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Counting real cost of climate variability for farmers

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In an exclusive AgroSpectrum interview, Shantanu Agarwal, CEO of MATI, explains why resilient production figures can mask mounting farm-level costs, how erratic weather is eroding profitability, and why India's climate adaptation strategy must prioritise farmer incomes, groundwater management and more responsive crop insurance



A resilient harvest does not necessarily translate into a profitable season for farmers, and conventional agricultural statistics often fail to capture this distinction. In an exclusive AgroSpectrum interview, **Shantanu Agarwal, CEO of MATI**, examines the mounting economic costs of climate variability, from higher irrigation and input expenses to crop losses that remain invisible when aggregate production figures appear stable. Drawing on farmer experiences across India and Zambia, he highlights how hyperlocal weather variations, groundwater depletion and the inadequacies of existing crop insurance mechanisms are reshaping farm-level risk. He argues that climate adaptation must move beyond rainfall forecasting to encompass viable crop

diversification, assured markets, more responsive insurance, and investments in soil health and water conservation.

With a potentially strong El Niño threatening the next agricultural cycle, Agarwal makes a compelling case for acting before planting decisions are made, rather than waiting for the damage to show up in crop statistics.

MATI's report captures something climate statistics often miss: farmers can lose money even when aggregate yields appear relatively resilient. What does the 2026 experience tell us about the growing gap between "normal" production data and the actual economics of farming?

The 2026 season shows that a normal harvest figure can hide a hard year for the farmer. Production data records how much grain came out of the field. It does not record what the farmer spent to get it. Some of the farmers we spoke to had to act to protect their crop. One had to irrigate just to transplant his paddy when the rain was late. Another had to spray for stem borer in the fields he transplanted late. We do not yet have cost data across all the farmers we work with, and that is the point. If we want to know how farmers are doing as the weather becomes more erratic, we have to measure income and the cost of production each season, and not only yield.

Indian farmers in the report describe a late and erratic monsoon, with higher irrigation, labour, tractor, fertiliser and pesticide costs. How significant is this emerging "cost of climate variability" for farm profitability, and why is it still poorly captured in agricultural policy and crop-loss assessments?

For a smallholder on one or two acres, the margin is thin, so any extra cost in a bad season comes straight out of what the family takes home. The farmers we spoke to described a late monsoon followed by heavy rain once the crop was in. Some had to irrigate to establish the crop, some had waterlogging after transplanting, and one saw his herbicide washed off before it could work. Each of these is a cost the farmer carries before he knows what his yield will be. These costs are poorly captured because crop-loss assessment in India is built to measure yield. Crop insurance pays out when crop-cutting experiments show that yield in an area fell below a threshold. If a farmer spends his own money and saves the crop, the system records no loss. Policy needs to count what it costs a farmer to save a crop, as well as what it costs to lose one.

The report finds striking differences between villages located within roughly 90 km of each other, with some farmers reporting good crops while others faced disease and rain damage. What does this local variation imply for the way India designs climate advisories, crop insurance and agricultural interventions?

India already plans agriculture close to the village. An extension officer typically covers five or six villages, planning happens at the block level, and farmers receive advisories in their own language. The gap is reach and engagement: whether the advice gets to the smallholder in time to change what he does, and whether he trusts it enough to act on it. Local variation like the one in our report makes that last step matter more, because villages within 90 km of each other can have very different seasons.

Crop insurance is where the gap is largest. Losses are assessed across an insurance area from a limited number of crop-cutting experiments, so the result often does not match what happened on a particular farm. The sum insured is based on the cost of cultivation, not on the value of the harvest the farmer lost. The payout is too little and too late. Take a farmer whose acre should have earned him $600 in a normal year. After a bad season he might receive $50. Insurance that is assessed closer to the farm, and pays in proportion to what the farmer actually lost, would do more for farmers in a year like this than any other single change.

Several farmers are already responding to water stress by considering maize or millets instead of paddy. Are we entering a phase where climate adaptation will increasingly reshape India's crop geography, and what would farmers need from markets, procurement and policy to make such shifts economically viable?

Yes, I believe climate adaptation will reshape where India grows what, and farmers are already ahead of policy on this. One farmer told us that if next year looks like less rain, he will grow maize or millets instead of paddy. But a farmer will only switch if he can sell what he grows. From markets, he needs a buyer at harvest, which means processors and food companies contracting for these crops. From procurement, he needs a price he can count on. Paddy has assured procurement in many states and millets often do not, so the choice is weighted toward paddy even where the water is running out. Some states are already acting on this. Haryana, Punjab and Odisha pay farmers per acre to move away from paddy, and Haryana pays Rs 8,000 an acre for this year's kharif season. From policy, he also needs good seed available at sowing time and support through his first season with a crop he has not grown before. If he switches once and the price collapses, he will go back to paddy and he will not try again.

Groundwater emerges as a major concern, with one farmer reporting water levels falling from around 40 feet to 70 to 80 feet. If El Niño-driven rainfall volatility becomes more frequent, how much of India's climate resilience will ultimately depend on managing groundwater rather than simply improving rainfall forecasting?

I think most of India's climate resilience will depend on managing water in the ground, and less of it on forecasting. Forecasting is necessary. It helps a farmer decide when to sow. But it does not put water back in the ground. Farmers have been pumping groundwater to make up for bad rain, and the farmer who told us his water level fell from 40 feet to 70 or 80 feet is showing us that the reserve is running down. Two things matter most. The first is recharge, which is a job for state governments and village bodies. The second is keeping more water in the soil itself. Healthy soil holds water longer, which gives a crop time to survive a dry spell. We saw this in southern Zambia during the 2024 water shortages: on one maize field with no irrigation, the side where we spread rock dust kept its crop due to improved water retention, and the untreated side lost it.

The Zambia accounts present a different picture: farmers reported a relatively good 2025/26 harvest, even as forecasts point to below-normal rainfall for the 2026/27 season. What does this contrast between a successful harvest and a worsening forecast tell us about how farmers make decisions under climate uncertainty?

The contrast in Zambia tells us that farmers decide based on what they have seen, more than on what they are told. After a good harvest, it is very hard to act on a warning about the next season. The natural choice is to plant the same way again. A good harvest also creates a specific risk. Farmers often sell their surplus right after harvest, when prices are lowest, to pay school fees and debts. If the next season fails, they buy grain back later at a much higher price. So the decisions that will determine how Zambian farmers come through 2026/27 are being made now, before planting starts in November and December: how much grain to keep, which seed to buy, and whether to plant a more drought-tolerant crop. A forecast helps a farmer only when it reaches him before those decisions, through someone he trusts, with a specific choice attached.

MATI has deliberately presented individual farmer voices rather than treating them as a statistically representative survey. How should policymakers and agribusinesses use such first-hand intelligence alongside satellite data, weather models and official crop statistics when making decisions for the coming season?

Policymakers and agribusinesses should use farmer voices as an early warning, and then test what they hear against the larger data sets. We spoke to a small group of farmers in India and Zambia, and we said so. We published their answers in Hindi, English and Chitonga, and we said plainly that they do not all agree. Farmers give you what the other sources cannot. A satellite can see that a field is green. It cannot see what the farmer spent to keep it green, that his well is drying, or that he plans to switch crops next season. Weather models tell you what the weather may do. Farmers tell you how they will respond, and that response decides next year's food supply and next year's debt. If farmers in several districts describe the same rising costs or the same plan to change crops, that is a signal to check the official statistics, and to make sure seed, credit and procurement are ready before the season starts. Everything I know about farming, I learned by asking farmers.

With NOAA indicating a very strong El Niño could extend into 2027, what are the three interventions that need to happen before the next planting decisions are made, not after crop losses become visible, and who needs to take responsibility for delivering them?

With a very strong El Niño expected through the winter and into 2027, three interventions need to happen before farmers plant, and each needs a clear owner. First, a forecast that reaches the village before sowing, with a clear fallback: which crop, which variety, and what to do if the rain is late. State agriculture departments and their extension workers should deliver it, with the weather agencies supplying advice at block level. Second, money arranged before the shock: insurance that pays on early triggers, loans that can be rescheduled without penalty, and seed for alternative crops stocked in advance. Banks, insurers and agriculture ministries need to agree on this now. Third, investment in soil and water, which is slow and has to start before the drought arrives. Recharge is for state governments. Soil health is where MATI works. We tell the farmer: don't change anything. We spread the rock dust ourselves, at no cost to him, paid for by carbon removal, and in India, rice harvests on those fields grew a median 25 per cent compared with control plots in Kharif 2025, across 235 fields. Companies that buy from these farmers and buyers of carbon removal can fund this at scale. One bad season is a hard year. Two in a row is when farmers lose their land.

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