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Climate Change,
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CCAFS

CCAFS Climate-Smart Agriculture Learning Platform, South Asia

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Building evidence on the benefits of climate-smart agriculture

CCAFS South Asia is working with Practical Action Consulting, Nepal, to highlight the benefits of climate-smart agriculture among farmers through trainings and visits to demonstration plots.

BY ARUN KHATRI-CHHETRI, CCAFS SOUTH ASIA AND MILAN KUMAR JOSHI, PRACTICAL ACTION CONSULTING, NEPAL

CCAFS South Asia together with Practical Action Consulting, Nepal, are working with farmers and the private sector to implement climate-smart agriculture interventions in the production of rice, maize and sugarcane.

A package-of-practices (PoP) focused on climate-smart agriculture interventions for the selected crops have been put together for demonstration plots in farmers' fields and in private agricultural firms. Inspired by the model of climate-smart villages, a project led by CCAFS South Asia in India, Nepal and Bangladesh, these demonstration plots aim to involve the private sector in scaling out climate-smart agriculture and managing climate risks in the production of key crops.

AN AIM TO TRAIN 15,000 FARMERS

Training farmers on climate-smart agricultural practices and technologies is an integral component of this pilot project. The project aims to train 15,000 local farmers on climate-smart agricultural practices and technologies. These farmers would then inspire other farmers to follow suit by adopting climate-smart agriculture practices.

Since the onset of the project last year, 2,112 farmers have been trained (1,010 sugarcane farmers and 1,102 rice farmers) and 32 demonstration plots (12 in sugarcane and 20 in rice) for climate-smart agriculture interventions in sugarcane and rice have been established.

Similarly, private sugarcane firms (Eastern Sugar Mill-Golchha Organization) and rice firms (Saradha Group) have also set up advanced level demonstration plots that include all potential climate-smart interventions in sugarcane and rice. This participatory evaluation of climate-smart agriculture interventions has established connections between the farmers and private firms.

Demonstration plots have encouraged local farmers to participate in the trainings on climate-smart agriculture. Many farmers have shown an interest to learn about climate-smart technologies and practices that are being implemented in the demonstration plots of rice and sugarcane.

The project has realised that a combination of demonstration sites and training for farmers has a positive impact on the adoption rate of these technologies and practices among farmers and therefore uses the 'demo-and-training approach' to bring home this point. The extension agents of the project train farmers and also present to them the performance of crops on the demonstration sites. What farmers learn through the workshop trainings are immediately reflected in the practical sessions in the demonstration plots.
Says one farmer who is part of the training:

"*The performance in demonstration plots is the key reason for the increase in curiosity among the farmers about the climate-smart agriculture practices. Farmers who initially withdrew from the training programs now ask me about the improved practice of cultivation and have rejoined the training programs*."

In Nepal, about 70 percent of the agricultural labour is contributed by women. In order to ensure that both men and women farmers benefit from the trainings, the project team ensures that the trainings incorporate the specific challenges faced by men and women in dealing with climate change and adopting climate-smart agriculture practices. Trainings for women farmers are also conducted when there is a request. On average, about 43 percent of the participants in the farmers' training programme are women.

Beside the trainings and demonstration plots, the extension team regularly visits the farmers' field to address any technical issues and farmers can also contact the project team for support.

TWENTY MORE DEMONSTRATION PLOTS

This pilot project establishes 20 more demonstration plots for climate-smart interventions in maize crops in the beginning of the winter season. The next training sessions will be large-scale sessions aimed at farmers focusing on diverse socio-economic dimensions. The research team of the project will generate evidence of the benefits of climate-smart agriculture. The project will also focus on the promotion of carbon and energy smart practices in the pilot area.

How can we turn climate information into action?

As the world's climate changes and scientific understanding of the problem improves, how do we use new knowledge to help farmers prepare?

BY ALEXA JAY,
CCAFS, CLIMATE RISK MANAGEMENT

Climate information services are a powerful tool that live up to their promise of adaptation in agriculture by helping farmers both to protect against drought and take advantage of good climate conditions.

Experience in climate services is already out there—the governments of India and Mali have been delivering weather and climate advisory services to their farmers for several decades. To learn from these experiences, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) surveyed these national programs and other innovative climate services initiatives across Africa and Asia. A new CCAFS report details the findings.

The lessons learnt from these on-the-ground experiences show that it is today "Mission Possible" to scale up climate services for millions of farmers across the developing world to strengthen their resilience to climate risk and support their adaptation efforts.

Based on these lessons, CCAFS envisions five key steps towards sustainable national frameworks for climate services:

NURTURE PARTNERSHIPS TO BRIDGE THE GAP BETWEEN CLIMATE, AGRICULTURAL RESEARCH AND FARMERS

To create climate information services that are relevant to farmers on a broad scale, climate forecasters need to join forces with agricultural scientists, extension services, rural development agencies, farmers, NGOs, the media and the private sector. Mali's national agrometeorological advisory program used a multi-disciplinary working group model to address this challenge, which provided an institutional framework for different sources of expertise to put their heads together, and created a two-way information flow between providers of climate services and users.

GIVE FARMERS A VOICE

From the outset of a project, farmers' needs must be understood in terms of their specific service requirements, capturing the information types, delivery channels and lead time needed before, during and after the season. Institutional arrangements that open spaces for dialogue between farmers and scientists work to ensure farmer representation throughout the production and delivery of climate services.

Integrating traditional forecasting methods with scientific forecasting can also provide insights into current knowledge gaps at the local level, and increase farmers' trust in scientific forecasting.

INNOVATIVE COMMUNICATIONS CHANNELS TO REACH "THE LAST MILE"

Information and Communication Technology-based communication works particularly well for communicating shorter-range early warnings and advisories to farmers at a large scale. In Senegal, partnerships with community radio have expanded the reach of weather and climate forecasts from the initial pilot project of several hundred to almost 2 million users.

For communicating seasonal forecast probabilities, face-to-face interaction remains a superior medium for service delivery through training, communication and workshops with farmers, offering an effective way for tailoring information to farmer needs, training to understanding the complexities of information, and planning around historic variability and seasonal prediction.

TARGETING THE MOST VULNERABLE

The vulnerability of small holder farmers to climate risk is a major motivation for much of the recent interest and investment in climate services. In the cases we reviewed, the most vulnerable tended to be resource-poor, female and lower caste farmers, invisible to many outsiders.

Yet the challenges that lead some segments of rural populations to be more vulnerable also tend to make it more difficult to benefit from institutional services, including climate services. In order to build the resilience of farmers equitably, it is important to proactively target women and other marginalized farmers as full partners throughout climate services programs, ensure that their needs are met in the design of the climate service, and that they are represented in institutional and governance arrangements.

ASSESSING SERVICE DELIVERY

To ensure that climate services respond to evolving end-user needs, projects need to continually assess how well climate information services meet local needs throughout their lifespan. Participatory Action Research (PAR) and post-season reviews have proven to be effective methods for capturing farmer feedback on the quality and usefulness of services provided to them.

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New study shows how climate change will impact water availability in Koshi river basin

Originating in China, flowing through Nepal, before finally joining the Ganga in Eastern India, the transboundary Koshi River is a lifeline for millions along its course.

BY DHARINI PARTHASARATHY, CCAFS SOUTH ASIA

With references to it going back to ancient legend and scripture, the river is feared for the havoc it wrecks during floods but equally revered for the abundance it brings to lives.

A new study, the Projected Impact of Climate Change on Water Availability and Development in the Koshi Basin, Nepal, by researchers from the International Water Management Institute (IWMI) in Nepal, assesses the likely impact of climate change on water resources development in the Koshi River basin and generates projections for the 2030s and 2050s.

The Intergovernmental Panel on Climate Change (IPCC) in its report early this year highlighted that the South Asia region is particularly vulnerable to climate change. Using simulation models to understand how climate change will affect our natural resource base is one way to set the stage for better planning and adaptation.

There is no dearth of available water in Nepal. Nearly 225 billion cubic meters of water is available annually, yet only a paltry 15 billion cubic meters (less than seven percent) is actually used. Being an agrarian economy, most of this water goes into agriculture activity but even so only 24 percent of the arable land is irrigated. Crop productivity in Nepal remains among the lowest in South Asia.

So what are the implications of climate change on water availability in the Koshi River Basin and what are some recommendations based on the projections from this study?

IMPACTS VARY AT DIFFERENT SCALES

Using downscaled climate data from the CGIAR Research Program on Climate Change, Agriculture and Food Security, researchers ran the Soil and Water Assessment Tool (SWAT) model for the baseline (1971–2000), 2030s (average for 2016–2045), and 2050s (average for 2036–2065) to simulate water balances and runoff (basically the volume of water getting into and out of the system). The impact of climate change was estimated by comparing the baseline with the projected results.

The climate change analysis shows that the impacts are very scale dependent. This study compared projected changes at both temporal and spatial scales in water balance components (precipitation, actual evapotranspiration, and water yields) as well as flow volumes.

The findings indicate that the impacts of climate change are likely to be higher at smaller scales like seasonal and sub-basin levels than at larger, annual and full-basin, scales. At the sub-basin scale, precipitation is likely to increase in the upper transmountain region in the 2030s and in most of the basins in the 2050s, and it is projected to decrease in the lower sub-basins in the 2030s.

MAIN CONCLUSIONS AND RECOMMENDATIONS FROM THE STUDY

- Climate change will not reduce the bulk of water availability in the basin, that is, at the annual or basin scale.
- Climate change will increase variability in the hydrological system so future water resource management needs to focus on managing variability.
- Store and transfer water seasonally, that is, from the monsoon into the dry season as well as spatially - from water abundant to deficit areas

FOCUS ON STORAGE AND DISTRIBUTION

From this study, water yield in the basin, whether in the present or future, does not appear to be a pressing concern. Given that water use from the basin is merely 14 percent of its annual water availability, the study can reorient research focus from analysing changes in water flow under different climate scenarios to also looking at how storage and distribution facilities can be strengthened to use water efficiently.

The creation of storage infrastructure is not a silver bullet solution by itself, but requires strong local institutions and capacity building and training of those operating them.

"*The creation of storage infrastructure does not mean just investing in large reservoirs but it could be a combination of large and small scale storages which include both small and large reservoirs, community ponds as well as management of soil moisture and groundwater. Further assessment also has to be done on the placement and use of the storage infrastructure from a physical, social as well as governance perspective*," says Luna Bharati, Principal Investigator, IWMI Nepal.

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Stakeholders learn new features of yield forecasting toolkit

For policymakers to make informed decisions on food policy planning – from production, trade, weather impacts to overall food security in the country – it is critical that they have access to in-season crop yield forecasts.

BY ARUN K.C. AND PARESH SHIRSATH, CCAFS SOUTH ASIA

The CCAFS Regional Agricultural Forecasting Toolbox (CRAFT), developed together with the Asia Risk Centre, for South Asia uses seasonal weather forecasts, historical databases, and current weather to estimate yields of various crops in advance.

It can provide policymakers and stakeholders precise information on the likely volume of crop production in specific areas at different times of the year. The tool also supports risk analysis and climate change impact studies for policymakers and help anticipate the impacts of climate variations on crop production and in agricultural and food security management decisions.

CCAFS in South Asia has been closely working with stakeholders in the region to enhance their capacity in yield forecasting. We work to make these tools accessible to national research institutes and policymakers to enable better policymaking and planning. Recently a workshop was held to release CRAFT V2.0.0 in - an updated version of the toolbox. The new version of CRAFT is more user friendly than the old version and can precisely forecast in-season crop yields.

HANDS-ON LEARNING SESSIONS

In all, 32 participants from South Asia (Bangladesh, India, Nepal, and Sri Lanka) and Africa representing national agriculture research centres, ministries of agriculture, non-governmental organisations, national universities, and CGIAR Centers attended a workshop to learn about the upgrades to the toolbox. Resource persons guided participants through the structure and functions, software installation process, data requirements and preparation and in-season crop yield forecasting.

The CRAFT V2.0.0 provides support for spatial input data, spatial crop simulations and integration of seasonal climate forecasts, spatial aggregation and probabilistic analysis of forecast uncertainty. The new version allows calibration of model predictions from historic agricultural statistics, analysis, and visualization. This toolbox is based on crop simulation model-Decision Support System for Agrotechnology Transfer (DSSAT) and incorporates the Climate Prediction Toolkit (CPT).

Case studies have been conducted using the old version of CRAFT in Bangladesh, India, Nepal and Sri Lanka. CCAFS's research partners in each country were involved in testing the toolkit in different ecological systems. Initial results indicate that the toolbox customized for South Asia Region was able to forecast the crop yields very well. However, simulation model was required to validate and calibrate to fit for different crops and ecological conditions.

COUNTRY-WISE CASE STUDIES

The new version of CRAFT will be used for crop yield forecasting in Bangladesh, India, Nepal and Sri Lanka. Center for Environmental and Geographic Information Services (CEGIS) in Bangladesh, Indian Meteorological Department and Indian Council of Agricultural Research in India, Nepal Food Security Monitoring System in Ministry of Agriculture, and Natural Resource Management Centre (NRMC) of Department of Agriculture, Sri Lanka will use the updated CRAFT for yield forecasting of various crops in different seasons. Scientists from African countries were enthusiastic to test the toolbox for forecasting crop yields in different agricultural systems in East and West Africa.

Badri Khanal, Ministry of Agricultural Development, Nepal, one of the participants at the workshop said,

"The uses and benefits of using CRAFT need to be shared with government and research institutes. An attempt will be made to forecast in-season rice yields (2014-2015) using the toolbox."

The CRAFT maintenance team will work to fix some technical challenges in the software and incorporate feedback from CRAFT users and stakeholders. They have plans to include more crops into CRAFT produced in the region.

PARTICIPANTS' FEEDBACK

Participants expressed appreciation about the toolkit and offered feedback on some issues such as:

- Simplifying installation
- Including more crop models
- Uploading datasets, and
- Creating a help and support forum

Taking this into account, an online support group has also been created.


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New manual on guidelines to measure greenhouse gas emissions in smallholder systems

When undertaking experiments to quantify the emissions from farm land, many factors can influence the results. Researchers from CIMMYT and the Indian Council for Agricultural Research (ICAR) have developed a set of protocols for these experiments.

BY TEK SAPKOTA, CIMMYT AND DHARINI PARTHASARATHY, CCAFS SOUTH ASIA

Agriculture is a victim of climate change. Rising temperatures, erratic rainfall and extreme weather events can lower productivity, destroy harvests and threaten food security and livelihoods.

But this is only half the story. Agriculture also contributes to climate change. Even by modest estimates, it is responsible for nearly 14 percent of greenhouse emissions - primarily through nitrous oxide, methane and carbon dioxide. When land conversion and deforestation are taken into account, the figure is closer to 30 percent.

The good news is that agriculture is also capable of sequestering carbon and storing it in the soil, thereby reducing emissions into the atmosphere. Adaptive and productive practices that are inherently low-carbon is one way to ensure that, while farmers are protected from the impacts of climate change and continue to produce food sustainably, they are not simultaneously adding to the crisis.

WHY QUANTIFY EMISSIONS FROM AGRICULTURE?

Understanding the dynamics of fluxes - the exchange of gases - between agricultural fields and the atmosphere is essential if we want to know the contribution of farm practices to greenhouse gas emissions. As we turn towards sustainable development pathways, quantifying emissions from agricultural production systems is a critical area of scientific investigation. This research can help farmers, scientists and policymakers understand how mitigation can be integrated into policy and practice.

Scientists at the International Wheat and Maize Improvement Center (CIMMYT), supported by the CGIAR Research Programme on Climate Change Agriculture and Food Security (CCAFS), together with scientists from the Indian Council of Agricultural Research have brought out guidelines to measure greenhouse gas emissions using static chamber-based technique. A manual titled: Greenhouse Gas Measurement From Smallholder Production Systems, sets out protocols of standard of practice. This would also make comparisons between different emission studies more meaningful.

The chamber-based flux technique is a very widely used technique to measure greenhouse gas emissions. More than 95 percent of the thousands of published emission studies have used this method.

"*It is particularly suitable for measuring greenhouse gas emissions in smallholder systems in developing countries, mainly because it is relatively inexpensive, versatile to many field conditions and the technology is very easy to adopt,*" says A.K. Sikka, Deputy Director General, Natural Resource Management, ICAR, in the foreword to the manual.

HOW THE CHAMBER-BASED FLUX MEASUREMENT TECHNIQUE WORKS

The closed chambers is to accumulate the soil flux of greenhouse gases in the chamber's headspace. The increase in gas concentration over time essentially indicates the amount of flux from the soil. To carry out these experiments, chambers are placed in specific locations on the agriculture plot. At certain time intervals, air samples are physically extracted from the chamber at using an air-tight syringe.

The concentration of greenhouse gases in the air samples is quantified in a gas chromatograph. The soil flux of greenhouse gases is calculated through regression of the gas concentration with time.

HARMONISING PROCEDURES FOR BETTER RESULTS

This method for measuring emissions is relatively simple but several factors can influence the final results. The materials used in chamber components, the frequency of sampling, storage of the sample and the method of calculation, can make results vary.

In order to minimise such variability, the new manual can guide users on how to maintain minimum standards while carrying out these experiments. Harmonising standard procedures will also lead to better inter-study comparisons and to assess the reliability of results that emerge from different studies.

The manual by scientists from CIMMYT and ICAR sets out guidelines for carrying out GHG measurements.

This technique can be used to measure emissions at the field and farm level. The information obtained from chamber-based method can be used to refine and calibrate simulation models for large scale greenhouse gas estimations, an essential component of the national emission inventories.

The only limitation with this method is the uncertainty associated with the temporal and spatial variability of fluxes.

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.

The CCAFS South Asia office is hosted by
International Water Management Institute (IWMI) in New Delhi, India
http://ccafs.cgiar.org/where-we-work/south-asia

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For more information, contact:

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

South Asia Communications Specialist
Dharini Parthasarathy
E: d.parthasarathy@cgiar.org

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

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