Protecting farmers from weather-based risk

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Weather index insurance protects farmers against losses due to extreme weather and facilitates investments in their farms, but low demand for these products at market prices suggests the need for alternative approaches to protecting farmers from weather-based risk in developing countries.

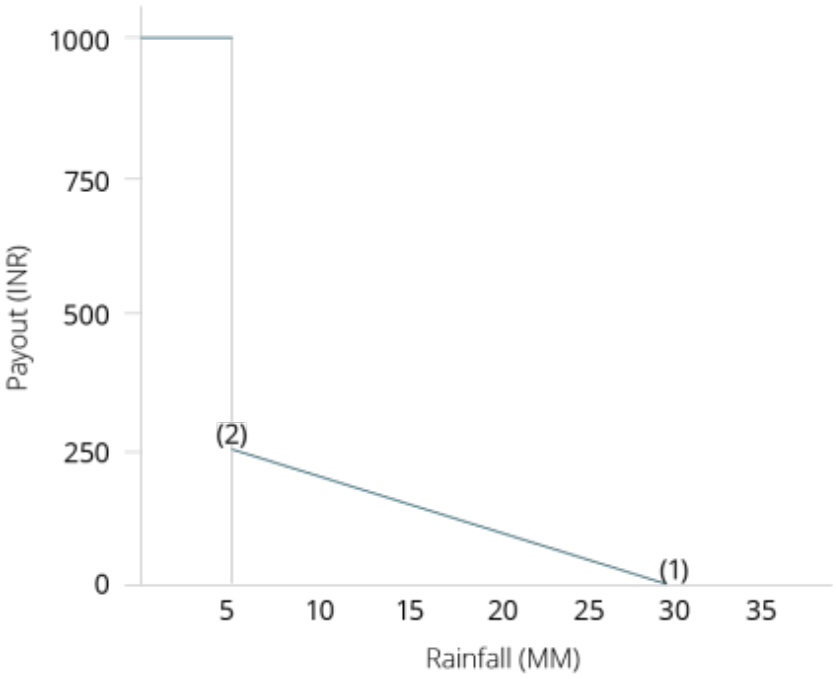
Farmers at work, Manavannur village, Tamil Nadu. Photo: Putul Gupta | J-PAL

Summary

Floods, droughts, heat waves, cold spells, and other natural disasters are large sources of risk for farmers. A drought, heat wave, or other disaster can lead to a poor harvest, leaving uninsured farming households with little income for the season. In order to cope with unpredictable weather, farmers often plant low-risk, low-return crops instead of investing in more profitable crops that are more sensitive to weather. Furthermore, farmers wary of bad weather may hesitate to make other investments in their farms, such as increasing fertilizer use. As a result, the threat of extreme weather can trap farmers in a cycle of low productivity.

Weather index insurance, which makes payouts based on an easily observable variable such as rainfall, is an innovative financial product designed to make insurance accessible to poor smallholder farmers. Weather index insurance was first offered in the early 2000s, and it is now marketed to individual farmers in over fifteen countries. Randomized evaluations in Ethiopia in 2010 [1] , and 2011 [2], , Ghana [3], , Andhra Pradesh, India in 2006 [4], and 2009 [5], ,Andhra Pradesh, Tamil Nadu, and Uttar Pradesh, India [6], , Gujarat, India in 2007 [4], and 2009 [7], , and Malawi [8], tested take-up of weather index insurance products. Three of these also measured the effects on agricultural production decisions [3], [5], [6].

Stylized payout schedule for drought insurance

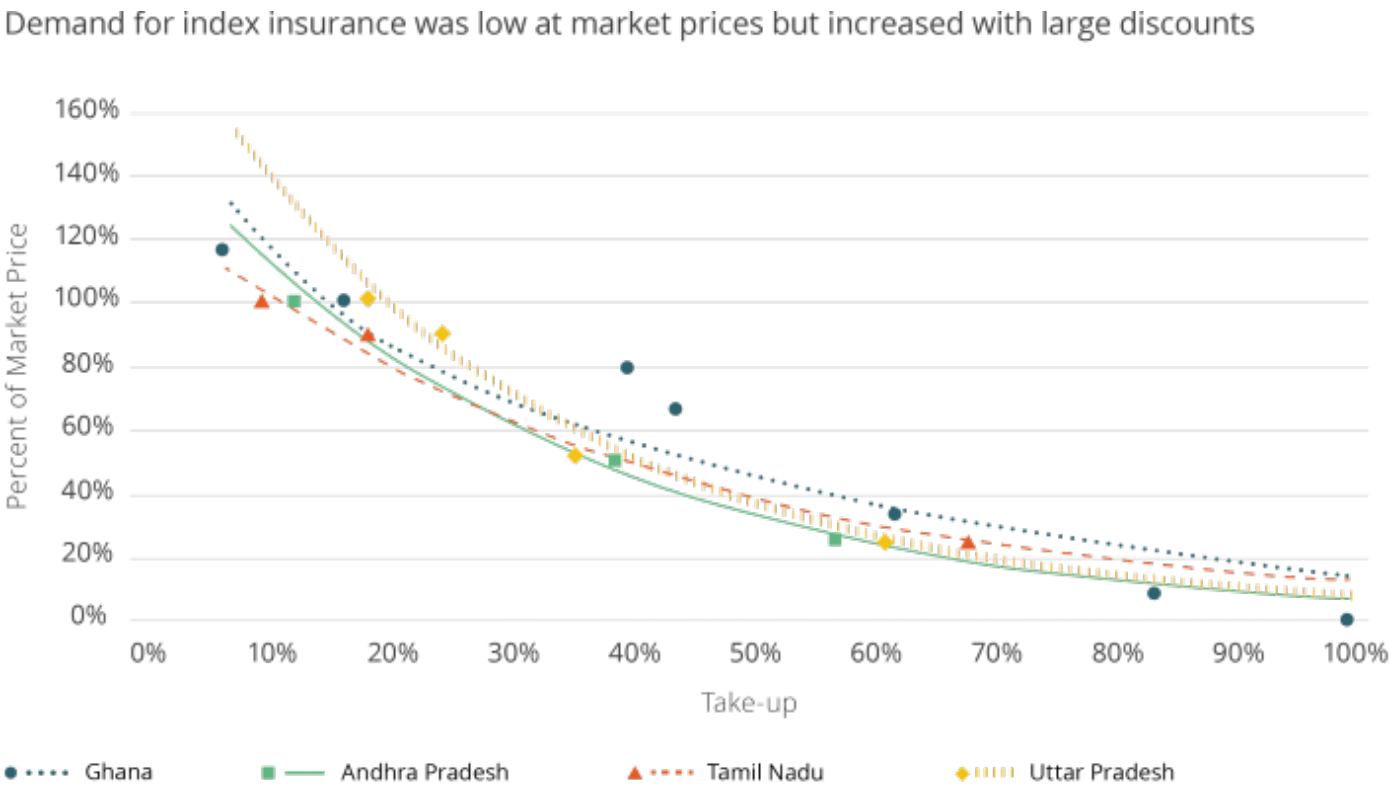


If rainfall is below threshold (1), farmers receive a payout which depends on the size of the rainfall deficit. Below threshold (2), corresponding to total crop failure, farmers receive a lump-sum payment. The products tested in three of the featured evaluations [4], [5], [8] follow this schedule, with exact thresholds and payouts varying by location.

Overall, these studies found that weather index insurance can change farmers' investment decisions, but low demand for these products at market prices suggests the need for alternative approaches. While self-sustaining markets for weather index insurance have not emerged, finding ways to address weather risk remains a priority for agricultural development. One promising alternative is to explore other risk-mitigating technologies, such as improved seeds that better tolerate weather events.

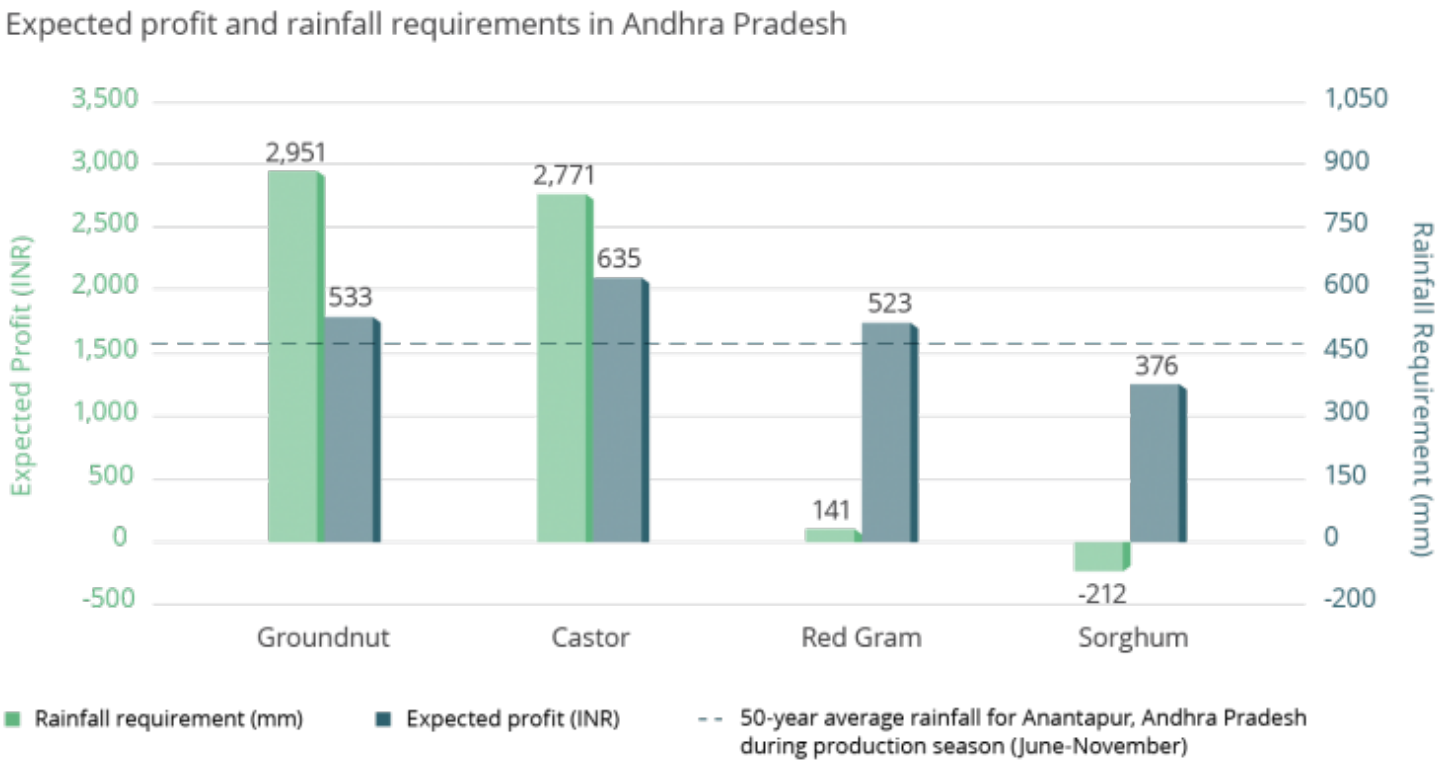
Supporting evidence

Without substantial subsidies, take-up of weather index insurance was low. Large discounts increased take-up substantially and interventions designed to increase financial literacy or reduce basis risk also had positive effects. However, at market prices, take-up was in the range of 6–18 percent, which cannot sustain unsubsidized markets.



Two studies ([3], and [6]) randomly offered discounts to customers, generating enough data to estimate demand curves for weather index insurance. Demand was low—below 20 percent—at market prices but increased when farmers were offered large discounts.

Insured farmers were more likely to plant riskier but higher-yielding crops. In the three studies that measured changes in farmer behavior, farmers who bought insurance shifted production toward crops that were more sensitive to weather but more profitable on average [3], [5], [6].



This stylized graph shows the trade-off a farmer in Andhra Pradesh [5] might face when deciding what combination of crops to grow. The most profitable crops are highly sensitive to rainfall, while the most drought-tolerant crop is unprofitable—but may feed the household during a difficult year.

Although low demand has prevented markets for commercial weather index insurance from scaling, in cases where farmers were given subsidized insurance, the protection led them to make investments to increase farm productivity. These facts point to the need to study a range of alternative approaches to address weather risk. Providing protection against weather risk may be a crucial step in getting farmers to plant cash crops and make other investments to increase production.

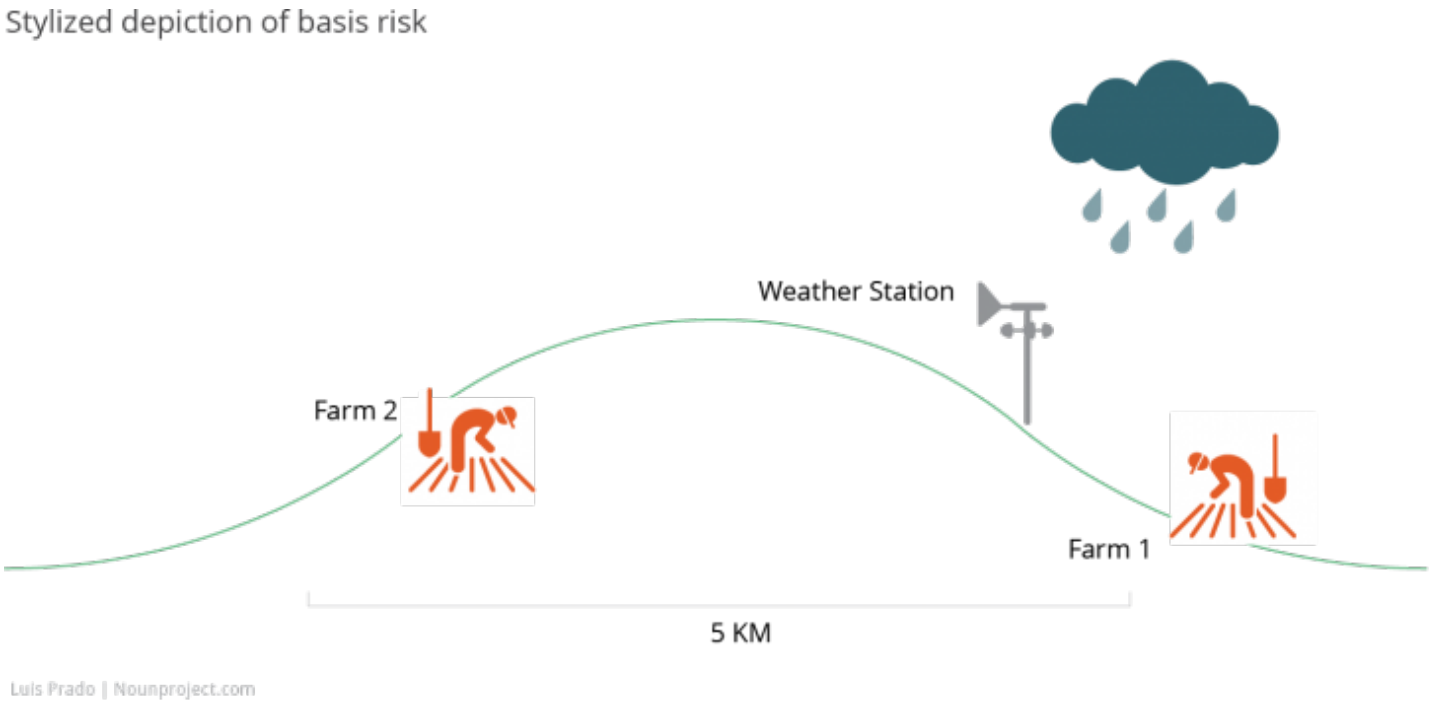
Farmers' lack of interest in purchasing insurance has limited the growth of commercial markets. Many insurance providers rely on generous government subsidies, technical assistance from aid agencies, or bundling insurance with more popular products.

Insured farmers made different production decisions, underscoring how weather risk limits farmers. They shifted production toward crops that were more sensitive to weather but more profitable on average. Whether through index insurance or another approach, providing protection against weather risk may be a crucial step in getting farmers to plant cash crops, use more fertilizer, and make other investments to increase production.

Weather index insurance has fallen short of an elusive goal: becoming an insurance product that can be profitably sold to poor farmers. This points to the need to research alternatives that help smallholder farmers manage weather risk, including:

- **Improving index design.** Using indices based on yields, rather than weather, may reduce basis risk, especially with remote sensing technologies that can accurately measure yields for small areas. These improvements, which increase data quality and better tailor payouts to actual risks, may allow insurers to offer products that more effectively protect farmers from the risks they face.

Basis risk is the risk that the index will not accurately predict a farmer's loss. In the figure below, farm 2 experiences a poor harvest, but rainfall at the weather station is adequate, so there is no payout.



- **Using subsidized insurance to deliver cash to farmers.** The studies that gave away free insurance compensated comparison group farmers with cash grants [3], [5]. While insurance led farmers to shift production toward higher-value crops, receiving cash did not. For policymakers seeking to influence farmers' production decisions, large insurance subsidies may be more effective than cash transfers. Over time, experience with subsidized insurance may increase farmers' willingness to pay for these products.
- **Selling insurance to institutions that are also affected by weather risk.** Weather shocks are a source of risk for agricultural lenders as well as governments providing disaster relief or social safety net programs. Unlike individual farmers, banks and government agencies cover broad geographic areas, which reduces basis risk. Although this approach has not yet been rigorously tested, insurance providers have begun to offer these products, which have the potential to both protect institutions and increase credit supply.
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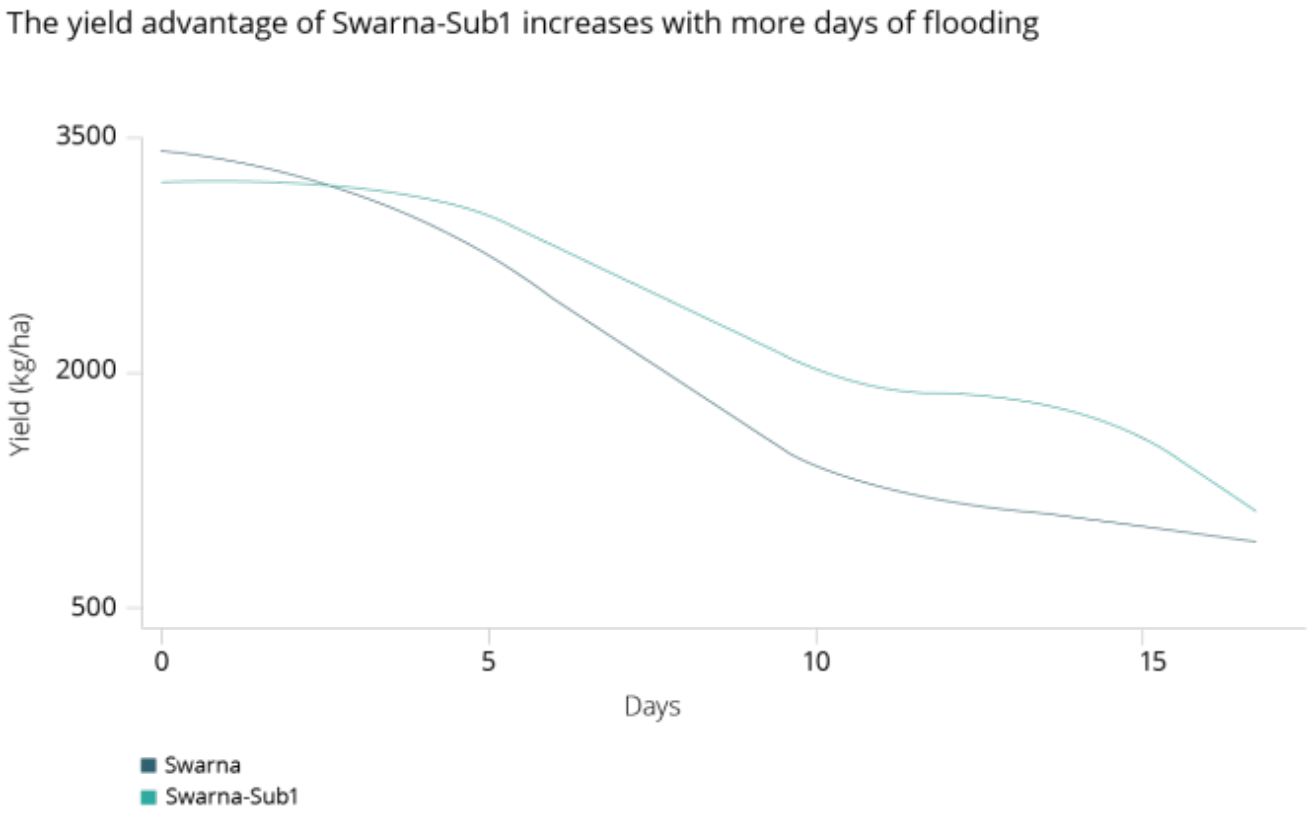
Promoting irrigation and stress-tolerant crops. Most smallholders rely on rain-fed agriculture, so improving irrigation systems is a natural first step in helping them cope with variation in rainfall. In addition, agricultural research centers have developed crop varieties that tolerate conditions such as drought, flood, and salinity while maintaining good yields under normal conditions. Similar to the impact of insurance on farmer decision-making, risk-mitigating technologies such as submergence-tolerant rice allow households to make riskier production decisions, including input purchasing.Results from a randomized evaluation of a flood-tolerant rice variety in India are promising. The Swarna Sub-1 rice variety, developed by researchers from the Consultative Group on International Agricultural Research, significantly reduced yield losses during a flood year and did not reduce yields during a non-flood year. Furthermore, farmers planting the flood-tolerant rice variety also planted more rice, used more fertilizer, and used better planting techniques [9].



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