

**DIGITAL
DISSEMINATION OF
ACCURATE WEATHER
FORECASTS TO
FARMERS**

Paul Winters

Asia and the Pacific Food Security Forum

April 11, 2024

This is not an ADB material. The views expressed in this document are the views of the author/s and/or their organizations and do not necessarily reflect the views or policies of the Asian Development Bank, or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy and/or completeness of the material's contents, and accepts no responsibility for any direct or indirect consequence of their use or reliance, whether wholly or partially. Please feel free to contact the authors directly should you have queries.

INNOVATION COMMISSION



Promote innovations to address challenges of climate change, food security, and agriculture.



Identify innovations with evidence of impact and cost-effectiveness, as well as early-stage innovations with high expected returns.



Generate recommendations to stimulate their development and transition to scale.



Examine the role of meta-innovations: mechanisms to encourage innovation development.

WEATHER FORECASTS

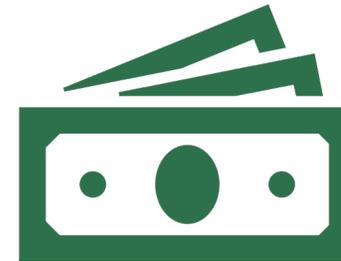
- **Climate change:** Variation in daily precipitation will increase by 4-5 percent and temperature variability by 10-15 percent per degree Celsius of warming.
- **New technology** allows more accurate and timely weather forecasts. E.g. Monsoon onset can be predicted up to a month in advance in some regions.
- Strong evidence that **farmers adjust their behavior** and investment decisions in response to accurate weather forecasts. E.g. Farmer profits in India are 11.5% higher where forecasts are better.

WEATHER FORECASTS

Procuring and disseminating accurate weather forecasts is highly cost-effective



USD 23 million to procure accurate seasonal forecasts for 12 countries over 5 years



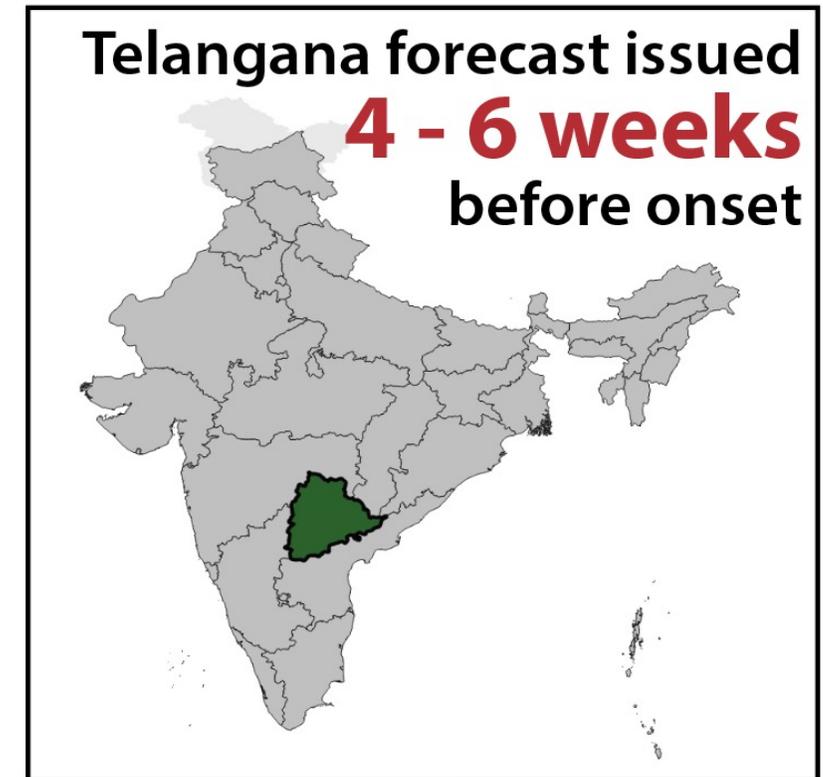
USD 3 billion in benefits for Indian farmers alone

EVIDENCE FROM MONSOON TOTAL RAINFALL FORECASTS

- Total rainfall forecasts affect farmer profits in villages where regional forecasts are highly-correlated with local rainfall
- Profits increase by 11.5%
- When bad rainfall is predicted, planting-stage investments go down and out-migration increases
- Lowers planting-stage investments by 15.8 percent overall
- Increases out-migration by 2.4 percentage points

EVIDENCE FROM MONSOON ONSET FORECASTS

- Vastly more accurate and timely weather forecasts are now possible.
- In many areas, monsoon onset can now be predicted a month in advance.
- Farmers who received bad news reduced land under cultivation by 22%
- Farmers who received good news were 16 percentage points more likely to invest in cash crop and increased total input expenses by 34%



**CASE STUDY:
DELIVERY OF
ACCURATE
WEATHER
FORECASTS
IN INDIA**

- The Ministry of Agriculture and Farmers' Welfare will disseminate forecasts to selected districts via SMS in early May:
 1. Total rainfall forecasts
 2. Monsoon onset forecasts
- Proof-of-concept: lessons for other countries in the region.

DIGITAL AGRICULTURE

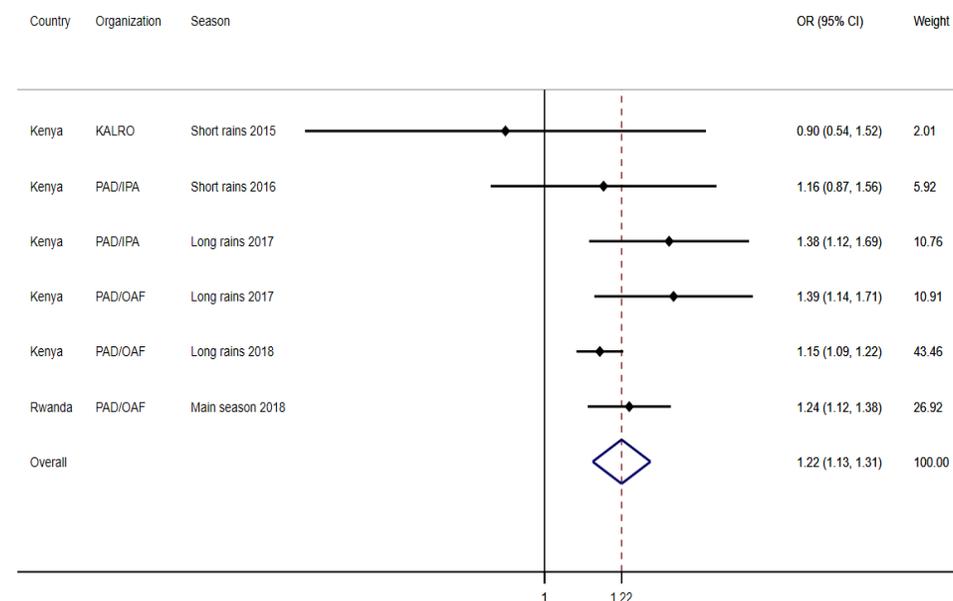
- Millions of farmers already benefit from digital agriculture programs launched by governments
 - Human centered design, A/B testing key to increasing accessibility and relevance— e.g. India and Ethiopia
 - Economies of scale, scope allow expansion to reach hundreds of millions
- Weather forecasts can be an entry point for a range of digital extension and other services



DIGITAL AGRICULTURE

Digital extension increases the odds of adopting recommended inputs by 22%

- Widespread soil acidity in East Africa, treatable with lime
- Baseline adoption is modest: 3-10%
- Implied marginal benefit-cost ratio approximately 8:1 (much larger at scale with lower text rates)





Innovation Commission:

Climate Change

Food Security

Agriculture