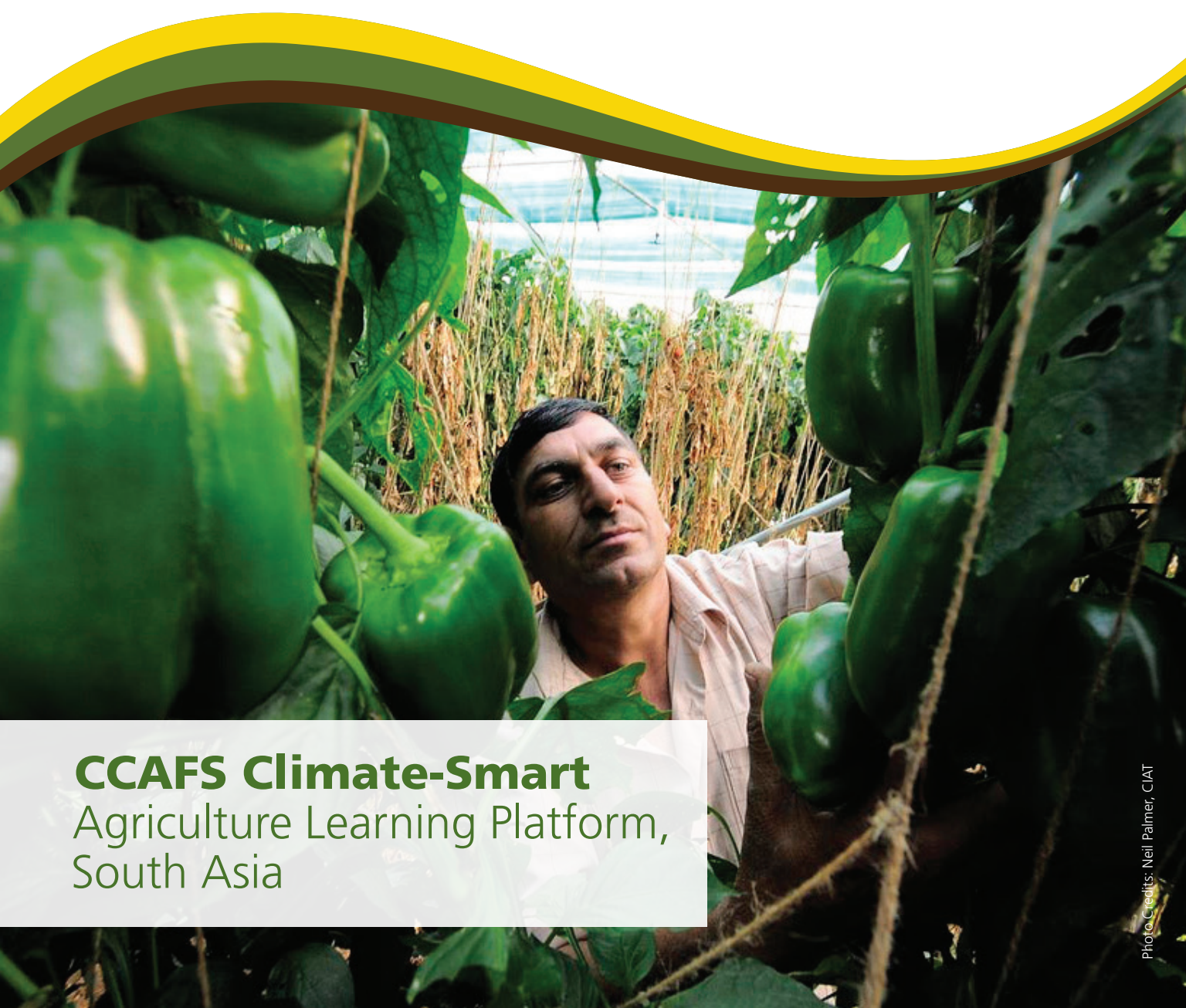




RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



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A photograph of a man with dark hair, wearing a light-colored shirt, looking up at large green bell peppers in a greenhouse. The peppers are hanging from vines, and the background shows the structure of the greenhouse and other plants.

CCAFS Climate-Smart Agriculture Learning Platform, South Asia



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Strengthening the route to climate resilience in South Asian agriculture

A consultation held with national partners opens up dialogue about the future course of research and action for climate resilience and food security in South Asia.

Shehnab Sahin,
Nitya Chanana and
Pramod K. Aggarwal
(CCAFS South Asia)

Despite surpassing average global growth rates, South Asia exhibits some of the most glaring gaps in income distribution, access to resources as well as food and nutrition security. Climatic challenges have only exacerbated the existing issues especially for the agricultural sector which is almost always reeling under the pressures of meeting food security goals while attempting to save itself from multiple vulnerabilities. The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) has been working in conjunction with national partners in the region to help usher in transformative solutions to some of the critical challenges faced by the agriculture system and communities through advance research and extension services. With a multidimensional approach, climatic resilience in South Asian agriculture has been pinned as the priority to be converged with existing policy programs and therefore a constant flow of dialogue becomes imperative to continue concerted and upgraded efforts to attain common goals.

National consultation for a future roadmap

CCAFS had held a consultation in September 2017 in New-Delhi to acquire the national perspectives on priorities for research pertaining to climate resilient agriculture in the region. The participants included researchers, policymakers, agro-industry representatives from South Asia, as well as leading international experts working on CCAFS focus areas. Presentations were made by Prof Ramesh Chand (member-agriculture, Niti Aayog; India's primary planning body), Dr Bimala Rai (advisor to the President of Nepal), Dr T. Mohapatra (Director General, Indian Council of Agricultural Research) and Dr H. Pathak (Director, Indian Council of Agricultural Research-National Rice Research Institute). This was followed by a panel discussion on how CGIAR-CCAFS and National Agricultural Research Systems should link with the private sector for accelerating climate risk management in agriculture.

Representatives from the agri-business, insurance, banking as well as the information and communication technology (ICT) sector participated in the panel discussion. S. Sivakumar, Chief Executive of the Agri Business Division, ITC Ltd highlighted the need for knowledge gap funding about climate affected agriculture and its continuous communication for the private sector to create serviceable products for the farmers. Multiple entrepreneurial model for agri-business and its packaging for

climate related issues, led by youth, must be prioritized. T.S. Raji Gain, Chief General Manager, Farm Sector Policy Department of National Bank for Agriculture and Rural Development (Climate and Rural Development) recommended in-depth institutional mapping of the socio-economic scenario to better inform this sector regarding trends of farmers' adoption of mitigation and adaptation techniques. Malay Kumar Poddar, General Manager, Agriculture Insurance Company of India (Agriculture Insurance) stated the need for persistence in research particularly crop loss assessments for most precise implementation outcomes for schemes such as the Prime Minister Crop Insurance Scheme. Sandeep Malhotra, CEO, IFFCO Kisan Sanchar Limited (ICT and agro-advisories) emphasized on the importance of designing practical, action-based research, convergence with state, district and village level programs along with time bound, targeted program design and implementation.

Collating national perspectives

National perspectives are quintessential for understanding where focused efforts in research and extension are required to help make agriculture climate resilient. Some of the core recommendations that were made were to, bring global knowledge to local relevance; usher in new tools and methods for investment prioritization in adaptation options; promote agriculture risk management through improved seeds/breeds, best agronomic practices and precision agriculture technologies developed and available with the CGIAR; support to policy and institution building for adaptation planning. Further, a call for exploring new areas of research was made along with a proposal to develop incentive mechanisms for promoting climate-smart agriculture. For scaling the same, recommendation was made for developing new models/methods of ICT. Advancement and continuity in gender transformative research for the region and social inclusion in all segments of project design and implementation was alluded to as normative.

To sum up the deliberations, the gaze can be shifted towards the words of CIAT Director General Ruben Echeverria.

"The buzz words right now need to be policy engagement, communication and partnerships. CCAFS research in the region in the second phase must be more demand-driven and impact-oriented to ensure that no wide gap remains between policy implementation and research outcomes".



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A stitch in time saves nine

On field experience in India reveals how early stage interventions can significantly minimize risks of crop failure.

Arun Khatri-Chhetri,
Kunal Pandey
(CCAFS South Asia) and
Rajashree Joshi (BAIF)

Crop failure is every farmer's nightmare. The prospect of bad dreams turning into protracted reality has only been made stronger due to climatic changes that are wreaking havoc upon South Asian agriculture. One of the locations suffering on this account is Mathura, a prominent district in the northern Indian state of Uttar Pradesh, also the most populous state of the country. Here, bajra (Pearl Millet) is a major kharif season crop and its cultivation in the district mainly depends on rainfall patterns. Time, duration and amount of rainfall during the bajra crop sowing period are critical for successfully establishing the crop in farmers' fields. In many locations of the district, farmers have experienced long dry spell just after the bajra sowing. However, in some places, farmers have received heavy rainfall and temporary inundated crop fields. These conditions have led to complete failure of bajra crop in many farmers' fields.

Offsetting climatic risks

The United States Agency for International Development (USAID) has funded a project on scaling out Climate- Smart Villages in India in the attempt to promote resilience and build strong farming communities in the region. One of the core objectives of the project is climate risk mitigation in farms through climate-smart practices. A range of such practices are made into composite packages and through different mediums introduced to farmers for early stage interventions to offset and overcome climate induced risk of crop failure. In the current project district, the early stage interventions include information and communication technology (ICT) based agro and meteorological advisory, introduction of climate and disease resilient seed varieties, seed germination testing, seed treatment trainings and adoption of productive practices like line sowing.

Action and relief through project intervention

The first set of ICT services were rolled out to 2980 farmers in the three USAID project districts of Nalanda (Bihar), Betul (Madhya Pradesh) and Mathura (Uttar Pradesh) during Kharif season in 2017, with 8195 farmers registering themselves for the service for the Rabi season. The type of services include weather information, agro-advisory, livestock management, information on government schemes and also general services (health and hygiene, child care). Extensive trainings have been conducted on climate and disease resilient variety of seeds with access to improved variety Bajra (Pearl millet) mostly in Mathura.

In Mathura, limited knowledge on seed germination often amounted to losses and thereby, exposure to seed germination testing by the project team largely helped address the issue and save on seed costs. Further, trainings were expanded to include awareness raising on seed treatment by bio fungicides (*Trichoderma* with PSB and *Azotobacter*), and replacement of broadcasting method with that of machine based line sowing, for Bajra. This has ensured that seeds get adequate moisture during long dry spell condition after sowing while also attaining proper germination after sowing.



Figure: Crop performance in treatment and control plots in the project area

Key message to carry forward

As is evident through the enclosed images, the project activities help reiterate the fact that proper action taken at early stages of growth can go a long way in avoiding crop failure which are only exacerbated due to climate change. In the CSV plots of Mathura, line sowing methods resulted in 100% seed germination while in the non-CSV plots, 50% of the project farmers had to undertake multiple re-sowings with compromised seed germination. Thus, it was seen that change in seed variety and sowing method can significantly reduce crop failure due to weather risks such as long dry spell and heavy rainfall after crop sowing. Adoption of such methods can not only minimize the impact of weather risks during the early crop growing stages but also improve crop yield and income. Therefore, verifying the accuracy of the idiom that, a stitch in time indeed helps save nine.

** The views expressed in this article does not represent the official views of USAID.*



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Women farmers call the tune in Betul, Madhya Pradesh

The Climate-Smart Village project in Betul district of Madhya Pradesh creates women led local institutions to usher in climate-smart practices in agriculture.

Nitya Chanana,
Arun Khatri-Chhetri,
Shehnab Sahin
(CCAFS South Asia) and
Rajashree Joshi (BAIF)

Women have been central figures in Gondi tribes' legends of origin. It is said that when Gondi gods were born, they were abandoned by their mother, then rescued by goddess Parvati but remained hidden in caves at the behest of her consort, lord Shiva. A Gondi hero took help from goddess Jangu Bai and rescued them from caves, thus, laying the foundation of their society led by these Gods. In the domain of reality one sees that Gondi women still command ethereal respect and are seen to actively participate in most walks of life including that of agriculture. This inclusiveness has been capitalized on by the project team devised by CCAFS funded by the United States Agency of International Development (USAID) to scale the Climate-Smart Village (CSV) approach in Madhya Pradesh along with Bihar and Uttar Pradesh.

Crafting local institutions to usher in climate-smartness in agriculture

The CSV project in Betul district of Madhya Pradesh aims to build resilience among farming communities through a range of climate-smart agricultural (CSA) activities. Central to the project is the creation of local institutions called the Village Climate Management Committee (VCMC) or 'Gram Jalvayu Samiti' in vernacular in each of the 38 villages chosen for project implementation in Betul district. These local, informal institutions will oversee the management of the project while also ensuring true empowerment of the local communities. In the case of Betul, a further element of novelty comes from the fact that the local institution created (i.e the VCMC) is comprised entirely of women farmers.

What entails the Village Climate Management Committee?

The Committees are a result of extensive consultations with the women farmers in the area, comprising of women farmer members, headed by a Chairman and a Secretary. Each committee will be responsible for over-seeing the formulation of site specific project intervention plans, its implementation including monitoring and evaluation. Further, a roadmap has been created to cultivate a larger institution called the 'Kisan Jalvayu Sangh', comprising the 38 Chairmen and Secretaries of the VCMCs in the project district, to be registered as a producer company of farmers.

The VCMC plan of action

First and foremost, the VCMC members had been tasked with the selection process of farmer beneficiaries in the project villages. Out of the 38 villages in the district, a total of 3725 female farmers have been chosen as project beneficiaries out of which further segregation has been made on the basis of super-champion, champion and other CSA farmers. Subsequently, village level analysis for climatic risks were conducted, leading to the identification of locally contextualized climate-smart agricultural interventions (ICT based agro and climate advisories, sustainable agricultural practices like integrated pest/nutrient management, crop insurance etc.).

To ensure the efficient institutional operation and sustainability, a number of by-laws were crafted to govern the same, some of which include member compliance regulations, resource pooling and individual member contributions, social audits of the programs among others. It is aimed that further legitimacy and credibility will accrue to the local institution through its crafting of the larger Village Development Plan that will in turn seek convergence with on-going government schemes in the project areas. Financial sustainability has been worked out through the Village Development Fund that will be managed by the VCMC and which will ensure farmers contribution in the same.

Talking about her new found role in the VCMC, Rajeshwari, a farmer in Betul says,

'Over the years we have witnessed variations in our crop yields. Some years the yield has been good, and in some other, it has been very bad, which put my family in a lot of risk. This project initiative looks very promising to me and I am sure there will definitely be improvement in our yields. I am proud to be a member of the VCMC and excited to be part of the change'.

**The views expressed in this article does not represent the official views of USAID.*



Neil Palmer/CIAT

Voyaging with new crews

New partnerships being forged in South Asia are leading the way for scaling out climate-smart technologies, practices and services in the climatically risk prone areas.

Anjali Pant,
Arun Khatri-Chhetri
(CCAFS South Asia) and
Akhilesh K. Yadav (ITC)

While there are many channels through which scientific developmental research gets espoused, one by the private sector seems to be making strides in the recent past. With increasing private sector engagement with research for development, a panoramic potential for benefits has emerged. The Climate-Smart Village (CSV) approach too is all set to be scaled up by the private sector in India with new partnerships spawned with ITC Limited, a multi-business conglomerate of India.

ITC Limited has already made its foray into rural empowerment in the country with extensive work being done to develop water and forest resources, creating new non-farm livelihoods, expanding primary education and skills in the rural hinterlands while also creating economic opportunities to empower rural women.

Striking partnerships for climate resilience in rural India

Considering the increasing climatic impacts on the agriculture system of the country and its consequent bearing on rural livelihoods, ITC has partnered up with the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) to help the agriculture-dependent communities to implement and scale up the CSV approach in its outreach areas. With an aim to initially cover approximately 2000 villages in six states of India, the first phase of the project has been launched in the three states of Madhya Pradesh, Maharashtra and Rajasthan for 2016-2019.

What does the project entail?

The ITC-CCAFS project aims to address the growing challenge of climate change impact on current as well as future food security in ITC outreach areas. The project has been designed with utmost focus on community participation as local ownership and empowerment goes a long way towards establishing sustainability of such initiatives. The project is divided into two phases. The first phase is focussed on achieving current sustainable livelihoods through key important areas like agriculture, watershed, afforestation and women empowerment. The second phase being more future centric, targets to upgrade capabilities via education, skilling, sanitation and management of solid waste. For the implementation of the CSV approach in the key areas, as part of phase one, this joint project will: i) create

a road-map for each cluster of villages that will act as a tool for communities in assessing the progress and alignment towards CSVs, ii) participatory implementation of various climate-smart interventions to promote Climate-Smart Villages in on-going projects of ITC, and iii) strengthen the capacity of farmers, local bodies and other stakeholders in climate change adaptation and mitigation.

To illustrate some of the project initiatives and its ensuing outcomes, the outreach areas of Maharashtra (Ahmednagar and Pune) can be looked at. The region around Ahmednagar district being situated in the rain shadow area is severely affected by water scarcity. With the monsoon season shifting its pattern, scanty rains are observed in June (the changed normal) which forces farmers to undertake re-sowing of the kharif crops like Bajra and moong. As part of the ITC Project, a number of soil and water conservation techniques have been strategically placed to hold the water, harvest it in ponds and also recharge the groundwater aquifer. Main interventions include: Contour Conservation Trenches (CCT), Farm Bunds, Deep Level Trenches (DLT), Water Augmentation Trenches (WAT), Recharge Farm Ponds, Check Dams, and Percolation Dams. Farmer beneficiaries have attested to the interventions having helped in the augmentation of the water resources, improving crop yields, bringing larger area under cash crops, thus, ensuring higher incomes and reduced migration.

The women farmers have also set up a small custom-hiring unit for the costly farm implements like Multi-Cropper, Ridger, Cultivator, and Rotavator. Women SHGs in the region have been enthusiastic about their work and participation in the project operations.

Thus, it is evident with the progress so far that such joint ventures are pressing for a bottoms-up change in the rural hinterlands of India which are facing climatic risks in their agriculture systems. It is hoped that such models of collaboration are furthered and help attain multiple benefits of resilience, livelihood enhancement, gender inclusion among others within the larger ambit of community empowerment.



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Monitoring weather deviations and crop conditions for agriculture insurance in India

Near real time assessment reports on weather deviations and crop conditions using multiple methods and large geo-spatial databases are being tested through the insurance perspectives for seven major crops in India.

Pramod K. Aggarwal,
Paresh B. Shirsath,
Ponraj Arumugam,
Sheshakumar Goroshi,
Mansi Nagpal and
Shalika Vyas (CCAFS South Asia)

Since the last two years Government of India has been implementing a revamped crop insurance scheme (Prime Minister Crop Insurance Scheme) with the village as the insurance unit. This revamped scheme has now reached over 50 million hectares of cropped area and aims at reducing the basis risk and in turn minimize farmers' distress over crop insurance. The agriculture production system in South Asia is intricately linked with location-specific meteorological conditions particularly with precipitation and its distribution. It's often the weather conditions which shape the agricultural output of the season, along with management and farm-specific characteristics. The monitoring of the agriculture production systems is done through food security perspectives and mostly done at the regional scale. Besides, the outputs from the current monitoring systems were not available on either real/near-real time basis. Continuous monitoring is often required for all those agencies and individuals which are involved in agricultural and allied sectors especially the agriculture insurance sector.

Bridging gaps

The CGIAR research program on Climate Change, Agriculture and Food Security in South Asia is trying to bridge this gap by providing near real time assessment reports on weather deviations and crop conditions using multiple methods and large geo-spatial databases through the insurance perspectives for seven major crops in India. These reports present district-level analysis of agriculture-specific indicators prevalent over India. High resolution gridded data was used to estimate near-real time crop condition and weather parameters. With temporal dimension of two weeks and district level analysis, the reports can ensure consistent and extensive monitoring. It aims to build a common platform where location specific, high quality data is available with minimal time lag, to monitor weather conditions and track the progress of agriculture outputs in the country. Deviations from long term averages is presented to gauge overall climatic trends.

Contriving the report

The report is structured in three sections: first section presents weather parameters, second section describes the crop condition using remotely sensed vegetation indices and third section highlights the crop specific conditions of prevented sowing, sowing failure and final yield estimates are described thereafter.

The weather analysis presented here comprises of rainfall and temperature analysis. Rainfall is analysed comprehensively by focusing on volume, distribution and extremes. Additional section of drought is also included, which presents the Standardized Precipitation Index (SPI). Crop condition is described by Normalized Difference Vegetation Index (NDVI) using MODIS datasets. The comparison from previous years and long-term averages are also presented in order to make qualitative inferences on the overall trends in vegetation cover. The final section on crop condition presents areas with likely chances of prevented sowing and crop failure, mid-season adversity (only for mid-season report) and finally yield loss assessment under different confidence level using multi-criteria assessment. Prevented sowing indicates areas where there are likely chances that sowing could not take place due to inadequate conditions. Similarly, sowing failure indicates areas where there are likely chances that crops could not survive due to unfavourable conditions. All the indicators were derived through multi-criteria assessment using weather derivatives, remotely sensed vegetation indices and crop growth modelling. This analysis was carried out only for rainfed regions; and flood losses are not considered. We recommend minimal validation and ground-truthing before further use.

We believe these reports at this stage provides vital inputs to managers, planners, insurance and reinsurance industry. At this stage the reports are still incipient although rich enough in their content to serve several aspects related to crop insurance like qualitative checking of the field datasets. The analysis will soon be developed into a web-based portal where all the indicators and district/sub-district/village wise data can be accessed on near real time basis.

Report can be accessed through:

<https://cgspace.cgiar.org/rest/bitstreams/147345/retrieve>



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About CCAFS

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a research initiative seeking to overcome the threats to agriculture and food security in a changing climate. CCAFS invests in research to address the crucial tradeoffs between climate change, agriculture, and food security and works to promote more adaptable and resilient agriculture and food systems in five focus regions: South Asia, Southeast Asia, West Africa, East Africa and Latin America. CCAFS work is carried out with support from CGIAR Fund Donors and through bilateral funding agreements. For details please visit <https://ccafs.cgiar.org/donors>. The views expressed in this document cannot be taken to reflect the official opinions of these organizations.

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For more information, contact:

South Asia Regional Program Leader
Pramod K. Aggarwal
E: p.k.aggarwal@cgiar.org

South Asia Science Officer
Arun Khatri-Chhetri
E: A.Khatri-chhetri@cgiar.org

South Asia Communications Specialist
Shehnab Sahin
E: s.sahin@cgiar.org

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