Thematic Brief

Relevance Of Weather-Related Advisory For Agriculture As Climate Change Mitigating Effort

This thematic brief is developed under the Action Learning Research project '*Role of Gender in Agriculture, Climate Change and Food Security* ' by Friends of Women's World Banking (FWWB) India. As the author **Bharti**, role has been to review and analyse existing literature and FWWB's work on weather-related agricultural advisories to mitigate the impact of climate change on agriculture.

Context

The agricultural sector plays a vital role in promoting economic and social progress in developing nations, with a significant proportion of the global population living in poverty relying on agriculture as a primary source of household income (FAO, 1995). In South Asia, over 75 per cent of people reside in rural areas and rely on rain-fed agriculture, livestock, and forests for their sustenance. In India, agriculture is the primary source of livelihood for about 70 per cent of India's rural population. Agriculture plays a significant role in the country's food security and in achieving the Sustainable Development Goals (SDGs). One of the critical challenges faced by agriculture is climate change.

The increasing frequency and severity of extreme climatic events and their impacts are being realised in many regions of the world, particularly in smallholder crop and livestock production systems.

Heatwaves that cause crop loss and reduced agricultural labour productivity increase the vulnerability of agri-horticulture sectors, and the absence of other livelihoods leads to the outflow of productive labour. As temperatures rise, the risk of pest infestation increases, as it creates ideal conditions for many pests to thrive and reproduce. Additionally, rising temperatures can alter plant and crop growth patterns, attracting more pests.

Suddenly, an increase in extreme weather events, such as hailstorms, cloud bursts, and landslides, leads to the destruction of crops. Changes in surface runoff (particularly reductions) due to shifts in precipitation patterns can lead to the drying up of perennial water sources, decreased soil moisture, and, subsequently, reduced agricultural yields. Droughts accelerate land degradation by increasing reliance on groundwater and perennial water resources, thereby heightening the risk of wildfires. Intense rainfall, leading to land and soil degradation, increases pressure on forests and results in biodiversity decline. The rising temperatures and changes in precipitation lead directly to soil erosion or waterlogging, resulting in lower crop yields and crop failures.

As climate-induced risks increasingly disrupt agricultural production systems, the ability of farmers, particularly marginalised and vulnerable farmers, to anticipate, respond to, and adapt to these challenges is being critically shaped by their access to timely, reliable, and context-specific agricultural and climate information.

There are multiple traditional and modern channels through which farmers can obtain relevant information for their agricultural concerns, including climate information; however, the efficacy of these channels varies. Extension services, for instance, are resource-intensive and have limited outreach, particularly for small and marginal farmers located in remote places. Extension workers appointed to extend agricultural services may be biased in favour of progressive farmers, possibly because it is easier to reach them from local input dealers, which may raise legitimacy concerns, as they may provide information that serves vendors' interests rather than farmers. Yet many farmers—particularly small and women farmers—are still dependent on information provided by input vendors and progressive farmers.

Methodology

This analytical brief is developed by examining secondary literature on weather-related agricultural advisories and FWWB's efforts to mitigate the impact of climate change on agriculture. FWWB's work in integrating technology into weather forecasts and predictions for small and marginal farmers (preferably women farmers) in the agricultural value chain is referenced and analysed in this note. Thus, through a desk review and analysis of research reports, policy papers, and FWWB's project documents, this analytical brief discusses the global and country-specific innovative work on weather-related advisory for small and marginal farmers.

Weather-related advisories for agriculture- Global and Indian experience

At the global level, the Global Information and Early Warning System on Food and Agriculture (GIEWS) continuously monitors food supply and demand, along with other key indicators, to assess food security across all countries. It issues regular analytical and objective reports on prevailing conditions and provides early warnings of impending food crises at the country or regional level. At the request of national authorities, GIEWS supports countries in gathering evidence for policy decisions or for development partner planning through its Crop and Food Security Assessment Missions (CFSAMs), fielded jointly with the World Food Programme (WFP). In country-level applications of tools for earth observation and price monitoring, GIEWS also strengthens national capacities to manage food security-related information.

In India, a phone-based short message service (also called SMS in common parlance) is an essential medium for delivering agricultural information to farmers in developing countries, as it makes information accessible to large numbers of farmers at an affordable cost. It leads to greater compliance with agri-met advisories in the scheduling of operations based on the crop growth cycle. Such SMSs, which are agri-met advisories, are sent by the India Meteorological Department (IMD) to farmers via mass media (radio, print, and TV), the internet, extension service personnel, and SMS on farmers' mobile phones and have led to greater use of forecasts to substitute for rainfall in groundwater or surface irrigation by treatment-group farmers.[1]

Under Agrometeorological Advisory Services (AAS), viz., Gramin Krishi Mausam Sewa (GKMS) scheme, the IMD, GOI generates medium-range weather forecasts (temperature, rainfall, wind, relative humidity and cloud amount) for the next 5 days at district and block levels and rainfall and temperature forecasts for the subsequent week at meteorological sub-division level. Based on the weather forecasts issued by the IMD, 130 Agromet Field Units (AMFUs) located at State Agricultural Universities (SAUs), institutes of the Indian Council of Agricultural Research (ICAR), and Indian Institute of Technology (IIT), etc., prepare agro-met advisories on every Tuesday and Friday for the districts under their jurisdiction and communicate to the farmers to decide on the selection of crops, appropriate time for sowing, harvesting, irrigation, fertilizer application etc. Along with the biweekly bulletins, daily weather forecasts and nowcasts are also disseminated to farmers by the Regional Meteorological Centres (RMCs) and Meteorological Centres (MCs) of the IMD. Such agromet advisories are communicated through multichannel dissemination systems,

[1] https://www.sciencedirect.com/science/article/pii/S2212096321000504

including print and electronic media, Door Darshan, radio, the internet, SMS on mobile phones via the Kisan Portal, and private companies. SMS-based alerts and warnings, along with appropriate remedial measures, are sent through the Kisan Portal during extreme weather events such as cyclones and deep depressions. Farmers access weather information, including alerts and agromet advisories specific to their districts, through the mobile app 'Meghdoot'. These weather details are also accessible to farmers through the 'Mausam' App. To extend real-time weather updates to rural farmers Social media platforms are also used to disseminate weather forecasts, severe weather warnings, and agro-met advisories.

Gram Panchayat Level Weather Forecasting (GPLWF) initiative by IMD, in collaboration with the Ministry of Panchayati Raj (MoPR), covers nearly all Gram Panchayats and shares weather forecasts on digital platforms such as e-Gramswaraj (https://egramswaraj.gov.in/), the Meri Panchayat app, e-Manchitra of MoPR, and Mausamgram of IMD (https://mausamgram.imd.gov.in/).

Bharat Forecasting System (BFS), another initiative by IMD delivers hyperlocal, real-time weather predictions at an unprecedented 6.5 km resolution. Powered by the Arka supercomputer and a rapidly expanding Doppler radar network, BFS enables village-level forecasts up to 10 days in advance. It is the world's first national-scale weather model to provide forecasts of weather events like heavy rainfall, thunderstorms, or heatwaves at a fine resolution—6.5 km grids—covering the entire Indian subcontinent with pinpoint accuracy. Such hyperlocal forecasts mean better crop planning, reduced losses, and more efficient use of resources.

ITC E-Choupal is a virtual marketplace where farmers can transact directly with a purchaser via an internet-linked computer, thereby realising a better price for their produce. E-choupals are village Internet kiosks that provide access to information on weather, market prices, and scientific farming practices to enhance farm productivity, improve farm-gate price realisations, and cut transaction costs. Each kiosk is run by a local farmer (Sanchalak), selected from the village and given brief training. ITC has launched a flagship extension programme called 'Choupal Pradarshan Khet' (CPK), or demonstration plots, to help farmers enhance farm productivity by adopting agricultural best practices. It is also currently working with agri-startups to provide farmers with many services, including location-specific weather forecasts, crop advisory, and crop quality testing.

Intelligence (AI)-based crop-specific WEA b THER ADVISORY, Tamil Nadu Agriculture University (TNAU), is the first AI-based weather advisory in the country. It provides weather-based automated agro-advisories based on factors such as the crop being cultivated and the sowing date. Based on this, AI calculates the advisory using weather information from the database for the previous and upcoming weeks and sends it to farmers.

Friends of Women's World Banking India (FWWB)'s focus on similar thematic

FWWB, through its work with small and marginal farmers, promotes direct participation in the agri-based economy, augments their capacities, and increases their climate resilience. It collaborates with agri-tech experts and specialists to build the capacities of farmers through training, workshops, and exposure visits, and enables catalytic finance for climate-adaptive

measures. So far, FWWB has supported 200 farmer collectives and more than 1.5 lakh farmers across India.

Under the 'Gender, Climate Change, and Agriculture' project, FWWB has partnered with Agcane [2]to support 700 potato value chain farmers cultivating 600 acres in Gujarat, MP and UP. The partnership broadly entails the orientation of the project team, Community Resource Persons (CRPs), and entrepreneurs on plotting and the use of satellite-based weather forecast information. Two applications, the Drawplot application (for plotting) and Agcane (weather forecast and monitoring) are being used to monitor vegetation growth and water stress levels in the fields. Such a partnership had emerged as a successful pilot and demonstrated as a futuristic tool for better planning, awareness generation, and increased farm income.

Similarly, under 'Gender, Climate Change, and Agriculture' project FWWB has initiated a partnership with Digital Green [3] in Maharashtra and Andhra Pradesh to help small-scale farmers improve their productivity and incomes. Such an initiative demonstrated a use case of an open-sourced, farmer-powered application called 'FarmerChat' to respond to local needs and make climate-smart guidance accessible to farmers via images, voice, and text, in real time and in their own language.

The above two examples exemplifies FWWB's efforts towards establishing relevant localised weather based advisory for agriculture particularly for small, marginal and women farmers. In each of these examples, existing such partnerships will aim to ensure timely and regular weather forecasts for better crop planning, reduced losses, and more efficient use of resources.

Concerns and way forward

It has been learnt that such technological innovations in the field of weather forecast have been non-inclusive in some aspects of the design, delivery and access. As men have more access than women, and so is the prevalent rural–urban divide. There is unspoken gender divide in access to, control over, and use of ICT tools, mainly due to cultural and social limitations, time and mobility constraints, financial constraints, literacy and education, the high cost of ICT deployment, a lack of basic infrastructure, and unfamiliarity with ICT. In this context, weather information alone is insufficient unless farmers have the capacity to interpret and integrate it into agricultural decision-making.

To overcome these barriers to women's access to and use of ICT and remove this gender divide, at least in the agricultural sector, it must be ensured that the content is adapted to the needs of men and women; the process of design is inclusive and ensures participation of men and women at all stages; gender is considered at the individual level, the organizational level and the enabling environment level; gender issues regarding partners' involvement in the initiative are analysed; there is the right mix of men and women as leaders; digital literacy (ability to access information) is combined with process literacy (looks at

[2] Agcane enables the farmer increase Crop Yield through regular monitoring of crop health using satellite information and by taking timely actions.

[3] Digital Green is a global tech nonprofit organisation using the power of generative AI to help small-scale farmers around the world improve their productivity and incomes.

understanding, interpreting, and applying advisories to farm decisions); economic, social and environmental sustainability is ensured; a gender analysis is conducted to identify opportunities on how ICT can enhance current practices; direct relationships are developed with male and female farmers; ICT is used to complement existing information channels; and employment opportunities are provided for women as service suppliers in agricultural-related ICT services.[4]

[4] WOMEN AND CLIMATESMART AGRICULTURE: A Programming Guide for Eastern and Southern Africa https://africa.unwomen.org/sites/default/files/2023-05/CSA%20programme%20