Managing Climatic Risks in Agriculture: What are Our Options?

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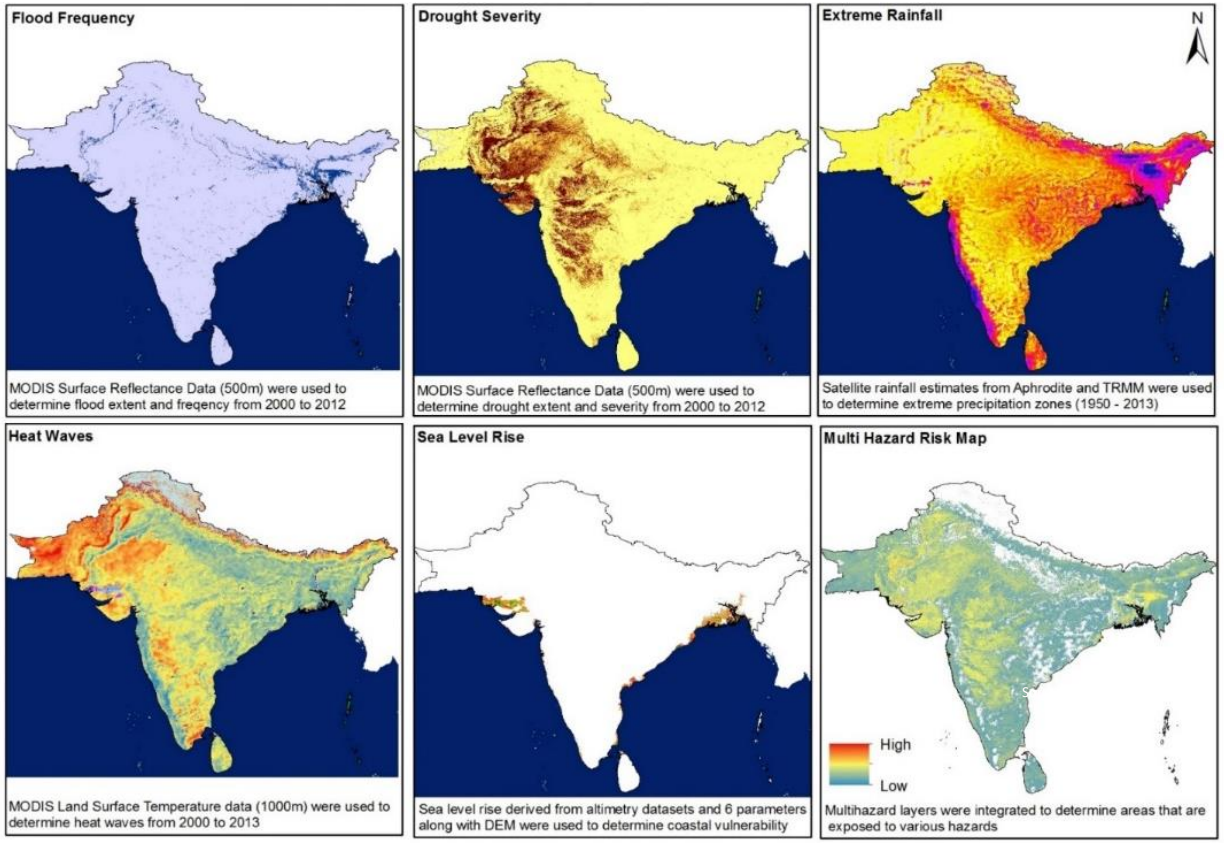
CIAT Centro Internacional de Agricultura Tropical Desde 1967 Ciencia para cultivar el cambio

BISA Borlaug Institute for South Asia

CIMMYT

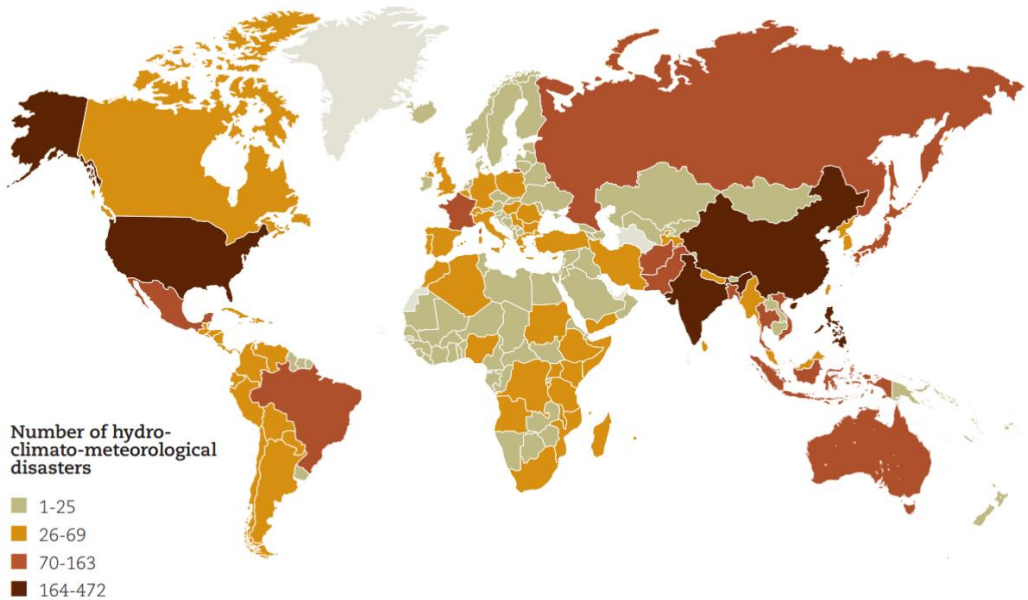
Climatic risks are common in South Asia



- Drought: 70% land
- Floods: 12% land
- Cyclones: 8% land
- Frost: Northern regions
- Heat: Frequent at many places
- Coastal salinity ingression
- Vulnerable to climatic variability
- Climate change hotspot
- Managing climatic risks crucial for food security and poverty alleviation

Climatic risks are increasing with time

Number of weather-related disasters (1905-2015)



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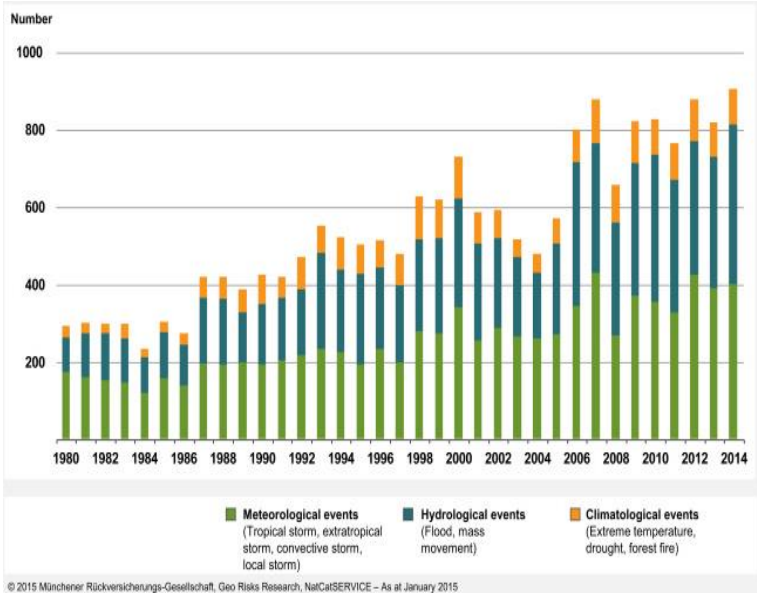
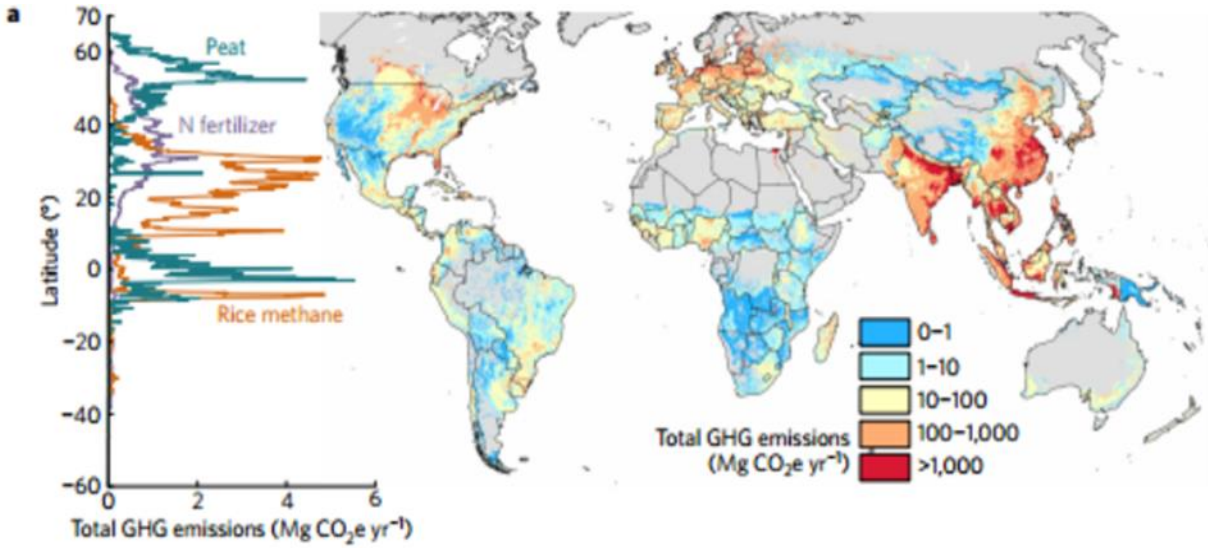


Source: The human cost of weather-related disasters:1995-2015. CRED and UNISDR, 2016

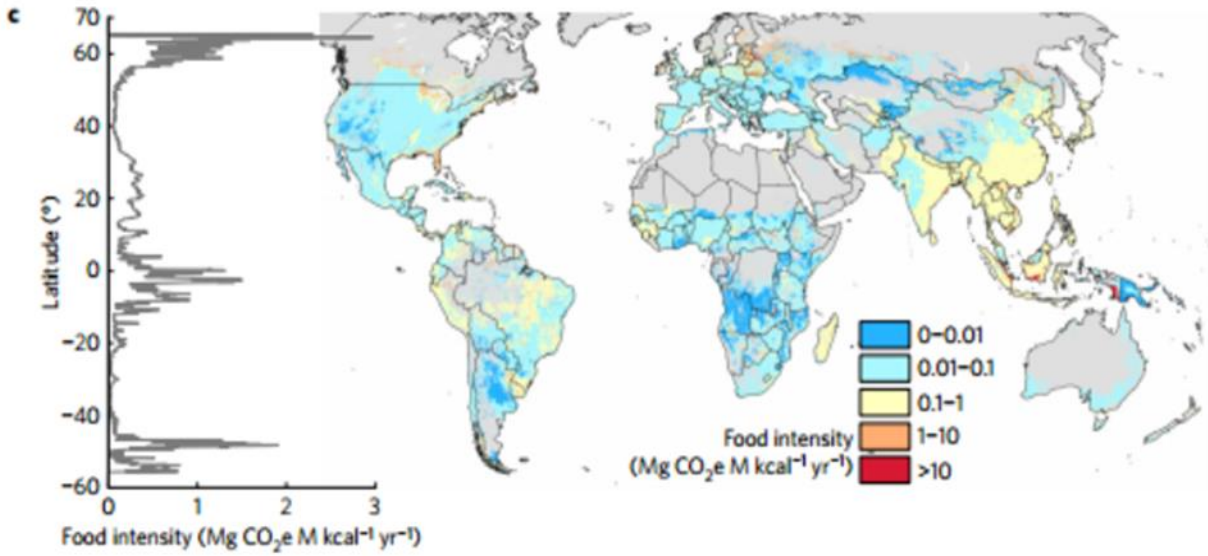
Impact on agriculture?

Asia, a hotspot for emissions

GHG emissions from agriculture



Food intensity



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Food production in India?

- India could lose 10-40% of crop production by the end of the century due to global warming.
- Evidence reveals that changing climate has already impacted rice and apple yields.
- Projections indicate the possibility of losing of 4-5 million tons of wheat production with every rise of 1◦C temperature throughout the growing period.
- Recent simulation analysis has indicated that rainfed maize, sorghum and rice yields are likely to be adversely affected by the increase in temperature.

Addressing the challenges through Climate-Smart Agriculture (CSA)

An integrative approach to address the interlinked challenges of food security and climate change, that explicitly aims for three objectives:

A. Sustainably increasing agricultural productivity, to support equitable increases in farm incomes, food security and development;

B. Adapting and building resilience of agricultural and food security systems to climate change at multiple levels; and

C. Reducing greenhouse gas emissions from agriculture (including crops, livestock and fisheries).

Understanding CSA

There are a range of CSA practices and technologies which can be explained through 7 entry points:

- SOIL MANAGEMENT
- CROP MANAGEMENT
- WATER MANAGEMENT
- LIVESTOCK MANAGEMENT
- FORESTRY
- FISHERIES
- AQUACULTURE

> **Practice**: as ways of doing things, eg. Precision farming, tillage etc.

> **Technologies**: new materials introduced into new or old practices and might include new drought tolerant varieties, a hardy breed of cattle etc.

Infusing soil management with “Climate-Smartness”.

PRODUCTIVITY

ADAPTATION

MITIGATION

Climatic threats: Heightening risk of run off and soil erosion due to a likely increase in frequency and severity of events like intense rainfall.

Our options? Introducing practices and techniques like contour ploughing or contour tillage, surface mulching etc. (field level) to landscape level approaches like land terracing or reforestation. Organic matter additions recommended in Conservation Agriculture, the inclusion of trees in crop fields, and the improved grazing management of natural pastures.

Climate-Smart Village R4D Approach:
A holistic strategy for scaling-up adaptation options

*To test, through participatory methods, technological and institutional options for dealing with climate change in agriculture; with the aim of scaling-up and -out the appropriate options and drawing out lessons for policy makers from local to global levels

What makes it different?

Key Steps

BASELINE ASSESSMENT

Climate Risk & Vulnerability
Resources & Markets
Local Knowledge & Goals
Technologies & Services

CSV Design

Strategic portfolio of technologies
CIS* tactical support
Institutional innovations
Stakeholder mobilization

Creating Evidences

Research evaluation
Stakeholder evaluation
Scalability

Scaling

Farmers to Farmers
Policies & programs
PPT

CLIMATE SMART FARMING COMMUNICITES

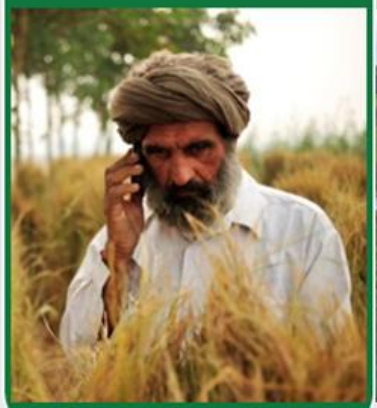
MONITORING, EVAUATION AND LEARNING

Key Interventions in a Climate-Smart Village

CLIMATE SMART VILLAGE

Weather-smart

- Weather forecasts
- Agro-advisories
- Weather insurance
- Climate analogues
- Avoided maladaptation



Water-smart

- Aquifer recharge
- Rainwater harvesting
- Community management of water
- Laser leveling
- On-farm water management
- Solar pumps

Seed/breed-smart

- Adapted varieties
- Adapted breeds
- Seed banks

Carbon/ nutrient -smart

- Agroforestry
- Minimum tillage
- Land use systems
- Livestock management
- Integrated nutrient management
- Biofuels

Institutional/ market-smart

- Cross-sectoral linkages
- Local institutions
- Gender strategies
- Contingency planning
- Financial services
- Market information
- Off-farm risk management

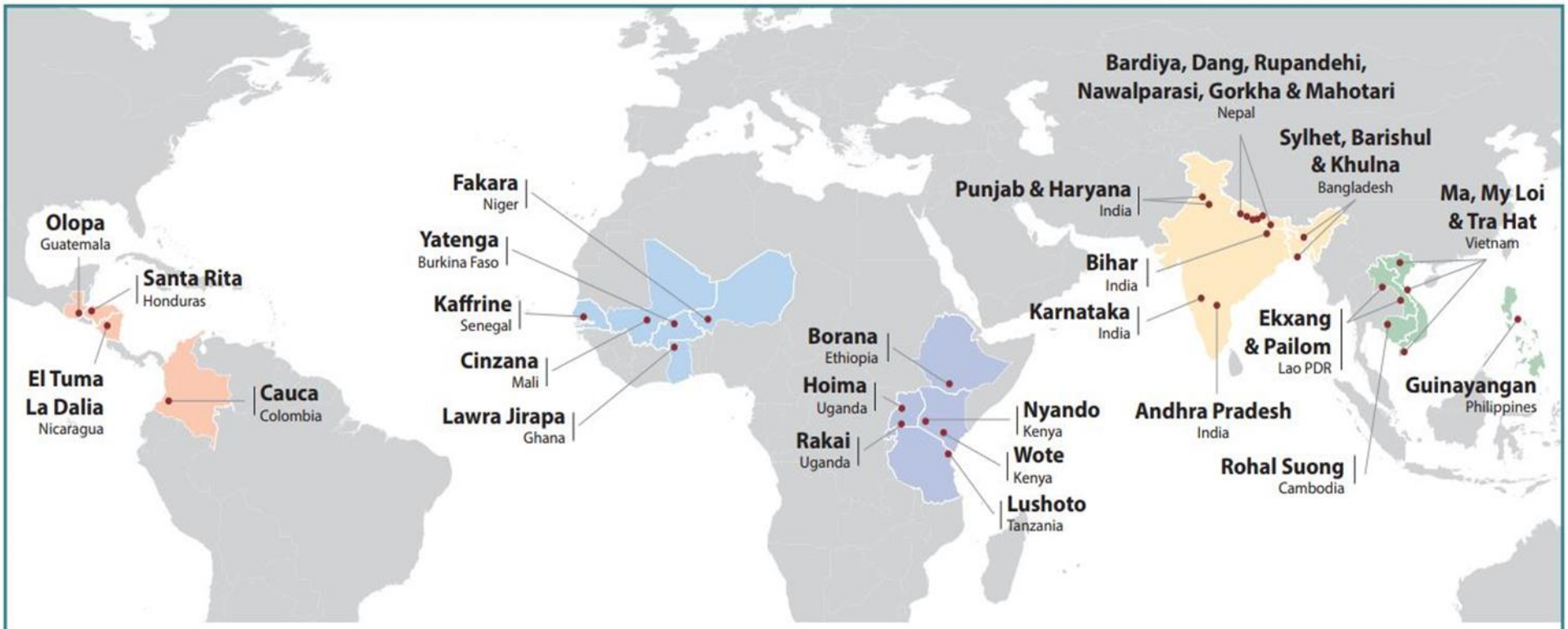
Climate-Smart Villages: Expected outputs

1. Increase in agricultural production.
2. Increase in farmer's income.
3. Stability of income in events of climatic risks.
4. Long-term adaptation to climate change.
5. Low carbon development.
6. Convergence of Government schemes.
7. Climate and development finance for rural development.

Examples of CSV approach:
Working with 1000s of farmers in 100s of villages

- **Haryana-Punjab** (CIMMYT, BISA, ICAR, state govt., Industry, farmers): RCT machinery and sensors, residue burning, farmers cooperatives, capacity strengthening
- **Bihar** (CIMMYT, BISA, ICAR, state govt., USAID): RCT, cooperatives, seed systems, solar energy, water
- **Telangana and Andhra Pradesh** (ICRISAT, ICAR, state govt., Microsoft): weather forecasts and advisories, capacity strengthening
- **Maharashtra** (BISA, ITC, state govt., NGOs): New seeds, weather advisories and insurance, capacity strengthening
- **Rajasthan** (CCAFS, ITC, state govt., NGOs): water and nutrient management, capacity strengthening
- **Uttar Pradesh** (CCAFS, BISA, state govt., USAID): Livestock breeds, feed, gender, capacity strengthening
- **Gujrat** (IWMI): Solar cooperatives, capacity strengthening
- **Madhya Pradesh** (CCAFS, BISA, state govt., ITC, USAID): water management, capacity strengthening

CSV Across the World



Latin America Colombia, Guatemala, Honduras, Nicaragua

West Africa Burkina Faso, Ghana, Mali, Niger, Senegal

East Africa Ethiopia, Kenya, Tanzania, Uganda

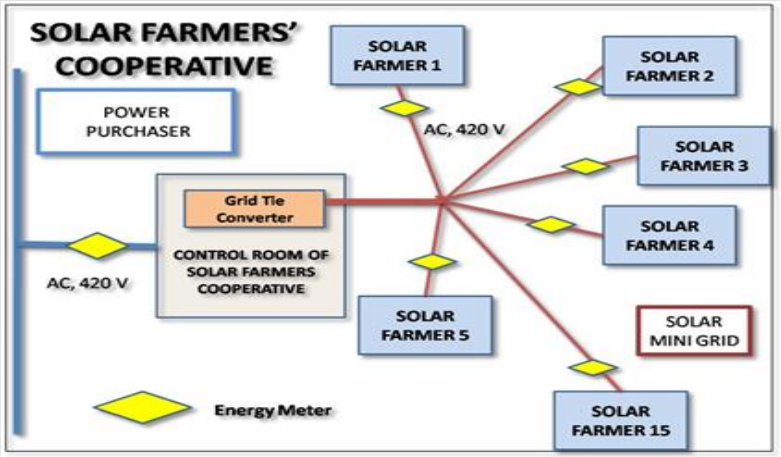
Southeast Asia Cambodia, Lao PDR, Philippines, Vietnam

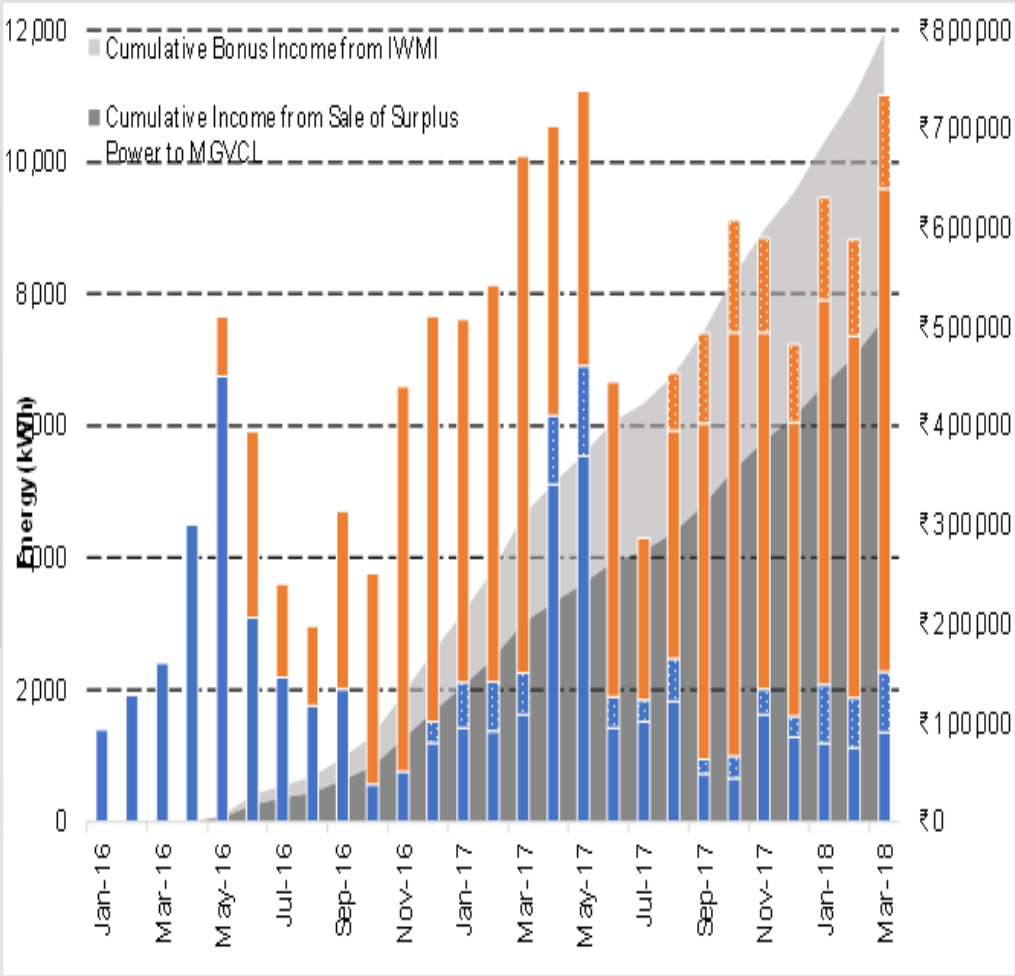
South Asia Bangladesh, India, Nepal

• Climate-Smart Village site

Illustrations from CSVs

Growing solar power as a remunerative crop





Pollution management, resource use efficiency, and GHG mitigation

- Rice residue burning a major source of air pollution in NCR
- Happy seeder technology allows wheat planting in rice stubble- no need to burn
- GHG emissions also reduced
- Resource use efficiencies improved

Empowering marginalized communities:
Tribal women in Betul, Madhya Pradesh

- Super-champion female farmers have been identified based on parameters of land ownership and influence.
- These farmers are organized into committees called Village Climate Management Committees and integrated into a decision making structure regarding assessment and deployment of CSA technologies and practices.
- These are providing training on CSA, distribution knowledge on insurance and ICT based agro-advisories among fellow farmer beneficiaries.

CIMMYT

Looking forward: Building evidence, systematic learning and scaling of risk management options

A comprehensive approach needs to persist to bring solutions to scale.

- **Knowledge generation:** CSA practices/technologies, services; CSVs; perfect evidence?
- **Incentive mechanisms**: business models, private sector
- **CSA enablers:** (sub-) National policies
- **Partnerships:** research and development, science and policy, public and private, south: south; science and communication