Cost Factors

The design of robust indices which adequately reflect smallholders' as well as the insurer's risk is vital to both the impact and the financial viability of the business model. The design of such indices often entails high initial investment costs in research and development. For example, robust indices heavily depend on the density of the weather station network, which in developing countries frequently lacks adequate coverage. Also, the development of tools that model agricultural risk such as catastrophe risk simulation techniques is often too complex and costly for private insurance companies. Therefore, these costs are commonly borne by governments or international donors. In addition, insurers frequently seek reinsurance for their products. Reinsurance is particularly crucial in the agricultural sector to manage covariant risk, and even more so in developing countries where insurers often operate in comparatively small areas with a limited product portfolio

## Revenue Streams

Most index-based microinsurance models rely on two forms of revenue: premiums paid by small farmers and subsidies paid by the government. Most farmers are either unwilling or unable to cover the full premium at actuarial rates. Governments therefore subsidize the premiums (Smith and Watts 2009).

In addition to insuring farmers, some microinsurers insure microfinance or other lending institutions against loan defaults. ACRE, for instance, offers a range of such products, including directly insuring loans or bundling indexed insurance with microloans to small farmers.

## Financial Viability

No model has yet shown evidence of financial viability; most schemes receive significant financial support from governments or donors. Some models (CADENA, NAIS, mNAIS) subsidize premiums directly, covering 75–90 percent of the premium cost. Others (ACRE) charge actuarial premiums and use support for research and development.

## Partnerships

Index-based agricultural microinsurance schemes that have reached scale generally involve a multitude of actors working together:

- Insurers—including private insurance companies, state-owned companies, member-based organizations, and NGOs—design and operate the schemes, collecting premiums and settling claims.
- International reinsurance companies, such as Swiss Re, reinsure index-based microinsurance schemes.
- Governmental, NGO, and research institutions support the design of index-based insurance products.
- Microfinance institutions, NGOs, farmers associations, and agricultural extension staff market the policies.

## Implementation: Delivering Value to the Poor

### Awareness

Index-based insurance products can be difficult to explain to farmers, especially in environments where insurance culture is weak or farmers have had bad experiences in the past. Implementing organizations therefore usually disseminate information via their networks of local NGOs or member-based organizations, such as agricultural cooperatives or farmers associations. Government extension services can also be used to promote products. Potential clients usually trust these organizations, making them invaluable in creating awareness. In addition to traditional training sessions in which the product is explained, many schemes have used brochures and TV or radio advertisements.

### Acceptance

The fact that pay-outs are based on an index rather than actual losses and that the two are not perfectly correlated (a problem known as “basis risk”) reduces both the demand for and the effectiveness of index-based microinsurance. Technological advancements in data collection, such as satellite data, have reduced basis risk by providing data that are spatially continuous (FARM 2012). Effective communication strategies that explain how the product works can also help build acceptance. The R4 Initiative used games that simulated financial markets to teach farmers about cost preferences and facilitate product design (World Resources Institute 2011).

## Availability

Microinsurance providers use various distribution channels, including cooperatives and networks of microfinance institutions, which market insurance products separately or in combination with other products, such as credit. Mobile banking helps make the product available in even the most remote regions.

## Affordability

Index-based agricultural microinsurance costs significantly less than traditional insurance, because insurers do not need to verify individual claims. To ensure affordability by the target group, governments frequently subsidize microinsurance schemes. Even so, low willingness to pay and high price sensitivity substantially hinder uptake (Biener and Eling 2012). Affordability remains a challenge.

*Table 1. Affordability of selected index-based agricultural microinsurance models*

Model/countries	Affordability
ACRE (formerly known as Kilimo Salama) (Kenya, Rwanda, Tanzania)	Premiums and pay-outs are processed via mobile banking. In addition to ensuring widespread availability, mobile banking helps keep transactions costs, and consequently premiums, low. Inputs (seeds) rather than outputs are insured, reducing the insured value but allowing farmers to plant the following season.
Componente Atención a Desastres Naturales (CADENA) (Mexico)	Federal government subsidizes 75–90 percent of premiums, depending on an area's level of marginalization.
Guy Carpenter (Mozambique)	"Portfolio pricing" model (which uses the insured sum in a region as the basis for risk calculation) reduces premium costs by including more smallholders and diverse areas in a group.
R4-Rural Resilience Initiative (formerly HARITA) (Ethiopia, Malawi, Senegal, Zambia)	Scheme allows farmers to pay for their coverage with their labor. Scheme is integrated into existing social safety net, disaster risk reduction scheme, or World Food Programme's Food Assistance for Assets program.

## Results and Cost-Effectiveness

### Scale and Reach

ACRE covers more than 185,000 farmers in Kenya, Rwanda, and Tanzania. Guy Carpenter covered 43,000 cotton farmers in its first year of operation, paying out about USD 230,000 to beneficiaries after the drought that year.

Few schemes have achieved scale, however. Weak demand, poorly designed indexes, and smallholders' liquidity constraints mean that most smallholders in developing countries remain without insurance coverage.

*Table 2. Impact of selected index-based microinsurance schemes on farmers' productivity and income*

Model/countries	Impact	Reach
ACRE (formerly Kilimo Salama), (Kenya, Rwanda, Tanzania)	Insured farmers invested 19 percent more and earned 16 percent more than uninsured counterparts, according to a 2012 impact study; 97 percent of farmers insured by ACRE in 2013, including many who purchased indexed insurance, received insurance linked to a loan.	About 185,000 smallholders (2013)
Index-Based Livestock Insurance	Insured households are less likely to sell livestock, more likely to buy livestock, and more likely to become self-sufficient in food consumption (Janzen and Carter 2013).	More than 4,000

(IBLI) (Kenya and Ethiopia)		smallholders (2014)
R4-Rural Resilience Initiative (formerly HARITA) (Ethiopia, Malawi, Senegal, Zambia)	Insured smallholders increased their savings by 123 percent more than uninsured smallholders and owned more oxen (the most valuable assets for many farmers) than uninsured farmers, according to an evaluation in Tigray conducted between 2009 and 2012. Farmers enrolled applied five times more compost than uninsured farmers; in some districts, they increased investment in agricultural inputs, such as fertilizer or seeds, more than their peers without insurance.	24,000 smallholders in Ethiopia and 2,000 in Senegal (2014)

The degree to which index-based microinsurance reaches the poorest farmers varies greatly. Findings from the Index-Based Livestock Insurance Project (IBLIP) in Mongolia suggest that better-off farmers tend to purchase coverage. In contrast, the R4-Rural Resilience Initiative in East Africa has found it difficult to attract better-off farmers.

### Improving Outcomes

Index-based agricultural microinsurance can increase farmers' income and productivity by increasing their willingness to invest and engage in riskier practices (Cole and others 2012). Insured farmers are more likely to plant higher-yield/higher-risk crops, invest more in fertilizers, and adopt other production-enhancing methods. Uptake is more common in areas that experienced several years of below-average rainfall or crop yields. It is also higher when the insurance is presented by a trusted third party, such as an NGO.

### Cost-Effectiveness

In the absence of insurance, many small farmers engage in costly mitigation strategies to prevent loss, using savings or selling off assets in the event of loss. Microinsurance can prevent these losses. Indexed insurance reduces administrative costs by eliminating the need for claim inspection and verification.

### Scaling Up

Models that have achieved scale share several features (IFAD and World Food Programme 2010):

- *Integrated approaches:* Insurance complements other risk-management strategies. It should be used only to offload that portion of risk that cannot be addressed by other means.
- *Participatory methods:* Drawing on farmers' knowledge in the design of products has led to improvements in indexes, especially where data are limited. Collaboration with the target group also helps create acceptance and awareness. Engaging potential clients in role-playing games in the pilot phase substantially increased demand in the R4 Initiative.
- *Supply chain approach:* ACRE's close links to the M-PESA mobile banking system reduce transaction costs and increase availability.

### Challenges

The primary challenge is increasing the uptake of services. Low financial literacy prevents many farmers from participating. Many small farmers also lack the liquidity required to buy insurance. Accurate historical data on weather and crop yields are often unavailable or unreliable, making indexing difficult. Many firms are experimenting with new methods of determining yields, such as satellite imaging, but this new technology is still in the development and testing phase. Even successful cases report that basis risk remains a challenge.

## Role of Government and Public Policy

Public-private partnerships can operate on a larger scale than commercial insurers, thanks to their affiliation with national social security programs and access to data (Herbold 2010). These partnerships reach millions of low-income households. Examples include NAIS and mNAIS in India and Componente Atención a Desastres Naturales (CADENA) in Mexico. Both governments subsidize up to 90 percent of the premiums.

Index-based insurance depends heavily on accurate and up-to-date meteorological and agronomic data, which governments collect. Government involvement is also crucial in providing a sound regulatory and legal framework, which determines the scope of activity of insurance companies and ensures their financial integrity. A solid legal framework fosters confidence among all actors. Regulatory frameworks may need to be revised and adjusted to reflect the specifics of index-based agricultural insurance.

**Table 3. Selected providers of index-based microinsurance**

Model	Countries	Website	Description
ACRE (formerly Kilimo Salama)	Kenya, Rwanda, Tanzania	<a href="http://www.acreafrica.com/">http://www.acreafrica.com/</a>	Offers products at actuarial premiums, using mobile banking.
Componente Atención a Desastres Naturales (CADENA)	Mexico	<a href="http://www.sagarpa.gob.mx/desarrolloRural/cadena/Paginas/default.aspx">http://www.sagarpa.gob.mx/desarrolloRural/cadena/Paginas/default.aspx</a>	Index-based crop and livestock catastrophe insurance program is available in some states. In other states, farmers receive compensation payments following climate disasters.
Guy Carpenter	Mozambique	<a href="http://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/industries/financial+markets/retail+finance/insurance/guy+carpenter">http://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/industries/financial+markets/retail+finance/insurance/guy+carpenter</a>	Company uses portfolio pricing model and innovative methods of data collection to keep premium costs low and accessible to large number of farmers.
Mongolia Index-Based Livestock Insurance Project (IBLIP)	Mongolia	<a href="http://www.iblip.mn/">http://www.iblip.mn/</a>	Index-based livestock mortality insurance product encourages farmers to adopt practices that build their resilience.
R4-Rural Resilience Initiative (formerly HARITA)	Ethiopia, Malawi, Senegal, Zambia	<a href="https://www.wfp.org/climate-change/r4-rural-resilience-initiative">https://www.wfp.org/climate-change/r4-rural-resilience-initiative</a>	Integrated approach to minimizing farmers' risk combines improved resource management (risk reduction), insurance (risk transfer), microcredit (prudent risk taking), and savings (risk reserves). Insurance-for-assets program allows farmers to work in community-identified projects in return for insurance coverage.
NAIS/mNAIS weather-based crop insurance scheme	India	<a href="http://www.aicofindia.com/">http://www.aicofindia.com/</a>	State subsidies keep premiums low. Link with agricultural credit insurance attracts large numbers of farmers.

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## Additional Reading

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## Profile: ACRE

*Rural farmers in Kenya, Rwanda, and Tanzania use mobile banking technology to purchase index-based insurance of agricultural inputs*



### Challenge

In the face of climate change, farmers in many developing countries are becoming increasingly vulnerable to the risks posed by extreme weather and climatic events. These adverse effects affect agricultural smallholders disproportionately, because their capacity to manage risk is limited. Smallholders often lack irrigation systems and are unable to access or afford high-quality agricultural inputs, such as seeds and fertilizer. Their increased risk exposure curbs agricultural investment and thus productivity, locking them into a vicious cycle of poverty.



### Innovation

In 2009, the Syngenta Foundation for Sustainable Agriculture, in partnership with the Global Index Insurance Facility (GIIF), began providing farmers in Kenya, Rwanda, and Tanzania, with index-based microinsurance products for livestock and crops. Index-based agricultural microinsurance is a type of microinsurance in which payouts are connected to publicly observable indexes, like temperature or rainfall, rather than actual incurred losses. These efforts have continued under ACRE (<http://www.acreafrica.com/>), a commercial company spin-off, and its partner network, which includes insurers, reinsurers, agribusinesses, microfinance institutions, NGOs, and input suppliers. ACRE collaborates with all relevant actors along the value chain of agricultural insurance, from local insurance companies to input companies and agribusinesses. Its services range from product development and improvement to risk monitoring.

The company offers three main index-based products:

- **Loan-linked insurance:** ACRE's main product is linked to credit from microfinance institutions. ACRE insures the loan and thus the input investment, which must be at least USD 100. Depending on the crop, the premium costs 5–25 percent of the input value. It is paid for by farmers or the microfinance institution. In case of a payout, the loan is covered by the insurance product. The product also provides agronomic training for farmers by microfinance institution agents.
- **Replanting guarantee:** The replanting guarantee is offered in collaboration with seed companies. Each bag contains a scratch card with a code inside. To register for insurance, farmers message the code to ACRE via SMS, paying for the insurance—and all ACRE products—using mobile banking, especially the M-PESA scheme in East Africa. The replanting guarantee starts upon registration and ends after two weeks. If there is a drought within that period, smallholders receive a voucher for a new bag of seeds, enabling them to replant within the same season.
- **Hybrid index and multiperil crop insurance:** This product combines the traditional yield-based approach and the index-based approach. Unlike traditional insurance, it covers the entire crop cycle, starting in the germination phase, providing more comprehensive coverage.

ACRE also offers contract seed grower insurance and indemnity-based dairy livestock insurance.



ACRE has established innovative distribution channels by building strong ties with the private sector. Both input suppliers and microfinance institutions, which have access to large numbers of people who would otherwise be costly to reach, function as aggregators. They have a strong interest in insuring farmers because better-off farmers buy more and better seeds and are more likely to be able to repay their loans.

### Impact

A 2012 impact study found that insured farmers invested 19 percent more than their uninsured peers and had incomes that were 16 percent higher. Virtually all insured farmers (97 percent) received loans linked to insurance. In 2013, 178,000 farmers received USD 8.4 million in financing. Many of them would not have been eligible for credit without such assistance.

### Scaling Up

ACRE has scaled up substantially since the pilot phase in 2009. It now reaches about 200,000 farmers in Kenya, Rwanda, and Tanzania, making it the largest index-insurance program in the developing world in which farmers pay a market premium. By 2018 it intends to provide insurance to 3 million farmers in 10 countries.

The lack of reliable long-term data on which indexes are based is the main barrier for expansion. Even when such data exist, collecting, verifying, and analyzing them is a very time-consuming process.

From a regulatory perspective, different legal systems can be a challenge. Every country has its own laws and regulations on the role of agricultural insurance providers and lawful fee percentages. Products and partnerships must therefore be tailored to both climatic and institutional environments.

## Profile: R4 Rural Resilience Initiative

*Thousands of smallholders in Ethiopia and Senegal use index-based microinsurance to manage risk and strengthen their resilience*



### Challenge

In the face of climate change, rural smallholders in many developing countries are becoming increasingly vulnerable to the risks posed by extreme weather and climatic events. The region of Tigray, in northern Ethiopia, for example, is regularly hit by severe droughts that often force smallholders to sell their assets and reduce their investments, reducing rural livelihoods and jeopardizing food security. Insuring these farmers would reduce their adoption of these deleterious coping mechanisms.



Community members participate in a mapping exercise as part of a workshop to identify R4 sites in Koussanar.

### Innovation

The R4 Rural Resilience Initiative (<https://www.wfp.org/climate-change/r4-rural-resilience-initiative>) is a strategic collaboration between the World Food Programme and Oxfam America that takes an integrated approach to risk mitigation. R4 provides four risk-management strategies to smallholders: improved resource management (risk reduction), microcredit (prudent risk-taking), savings (risk reserves), and index-based microinsurance (risk transfer). Implementation of the program is country-specific in terms of partners involved but generally involves public, private, and nongovernmental entities.

Farmers can insure both long-cycle crops (barley, wheat, maize, sorghum) and short-cycle crops (teff), up to a maximum of USD 155. Smallholders pay premiums of 13–22 percent of the sum insured, depending on the crop, with an average payment of about USD 18. For the many farmers who cannot afford the premiums, R4 offers an “insurance-for-assets” scheme, which allows smallholders to obtain insurance coverage in exchange for their labor. Participants work in community-identified risk-reducing projects, such as creating compost pits to improve soil quality. The initiative just reaches even the poorest farmers.

R4 applies participatory methods to designing its products. It developed a farmer-inclusive index using the Social Network for Index Insurance Design, which integrates both farmers' and scientists' knowledge and expertise. Scientists and local experts visit communities to inform smallholders about index insurance, learn about their risk perception, and obtain initial parameters for the design of the insurance, such as the timing of seasons and details about bad years. Indexes using satellite and rain-gauge information are developed. Additional field visits are conducted to understand farmers' preferences for different risk-management strategies and index designs through use of experimental economic research games.

### Impact

R4 has scaled up substantially since its pilot phase, in 2009. By 2015 it was reaching more than 24,000 smallholders in Ethiopia and almost 2,000 smallholders in Senegal, and pilots were being implemented in Malawi and Zambia.

An evaluation conducted in Tigray between 2009 and 2012 showed that the project largely achieved the aim of improving farmers' livelihoods (Madajewicz, Tsegay, and Norton 2013). On average, insured smallholders increased their savings by 123 percent more than the uninsured control group. They also increased the number of oxen, the most valuable asset for many farmers.

The program has had a significant impact on agricultural practices. Farmers enrolled in the initiative applied five times more compost in their fields than other farmers. In some districts investment in agricultural inputs, such as fertilizer or seeds, also rose. Female-led households, which initially had been among the poorest households, increased agricultural investment more than households headed by men. Households participating in the insurance-for-assets program reportedly improved their adaptive capacity to climate change at the village level, through water harvesting, agro-forestry, forage, and pasture production on wasteland.

### Scaling Up

Strong institutional partnerships with public, private, and nongovernmental players have facilitated the implementation and scale-up of the initiative. The different constellation of actors in each country demonstrates that R4 is capable of adapting to various institutional environments. Creating local capacity to manage index insurance will be critical to ensuring the program's long-term sustainability.

Several challenges risk limiting scale-up. One is that problems with data quality and availability mean that farmers can incur losses without the index being triggered. Solving this issue requires substantial financial investment and technological expertise. A second issue is that the number of farmers enrolled in the insurance-for-assets program has increased. Attracting better-off farmers capable of paying for insurance with cash—which would improve the financial sustainability of the program—has proven difficult.

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