Leveraging index insurance to protect farmers from weather-based risk

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When designed well, insurance does protect small-scale farmers from adverse weather events, but farmers have low demand for these products at market prices. New technologies and climate-smart agricultural practices can reduce farmers' risk exposure and increase their climate resiliency. More research is needed to understand how financial products and technologies can be bundled to help farmers make profitable production decisions and overcome the risk of crop losses and asset damages from worsening climate-change-related weather events.



Farmers at work, Manavannur village, Tamil Nadu. Photo: Putul Gupta | J-PAL

Summary

Floods, droughts, erratic rainfall and temperature patterns, and other adverse weather events are large and, due to climate change, increasingly common sources of risk for farmers that can cause devastating crop losses. Small-scale farmers in low- and middle-income countries often lack access to government-provided social safety nets or mandatory insurance schemes that provide protection against natural disasters. Instead, they safeguard against the threat of future losses by choosing to cultivate crops with stable but low yields and may limit their upfront investments in profitable technologies like fertilizer. As a result, their standard risk-reducing options can lead to a cycle of low-risk and low-return agricultural production [4], [22].

Financial products and new farming technologies are strategies that have been promoted to help farmers overcome the low-risk, low-return cycle [15], . An innovative financial product, weather index insurance, was developed in the early 2000s to address barriers that small-scale farmers face in adopting agricultural insurance. It simplifies the process of verifying claims across many small, fragmented farms by basing payouts on an easily observable variable, such as rainfall recorded at one weather station for a

cluster of nearby farms. One of its drawbacks is that farmers may have different weather realizations on their own land than what are suggested by the metric used to determine the payouts. Ongoing studies are attempting to improve upon the measurement of crop losses by using technologies such as picture-based insurance[1] (in which farmers can upload real-time pictures of weather-damaged crops) and remote sensing from satellite images.

A review of 20 randomized evaluations shows that farmers are generally unwilling to pay market prices for weather index insurance. However, addressing credit, learning, or trust constraints has shown to improve take-up rates in some cases. When farmers take it up, insurance is effective in incentivizing riskier, but more profitable, decision-making. Since take-up rates are very low at market prices, policymakers could instead consider offering insurance as part of broader social protection programs. New agricultural technologies and practices that are intended to help farmers adapt their production to increasing weather variability may also serve as a complementary strategy to provide farmers with holistic risk protection. More research is needed to identify which set of strategies, when offered together, may be most effective in helping farmers to choose the most profitable methods of production in the face of growing weather and climate-related disasters.

Supporting evidence

Farmers do not take up weather index insurance at market prices, making it difficult for institutions to offer financially sustainable insurance products.

In six studies, researchers varied the price of insurance to measure farmers' willingness and ability to pay for it upfront [1], [9], [16], [19], [20], [21], . Take-up was consistently low at market prices: across contexts, purchase rates hovered below 10 percent and did not exceed 20 percent. When very few farmers bought insurance, institutions could not earn enough profit such that continuing to offer insurance was not a worthwhile investment for them [1]. To successfully protect farmers from intensifying weather and climate shocks, policymakers should consider methods of increasing insurance take-up or providing it at a low cost to farmers.

Providing information to boost farmers' understanding and trust in insurance can increase farmers' take-up, but learning about the benefits of insurance is difficult.

In three studies where insured farmers received a payout, or saw that insured peers did, they were more likely to trust in the benefits of insurance and purchase it in subsequent years [6], [8], [16], . However, insurance is a complex product to learn about, and these impacts were concentrated among households with higher levels of financial literacy. Since the benefits of insurance are only observed in bad years, in "typical" years when there is not an adverse event, farmers do not realize a tangible benefit from paying for insurance. As such, it can be hard for them to justify purchasing insurance over time. Offering trainings can help farmers learn about insurance and boost their financial literacy [6], [11], . In China, farmers who were offered an insurance subsidy to encourage adoption increased their demand in the short term if they received a payout [6]. However, their beliefs about the benefits of insurance were susceptible to frequent changes. Sustained increases in demand only occurred among those whose positive experiential learning was accompanied by the long-term training program that was offered to some farmers alongside the subsidy. This suggests that while both training and positive reinforcement can be helpful tools to incentivize insurance take-up, they must be sustained over time, making them costly to the service provider.

In flood-prone areas of Bangladesh, a trusted nonprofit informed farming households that they were eligible to receive a simple-to-understand loan product, which guaranteed credit in the event of a flood [18], . Households who received regular information and reminders about their guarantee of protection dedicated more upfront resources to agriculture. Specifically, they increased the amount of land rented for agricultural production by 27 percent and applied more pesticides, even though take-up of the credit product itself was low. Farmers' understanding of their guaranteed flood protection was the driving factor in increased investment levels, suggesting that if insurance can be easier to learn about and is from a trusted provider, farmers may be more

willing to try it. In contexts where the insurance provider is not well known or trusted, offering insurance to farmers instead via peer groups or other informal agents may boost their perception of insurance and willingness to buy it [2], [10]. To ease high learning costs of insurance, policymakers should focus on simplifying the structure of insurance products and offering them within existing well-known programs and trusted providers or by leveraging peer groups.

Strategies to overcome farmers' credit constraints, such as bundling insurance and credit products, had mixed results in increasing farmers' take-up of insurance.

Income from farming is uneven across the agricultural season, and larger payouts typically occur at harvest time. Farmers generally have to pay for weather index insurance at the beginning of the season, when they tend to have limited cash on hand. Attempts to overcome farmers' cash constraints by pairing insurance and credit products have largely been unsuccessful in boosting take-up rates over time, although offering flexibility in repayment times has had some promising results [1], [2], [7], [12], [16], [17], . For example, under a contract farming scheme in Kenya, offering flexibility in repayment times substantially increased farmers' take-up of insurance, even without subsidies [7], . When farmers were allowed to repay insurance at harvest time, 72 percent chose to buy insurance, compared to just 5 percent of those who were offered the standard product, and the impact was largest for poorer farmers. While these results suggest that lack of credit constrains farmers' ability to make optimal investments, farmers in this setting were contractually obligated to sell their harvest to the lender, which ensured that the lender was guaranteed a return on their investment. Offering flexibility in repayment to farmers in Ethiopia increased insurance take-up from 8 percent to 24 percent; however, there were high default rates among some farmer groups [2]. In settings where insurance companies do not have a secure relationship with farmers, such as from contract farming models, delayed repayment may therefore pose an unattractive risk to lenders.

In another study in Ethiopia, uptake was high when farmers were offered insurance combined with an agricultural loan [1]. However, agricultural cooperatives offering the bundled product were hesitant to use their own assets to back the loan due to the risk of default. While credit is an important constraint to target alongside risk, insured loan products must be structured to meet the needs of lenders as well as farmers in order to sustain the market.

However, farmers purchase insurance when it is provided at low or no cost, increasing their overall risk tolerance and leading them to make more profitable production decisions.

Seven studies show that when insurance was subsidized, farmers did purchase it more often [6], [8], [9], [13], [14], [16], [20], . Having insurance incentivized farmers to shift their production decisions toward higher risk and higher reward choices. In four studies, farmers who took up discounted insurance chose to cultivate crops that were more sensitive to weather but more profitable than staple crops, like maize and sorghum, and in some cases, farmers were also more likely to invest in other profitable technologies like fertilizer [13], . In Kenya, offering subsidized insurance helped farmers avoid costly coping strategies after a drought occurred [14], . For instance, wealthier households, who often relied on selling assets to cope with shocks, were less likely to do so, and poorer households, who might have needed to decrease their consumption to cope with lost income, reported skipping fewer meals. In Andhra Pradesh, India, researchers offered the comparison group a cash grant that was of similar value as the insurance product offered [9]. While all farmers received a similar level of subsidy, providing it in the form of insurance rather than as a cash grant was a more effective method of nudging farmers' decision-making to be more risk tolerant. Farmers who took up insurance were 6 percentage points (12 percent) more likely to plant weather-sensitive cash crops, like sesame, relative to the comparison group mean of 45 percent.

Taken together, these results suggest that while small-scale farmers benefit from insurance, subsistence farmers and those who are less wealthy may not have the means to purchase it as a standalone product. To target the poor, policymakers should consider offering insurance within social protection programs or as a subsidized alternative to cash transfers to achieve productivity and profitability gains from riskier agricultural decision-making.

Bundling insurance with resilience-building agricultural technologies may provide farmers with holistic protection against weather-based risk, but more research is needed on how to develop effective combinations of strategies.

A related J-PAL Policy Insight, finds that agricultural technologies and techniques can improve small-scale farmers' resilience in the face of increasingly weather variability. For example, flood- and drought-tolerant seed varieties can help farmers maintain or increase yields and profits if a shock occurs. Three studies tested whether offering weather index insurance alongside one of these stress-tolerant seed varieties had advantages over offering only the seed variety [3], [5], [23], . In two of the studies, while providing just a drought-tolerant seed variety helped lower farmers' crop losses during moderate midseason droughts, farmers were more willing to make risky production decisions when the seed variety was combined with weather index insurance that could cover losses from more extreme weather events [3], [23]. However, one drawback was that the bundled approach was also subject to the same learning constraints faced by weather index insurance alone. While farmers were more likely to adopt after a drought, those who did not experience a payout were less likely to take up the bundle the following season. On the whole, these strategies have the advantage of being more cost-effective for lenders because the use of stress-tolerant varieties reduces the likelihood of more widespread crop failure and that insurers will then have to make a full payout. More research is needed to identify how resilience-building technologies can be combined with insurance or other financial protection tools to provide comprehensive weather risk protection for small-scale farmers.

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1. For example, the International Food Policy Research Institute and partners tested picture-based insurance in several locations from 2016 to 2022.

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1. Ahmed, Shukri, Craig McIntosh, , and Alexandros Sarris. 2020. "The Impact of Commercial Rainfall Index Insurance: Experimental Evidence from Ethiopia." *American Journal of Agricultural Economics* 102, no. 4 (February): 1154–1176. Research Paper, | J-PAL Evaluation Summary

2. Belissa, Temesgen, Erwin Bulte, Francesco Cecchi, Shubhashis Gangopadhyay, and Robert Lensink. 2019. "Liquidity Constraints, Informal Institutions, and the Adoption of Weather Insurance: A Randomized Controlled Trial in Ethiopia." *Journal of Development Economics* 140 (September): 269-278. Research Paper

3. Boucher, Stephen R., Michael R. Carter, Jon Einar Flatnes, Travis J. Lybbert, Jonathan G. Malacarne, Paswel Marenya, and Laura A. Paul. "Bundling Genetic and Financial Technologies for More Resilient and Productive Small-Scale Agriculture." NBER Working Paper # 29234, September 2022. Research Paper

4. Bridle, Leah, Jeremy Magruder, , Craig McIntosh, , and Tavneet Suri, . "Experimental Insights on the Constraints to Agricultural Technology Adoption." Working Paper, March 2019. Agricultural Technology Adoption Initiative, J-PAL (MIT), and CEGA (UC Berkeley). Research Paper

5. Bulte, Erwin, Francesco Cecchi, Robert Lensink, Ana Marr, and Marcel van Asseldonk. 2020. "Does Bundling Crop Insurance with Certified Seeds Crowd-In Investments? Experimental Evidence from Kenya." *Journal of Economic Behavior & Organization* 180 (December): 744–757. Research Paper

6. Cai, Jing, , Alain de Janvry, , and Elisabeth Sadoulet, . 2020. "Subsidy Policies and Insurance Demand." *American Economic Review* 110, no. 8 (August): 2422–2253. Research Paper, | J-PAL Evaluation Summary

7. Casaburi, Lorenzo, and Jack Willis, . 2018. "Time versus State in Insurance: Experimental Evidence from Contract Farming in Kenya." *American Economic Review* 108, no. 12 (December): 3778–3813. Research Paper, | J-PAL Evaluation Summary

8. Cole, Shawn, , Daniel Stein, Jeremy Tobacman. 2014. “Dynamics of Demand for Index Insurance: Evidence from a Long-Run Field Experiment.” *American Economic Review: Papers & Proceedings* 104, no. 5 (May): 284–290. Research Paper

9. Cole, Shawn, , Xavier Gine, Jeremy Tobacman, Petia Topalova, Robert M. Townsend, and James Vickery. 2013. “Barriers to Household Risk Management: Evidence from India.”*American Economic Journal: Applied Economics* 5 (1): 104–135. Research Paper, | J-PAL Evaluation Summary

10. Dercon, Stefan, , Ruth Vargas Hill, Daniel Clarke, Ingo Outes-Leon, and Alemayehu Seyoum Taffesse. 2014. “Offering Rainfall Insurance to Informal Insurance Groups: Evidence from a Field Experiment in Ethiopia.” *Journal of Development Economics* 106 (January):132–143. Research Paper

11. Gaurav, Sarthak, Shawn A. Cole, , and Jeremy Tobacman. 2011. “Marketing Complex Financial Products in Emerging Markets: Evidence from Rainfall Insurance in India.”*Journal of Marketing Research* 48: S150–S162. Research Paper, | J-PAL Evaluation Summary

12. Giné, Xavier, and Dean Yang, . 2009. “Insurance, Credit, and Technology Adoption: Field Experimental Evidence from Malawi.”*Journal of Development Economics* 89:1–11. Research Paper, | J-PAL Evaluation Summary

13. Hill, Ruth Vargas, Neha Kumar, Nicholas Magnan, Simrin Makhija, Francesca de Nicola, David J. Spielman, and Patrick S. Ward. 2019. “Ex Ante and Ex Post Effects of Hybrid Index Insurance in Bangladesh.” *Journal of Development Economics* 136 (January): 1–17. Research Paper

14. Janzen, Sarah A. and Michael R. Carter. 2019. "After the Drought: The Impact of Microinsurance on Consumption Smoothing and Asset Protection." *American Journal of Agricultural Economics* 101, no. 3 (April): 651–671. Research Paper

15. J-PAL, CEGA, and ATAI Policy Bulletin. 2016. “Make it Rain.” Cambridge, MA: Abdul Latif Jameel Poverty Action Lab, Center for Effective Global Action, and Agricultural Technology Adoption Initiative. J-PAL Policy Bulletin

16. Karlan, Dean, , Robert Osei, , Isaac Osei-Akoto, and Christopher Udry, . 2014. “Agricultural Decisions after Relaxing Credit and Risk Constraints.” *Quarterly Journal of Economics* 129 (2): 597–652. Research Paper, | J-PAL Evaluation Summary

17. Mishra, Khushbu, Richard A Gallenstein, Mario J. Miranda, Abdoul G. Sam, Patricia Toledo, and Francis Mulangu. 2021. “Insured Loans and Credit Access: Evidence from a Randomized Field Experiment in Northern Ghana.” *American Journal of Agricultural Economics* 103, no. 3 (May): 923–943. Research Paper

18. Lane, Gregory, . “Adapting to Floods with Guaranteed Credit: Evidence from Bangladesh.” Working Paper, September 2022. Research Paper | J-PAL Evaluation Summary

19. McIntosh, Craig, , Alexander Sarris, and Fotis Papadopoulos. 2013. “Productivity, Credit, Risk, and the Demand for Weather Index Insurance in Smallholder Agriculture in Ethiopia." *Agricultural Economics* 44 (4): 399–417. Research Paper, | J-PAL Evaluation Summary

20. Mobarak, Ahmed Mushfiq, , and Mark Rosenzweig. “Risk, Insurance and Wages in General Equilibrium.” NBER Working Paper 19811, June 2014. Research Paper, | J-PAL Evaluation Summary

21. Stoeffler, Quentin, Michael Carter, Catherine Guirkinger, and Wouter Gelade. 2022. "The Spillover Impact of Index Insurance on Agricultural Investment by Cotton Farmers in Burkina Faso." *The World Bank Economic Review* 36, no. 1 (February): 114–140. Research Paper

22. Suri, Tavneet, and Christopher Udry, . 2022. “Agricultural Technology in Africa.” Journal of Economic Perspectives 36, no. 1 (Winter): 33–56. Review Paper

23. Ward, Patrick S., Simrin Makhija, and David J. Spielman. 2020. “Drought-Tolerant Rice, Weather Index Insurance, and Comprehensive Risk Management for Smallholders: Evidence from a Multi-Year Field Experiment in India.” *Australian Journal of Agricultural and Resource Economics* 64, no. 2 (April): 421–454. Research Paper