

CLIMATE CONNECTION REPORT 2023

Stories of Climate Change from Rural India



THE TEAM

NEELESH MISRA

Founder

Gaon Connection
Gaon Connection Insights

.....

BOOK CONCEPT

Nidhi Jamwal

Managing Editor
Gaon Connection

EDITING

Pankaja Srinivasan

Editorial Consultant

Nidhi Jamwal

CONTRIBUTORS

Aishwarya Tripathi, Alok Sikka, Anoop Nautiyal, Brijendra Dubey, D Sarika, Dewesh Pandey, Fahim Mattoo, Gurvinder Singh, Komal Jadhav, Kuldeep Chhangani, Laraib Fatima Warsi, Madhu Verma, Manish Dubey, Mohammad Fair Alam, Mudassir Kuloo, Nidhi Jamwal, Pankaja Srinivasan, Parul Kulshresta, Parul Sharma, Pawan Kumar, Pooja Yadav, Pragati Prava, Pratyaksh Srivastava, Rafiqul Islam Montu, Rahul Jha, Ramji Mishra, Rishabh Srivastava, Sadaf Shabir, Sarah Khan, Shivani Gupta, Shrinivas Deshpande, Sumit Yadav, Sushen Jadhav, Tauseef Ahmad, Twarita Chouhan, Udaya Kumar, and Virendra Singh,

VISUAL CONCEPT & GRAPHIC DESIGN

Emkay

© December 2023 Gaon Connection

GAON CONNECTION IS INDIA'S BIGGEST RURAL COMMUNICATION AND INSIGHTS PLATFORM WITH PRESENCE IN 470 DISTRICTS OF THE COUNTRY.

PUBLISHED BY

Gaon Connection Pvt Ltd

B, 2/62Q, Dr Akhilesh Das Gupta Marg, Vishal Khand 2, Vishal Khand,
Gomti Nagar, Lucknow, Uttar Pradesh 226010

connect@gaonconnection.com

~~~~~  
*All rights reserved. No part of this book may be reproduced in any form or by any electronic or mechanical means, without permission in writing from the copyright owner.*  
~~~~~

Cover photo: Sudarshan Poojary (www.unsplash.com)

TITLE **PAGE NO.**

SECTION 1: LEFT OUT IN THE COLD

STORY 1: Cold Wave in Rajasthan: 40% Mustard Crop Lost to Ground Frost 13

STORY 2: A Sour Harvest for the Strawberry Farmers of Darjeeling 16

STORY 3: Trouble in Paradise 19

SECTION 2: TOO HOT TO HANDLE

STORY 4: As Spring Goes Missing 24

STORY 5: Wilting Wheat Crops 27

STORY 6: Mustard Farmers Feel the Sting 31

STORY 7: A Catastrophe for the Cumin Crop in Rajasthan 34

STORY 8: Rural Workforce Faces the Brunt of the Heatwaves 37

STORY 9: The Centre Demands Daily Surveillance on Heat-related Illnesses 41

STORY 10: 68 Dead, 500 Hospitalised Due to Extreme Heat in Ballia, Uttar Pradesh 43

STORY 11: 48 People Dead in the Space of Two Days in Deoria, UP 45

STORY 12: “She fainted and never recovered. The doctors declared her dead.” 47

STORY 13: “He just collapsed and died” 49

STORY 14: Rising Heatwaves Take a Toll on Women Farm Labourers 52

STORY 15: How Good are the Heat Action Plans? 56

STORY 16: ‘Cool-Roofs’ Can Save Lives. Here’s How 59

STORY 17: Firefighting in Rural Bihar 62

SECTION 3: DELAYED MONSOON, BELOW NORMAL RAINFALL

SECTION 3.1: A CYCLONE...

STORY 18: Cyclone in the Arabian Sea – Will it Affect the Onset of the Monsoon? 69

SECTION 3.2: DROUGHT...

STORY 19: A Cloud of Despair Cloaks Maharashtra as the Monsoon Drags its Feet	72
STORY 20: Farmers in Marathwada on Tenterhooks as Monsoon Plays Hooky	75
STORY 21: A Long Walk to Find Pastures	78
STORY 22: Farmer Groups in Maharashtra Demand Declaration of Drought	81
STORY 23: Farmers in Bihar Stare at Drought in the Face	84
STORY 24: Next to No Rains in Eastern UP Leave Both Paddy Farms and Cattle Parched	87
STORY 25: Sit-in Protest for Drought Declaration in Marathwada	90
STORY 26: Rainfall Deficit Heats Up Cauvery Dispute Between Tamil Nadu & Karnataka	92

SECTION 3.3: ... FLOODS.

STORY 27: As They Sow, So They Weep – Ground Report from Flood-hit Villages in Haryana	95
STORY 28: “There are Several Villages Submerged Under 15 Feet of Water”	98
Story 29: Tangri River Changed its Course; Farmers in Ambala Flooded with Trouble	100
STORY 30: ‘Rainfall Pattern Changing, Paddy Producing States Witnessing Low Rainfall’	102
STORY 31: Floods and Cyclones Claimed 1,224 Lives from January to July 2023	104
STORY 32: Sikkim Floods: What Triggered the Disaster?	105
STORY 33: Flash Floods in Guwahati, Assam	107

SECTION 4: NO SWEET TIDINGS

STORY 34: Bad News for Mango Lovers	113
STORY 35: Indian Government to Ban Export of Non-Basmati Rice	116
STORY 36: The Man Who Owns 435,000 sq ft of Land May Not have Rice to Eat This Year	119
STORY 37: Not Quite the Weather for Tea	122
STORY 38: Kashmir’s Strawberry Farmers in the Red	126

STORY 39: Not-So-Sweet News for Muskmelon Fans this Summer	128
STORY 40: No Cheer for the Cherry Farmers in Kashmir	131
STORY NO 41: Snail Invasion Destroys Soybean Farms In Maharashtra	134
STORY 42: The Fading Fragrance of Desi Betel Leaves in Munger	137
STORY 43: In Poll-Bound Madhya Pradesh, Sugarcane Farmers are Angry	140
STORY 44: Fresh Trouble For Paddy Farmers in UP As Rain Damages Ripened Crop	143
SECTION 5: SOLUTIONS STORIES	
STORY 45: A Solar Buzz is Taking Bundelkhand by Storm	148
STORY 46: Growing Ber in Barabanki	152
STORY 47: A Bed of Roses in Drought-Prone Solapur	154
STORY 48: A Polyhouse Farmer is Making a Profit of Rs 5 Lakh per Acre	157
STORY 49: Sweet Tidings for the Strawberry Farmers of Bundelkhand	160
STORY 50: Millet Cultivation in Vizianagaram, Andhra Pradesh, Gets a Boost	164
STORY 51: Baniyatala Village in Bundelkhand Learns to Become Water-sufficient	169
STORY 52: Harvesting Rainwater Saves the Day for a Tribal Village in Jharkhand	172
STORY 53: Ancient Water Harvesting Systems Thrive in Desert Villages of Jaisalmer	175
STORY 54: Bite into Crisp Apples Grown in Varanasi	178
STORY 55: Farmers in Jaisalmer on a Date with Israel	180
STORY 56: Kheep Cool in the Desert	182
STORY 57: Farm Mechanisation Boosts Millets Cultivation By Women Farmers	184
STORY 58: Farmers In Odisha & Assam Benefit From Micro Irrigation Systems	187
STORY 59: Solar Power Brings Windfall to Flour Mills & Rural Shopkeepers	190
STORY 60: Silk Reelers in Odisha Bask in the Sunshine of Enhanced Livelihoods	193

STORY 61: A Solar Irrigation Pumpset that fits into a Jhola is Helping Farmers	196
STORY 62: An Ancient Pot-Irrigation System Is Revived In North Karnataka	200
STORY 63: Potatoes: Buried Treasure in Gurez Valley	202
STORY 64: Using Nanotechnology to Enhance Agriculture	204
STORY 65: Soilless Farming is Picking up in Kashmir Valley	207
STORY 66: Bangladesh's Coastal Farmers Transform Saline Lands into Arable Fields	210

SECTION 6: POINT OF VIEW

STORY 67: Farming in The Times of Climate Change	215
STORY 68: Rain-battered North India is on its Knees. But, no Lessons Will be Learnt	218
STORY 69: The Land Beneath their Feet Slips While Authorities Sleep	221
STORY 70: Harnessing the Sun to Power India's Agri Sector	224
STORY 71: Sustainable Groundwater Development Through Solar Irrigation in India	228
STORY 72: Climate Change and Mental Health Burden in Uttarakhand	231
STORY 73: Reviving The Dying Wisdom	234
STORY 74: Getting Hammered from Pole to Pole and Tropic to Tropic	238
STORY 75: Flood-Resilient Toilet: An Eco Katha	242



MY DAUGHTER Vaidehi is eight years old. As all of us know, when we become parents, our worldview changes.

Things and events that were not important to us any more, begin to matter. And as parents we often wonder, what will be the life of my child like, when they grow up?

When I became a parent, there was something I had covered as a reporter for years, dispassionately, which suddenly became very personal.

Climate change.

This thought would, I am sure, cross the mind of everyone whose loved ones shall outlast them in this world: what will the future be like?

What will life be like when temperatures are rising, sea levels are inching up, and climatic patterns are changing dangerously? What will it mean for agriculture and food security – will my child have enough food on the table and will she have to compete with a much

larger number of people for a smaller share of food?

When winter and summer and monsoon and spring are all tossed around by climate change, what will be the cascading changes in every aspect of her life?

So this book is not just a piece of academic work, this is personal and it should be personal for every parent who is living in an era whose cruelty on our climate shall impact the era in which our children, and the children of hundreds of millions of other fellow humans, are going to live.

The book has 75 stories of climate change from rural India (for the year 2023). And not just chest beating but also a section dedicated to solutions stories where we tell how people in rural India are responding to climate related changes. There is so much to learn from these scattered examples.

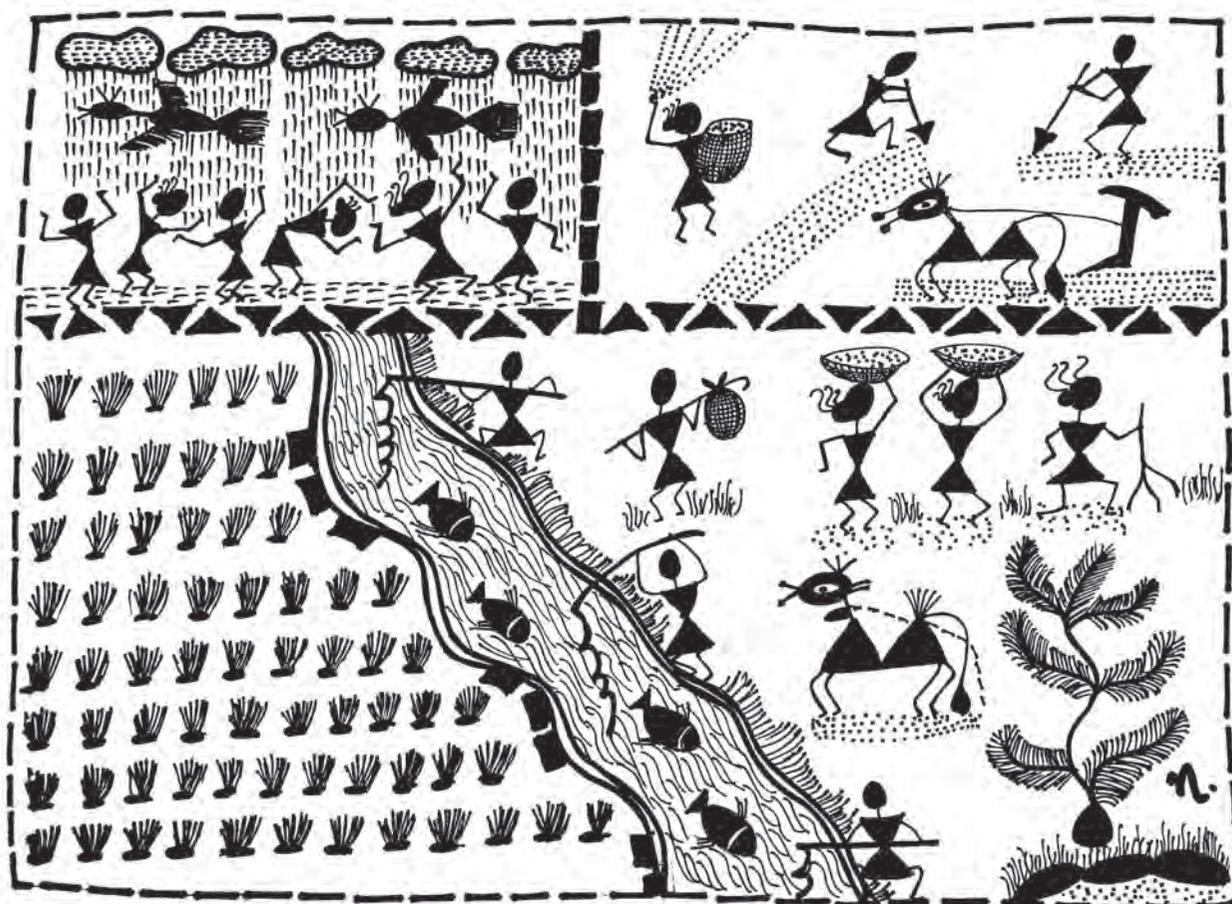
Every now and then we read stories of how rainfall has led to crop destruction, or droughts are fuelling migration but this is possibly the first time a book puts together an entire year of climate change impact.

I thank our entire team led by Managing Editor Nidhi Jamwal for their exemplary work in story after story, document after document, and every time becoming the voice of rural India with the utmost honesty, purpose and authenticity.

Let us all continue to make our Gaon Connection.

NEELESH MISRA

Founder
Gaon Connection



ILLUSTRATIONS: NIDHI JAMWAL

2023 HAS been a year like never before. It is on track to be the hottest year ever on record. And that means it is also a year of record human suffering.

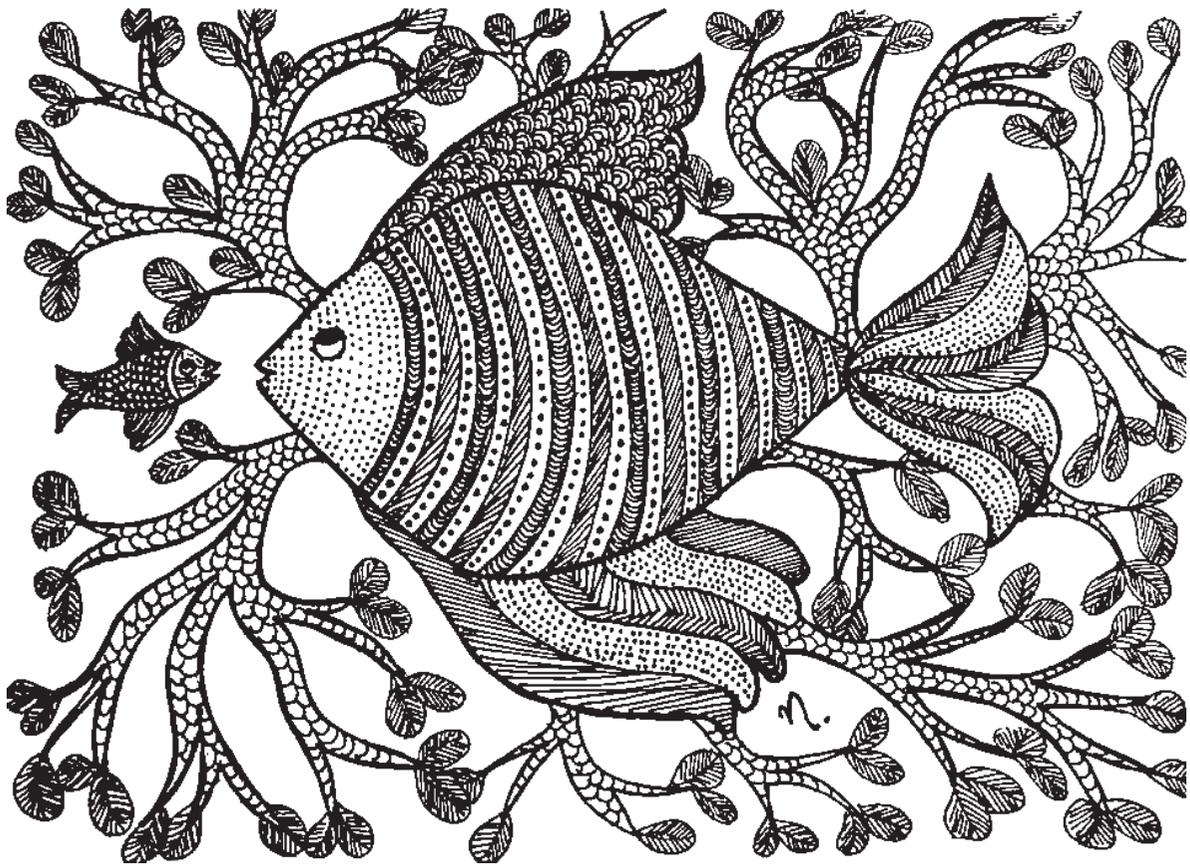
We don't need to go through complex research studies, or pore over IPCC (The Intergovernmental Panel on Climate Change) reports to know what that suffering is. Just look back on the months gone by.

It is very likely that you or your family members have suffered any of the following: illness due to extreme heat and humidity, flooding in the neighbourhood, skyrocketing prices of vegetables, dengue or malaria, extremely heavy rainfall, extended water cuts, or prolonged power outages.

With its presence in 470 districts of the country, Gaon Connection, which is India's biggest rural communication and insights platform, has its ear to the ground and through its network of reporters and community journalists, has reported on issues of climate change almost every other day.

Gaon Connection is the voice of rural India where two-thirds of the citizens of the country live, who, away from media spotlight, suffer the impacts of a changing climate. They have faced repeated crop losses, multiplying wage losses, and increasing health problems, due to increasing temperatures, erratic monsoon, or recurring floods.

These are concerns that should trouble us all no matter where we live as rural



India is also the food bowl of the world. What reaches your plate in a fine dining restaurant in Gurugram or Mumbai is the result of a toiling farmer who worked hard in her or his field tending crops for months till it was ready for harvest.

Floods for a long time were associated only with the rural hinterland where over the decades people have found some ways to cope with the annual cycle of disaster. Therefore they rarely received serious attention. However urban floods have now become a reality. They are recurring, destructive and undoubtedly a consequence of poor urban planning. But climate change has a key role to play too.

Changing rainfall patterns are leaving cities quite literally marooned and knee deep in trouble. Then, when there are long dry gaps in the monsoon season, it

affects water sources.

I moved to Mumbai, in January 2005, the same year of the Mumbai floods hit the metropolis on July 26. It was traumatic. There were power outage (Mumbai never has any power cuts so no one stocks up candles or a torch) when the city plunged into darkness; there was several feet of flood waters everywhere, the trains stopped, the airport shut down, there was no drinking water at home, mobile phones ran out of charge, and my husband was stuck in his office with absolutely no means of communication.

But now such disasters are becoming commonplace. In July this year, north India came to its knees due to unprecedented heavy rainfall that triggered floods in several states including Himachal Pradesh,



Uttarakhand, Punjab, Haryana and Delhi.

Floods in the Yamuna in Delhi usually affect the poor who live along the frothy and polluted river. But this July, residents of Delhi-NCR watched in horror as the Yamuna swelled and reached the Red Fort, reclaiming its old course which the city had long forgotten in its rush to grow concrete jungles on the floodplains.

Climate change is no more just an environmental issue; it is a global human rights issue.

When I started out as a journalist in January of 1999 with 'environment' as a beat, I was often a butt of jokes and ridicule (how can the birds and bees be a journalistic beat, I was asked).

But, more than two decades later, climate change has become the most sought after beat in the media. Media houses have two or three reporters dedicated to covering the environment with a separate desk that puts together these stories of science, politics and human survival.

This book, *Climate Connection Report 2023*, is an effort by the Gaon Connection's team to bring together its reportage on climate change this year in the form of a free-to-download document so that we can join the dots and see a pattern in the scattered stories of the changing environment.

It is also an attempt to bring rural India to the front and centre of climate change conversations, policies and response.

The book is divided into six sections, with one section dedicated solely to Solutions Stories because we believe that there is always a strong human will to respond to the challenge of the century.

I hope you find this book useful and informative, and it pushes you to take a small step, to contribute to solutions. Tell us about it and we will include your story in our next book.

NIDHI JAMWAL

Managing Editor
Gaon Connection

nidhi@gaonconnection.com

LEFT OUT IN THE COLD



2023. UNEXPECTED weather patterns right from the start of the new year left the farming communities from across the country flummoxed.

No rain, too much rain, bitter winters, early summers, severe heatwaves have played havoc with cultivation of produce and inflicted heavy losses on the people living in rural India, the food bowl of the country.

In early January this year, a severe cold wave swept through several districts in Rajasthan where frost led to the destruction of 40 per cent of the mustard crop. This meant excessive losses to the farmers, not to mention hike in prices for the consumers.

On the opposite side of the country from the deserts of Rajasthan to the cooler climes of North Bengal in West Bengal, strawberry farmers grappled with a different kind of problem.

In January this year, temperatures were not as cool as they should have been and the berries did not ripe as they should have. Fruiting happened late which in turn delayed the harvests.

Also, the erratic and unusual humidity and rising heat led to a scanty yield of strawberries. Farmers in North Bengal who had rejoiced in good profits in the past years were now thinking of abandoning strawberry cultivation altogether.

Meanwhile, up in the north, in the Union Territory of Jammu & Kashmir, there was surprise as it did not rain/snow as it normally does during Chillai Kalan, the bitterest period of the winters there.

But then, the surprise continued when it rained/snowed heavily in May. This upset the applecart not just for orchards where the yield of fruits was unexpectedly low, but also for the pastoralists who take their livestock to the upper reaches of the union territory in search of pasture. Weather experts feared this may affect the hydro-electricity generation which in turn will have a cascading effect on agriculture.

These are a handful of *Gaon Connection* reports from just the early months of the year, when weather conditions departed from the norm and created a very worried farming community.





The cold wave that gripped north and northwest India caused severe ground frost which destroyed crops of mustard, cumin, castor, and vegetables.

STORY 1

Cold Wave in Rajasthan: 40% Mustard Crop Lost to Ground Frost

Rajasthan alone contributes 43 per cent of the total mustard seeds produced in India. Severe cold wave in January destroyed the crop.

PARUL KULSHRESTA

JAIPUR, RAJASTHAN

FARMERS IN the districts of Sikar, Sri Ganganagar, Hanumangarh, Jaisalmer, and Barmer in Rajasthan are in despair. The cold wave that gripped north and northwest India in January caused severe ground frost which destroyed their crops

of mustard, cumin, castor, and vegetables.

Raysingh Jakhar Bansriwala, from a village in Hanumangarh district lamented that nearly 40 per cent of his mustard crop was destroyed due to the cold and frost.

“The cold wave and the rainfall were devastating. Added to that, because of the maintenance work at the Indira Gandhi Canal, we

got no water for irrigation,” Bansriwala said.

Mustard is one of the major crops of Rajasthan and the north western state alone contributes 43 per cent of the total mustard seeds produced in India. In Rajasthan, Alwar takes the lead as the major producing district followed by Shri Ganganagar, Bharatpur, Tonk, Sawai Madhopur, Baran, and Hanumangarh.

In Sri Ganganagar and Hanumangarh districts about 556 hectares of land are under mustard and the farmers are fearing 40 per cent of the mustard crop will be destroyed if the cold wave continues. According to them, the temperature has dipped down to minus 2.8 degree Celsius in some places, which is unusual for the desert state.

“The only way to beat the frost is through adequate irrigation. Watering the land in the mornings helps in mitigating the harm done to the land by frost,” said Prahlad Nojal, from Chapawali village in Sri Ganganagar district.

But as the power supply to the village is only at night, the farmers can irrigate their lands only at that time when the temperature is near zero.

“It would be much better if there was electricity available to us in the daytime and we could water our land in daylight. But who in the administration cares about farmers. While the government is busy delivering



The only way to beat the frost is through adequate irrigation. Watering the land in the mornings helps in mitigating the harm done to the land by frost.

speeches, we are bearing the loss,” Nojal complained.

According to the Jaipur office of India Meteorological Department (IMD), this is the first time since January 3, 2014, that the temperature has dipped to minus 2.7 degree Celsius. Before that, in 1974, the temperature dropped to minus 4.6 degree Celsius in Churu, which was the lowest temperature ever recorded in the state.

“We did issue a warning to the state government that this year the ground frost would occur from January 14 onwards. While ground frost in this season is not uncommon, the problem arises when it remains for more than two days. That is disastrous for the crops,” Radhey Shayam Sharma, director of the IMD’s Jaipur office, said. He said the situation would return to normal from January 18.

While farmers are reporting up to 40 per cent loss of their mustard crops, an official assessment is yet to be done.

Ascertaining the extent of the losses is not possible immediately, said B R Bakolia, assistant director of Rajasthan Agriculture Department, Hanumangarh district. "We will be able to say something about the losses only in the next few days. If there is rainfall in the next two days, things might improve. If not, there may be more damage," he warned.

"Our officials will go on field to prepare a report on the damage caused, especially to mustard," assured the assistant director.

According to farmers, if there is frost before the mustard seed ripens, it kills the plant. Therefore, it is important to keep the land irrigated to avoid damage.

"The temperatures falling to four degrees is normal, but it is getting colder by the year and this year was the worst so far," farmer Nojal said.

Meanwhile, P K Rai, director of Bharatpur-based National Research Centre on Rapeseed-Mustard (NRCRM), which is an ICAR (Indian Council of Agricultural Research) institute, warned that improper irrigation could damage the situation more. "Irrigating the land from time-to-time ensures there is no dryness, especially in places where the seeds are not yet ripened fully," Rai said.

In Barmer district, farmers are calculating the losses caused to their pomegranate, castor plant, cumin, and mustard plants.

"Nearly 30 per cent of pomegranate, 70 per cent of castor and 50 per cent of mustard is destroyed in the district," said Hastimal Rajpurohit, a farmer from Barmer. He worried about repaying bank loans, paying electricity bills and so on.

"Electricity is supplied only for two to three hours in a day and even that keeps tripping. But, no politician is worried about our well-being," he shrugged.



"The temperatures falling to four degrees is normal, but it is getting colder by the year and this year was the worst so far," said farmer Nojal.

It is expected that the ground frost will continue for another two to three days. This means more crops will be destroyed, greater losses for farmers and a definite price rise in the cost of the produce, worry the farmers.

Farmers in Sikar district have been protesting at Dodh village for the last four days about the irregular supply of electricity in villages which is making it difficult for them to keep their lands irrigated.

"Power supply is not stable. Sometimes power supply is there only for six minutes," said an irate Ram Ratan Bagadiya from Bhuwala village in Sikar district.

According to him, there is already a 60 per cent loss in vegetables and 40 per cent loss in mustard. "We demand the government compensate us for the loss and provide us proper electricity," Bagadiya said. □

This story was published on 18 January, 2023

STORY 2

A Sour Harvest for the Strawberry Farmers of Darjeeling



The strawberry farmers of Darjeeling, West Bengal are witnessing a poor harvest this year due to unfavourable climatic conditions for the fruit. PHOTOS: GURVINDER SINGH

More than a 100 farmers tend to strawberries over 151 bighas of land in North Bengal. But erratic weather and unfavourable temperatures this year, threatens to leave a large number of farmers with not-so-sweet harvest.

GURVINDER SINGH

DARJEELING, WEST BENGAL

PRABHA TIRKEY Chacko grows strawberries on her half bigha farmland (1 bigha = 0.13 hectare) at Hansqua Dulurchat village in Darjeeling district, West Bengal. In 2021, the 45-year-old farmer earned two lakh rupees from her bumper harvest of strawberries. But this year, she fears she may not even get half her usual berries output.

“I made handsome profits each year, but this year has turned out to be bad,” Prabha



Sowing of strawberry seeds is done by October end leading to the harvest by December end or beginning of January but the warm temperature has hampered the fruiting.

said. "Usually, the strawberries are ready to pick by the start of January but the production has been delayed this year," she said, pointing to the still-unripe strawberries that should have ripened by now.

Prabha said she had stopped going to her farm as it pained her to see the frugal and bad quality of the strawberries. "The yield stood at three tonnes last year but I will be surprised if I get even half of that this year. The New Year has been unkind to us," she added.

Over 100 farmers in North Bengal are staring at severe losses in strawberry farming due to the delay in fruiting. They say it could be the impact of the changing climate and unfavourable weather conditions. And the scientists agree.

"The change in climate is very apparent. Massive deforestation has led to the rise in temperature. The strawberry seeds require

a temperature of 16 to 24 degree Celsius. But it was hot and humid this year and not favourable for strawberry farming," said Amrendra Pandey, technical officer at the Department of Biotechnology, University of North Bengal.

Strawberry seeds that were sown by October end should be ready for harvest by December end or beginning of January, he added.

"The warm temperature affected the growth of the plants and the fruiting did not happen by November as it should have ideally. The plants were weak and the fruit scanty," Pandey said, adding that the exact loss in production will only be known by March when the season ends.

About 151 bighas of land are under strawberry farming in the state across the districts of Nadia, Darjeeling, Kalimpong, Balurghat and Cooch Behar. Last year, the



Prabha Tirkey Chacko, who cultivates strawberries in her half bigha farmland at Hansqua Dulurchat village in Darjeeling district of West Bengal fears that she may not even get half her usual berries output this year.

farms collectively yielded 50 metric tonnes of produce.

“I had sown strawberries in about a bigha of land and was expecting a yield of 2.5 tonnes,” Shantigopal Roy, a farmer from Patiram Jote village in Darjeeling district, said. But, like Prabha, he did not expect even half of that this year.

“I have been cultivating strawberries for the past four years and have made good money as the fruit is in huge demand by food processing industries. In anticipation of a good yield, I invested nearly two lakh rupees for ramping up infrastructure for my farm. But there are hardly any strawberries on my farm,” the 60-year-old complained. He said he was not sure if he would continue with strawberry cultivation.

University of North Bengal located in Siliguri is credited for commercially starting strawberry farming in the plains of North Bengal in 2012. Farmers were initially reluctant to take it up as there was a lack of cold storage facilities for the perishable fruit.

“Farmers also felt that the fruit was too costly and finding customers for it would be difficult. The price of the fruit hovered at around Rs 700–800 a kilogram even a decade ago,” recalled Ranadhir Chakraborty, head of the university’s Department of Biotechnology. It remains about the same now, he added.

“We broke that mindset and encouraged them to start cultivation in small patches of land in 2012. The result was overwhelming and farmers made a good profit,” Chakraborty said. Slowly, people from other districts also began strawberry farming, he added. So far, farmers have been earning well by cultivating strawberries. But this year has been bad.

“I have never seen such a sad state of affairs in the past four years that I have been cultivating strawberries. My strawberry plants are turning black or dying. If you know of any way I can save them, let me know,” Shantigopal Roy, the strawberry farmer from Patiram Jote village, said. □

This story was published on 30 January, 2023

STORY 3

Trouble in Paradise

Kashmir receives low snowfall in Chillai Kalan, but excess rainfall in April. Erratic weather patterns could impact agriculture, horticulture and the generation of hydro-electricity.



Between December 1, 2022 and January 31, 2023, there was 34 per cent below normal precipitation in Kashmir. PHOTOS: MUDASSIR KULOO

MUDASSIR KULOO

SRINAGAR, JAMMU & KASHMIR

IT IS EARLY May and the upper reaches of Jammu & Kashmir have received fresh snowfall. This has halted the bi-annual migration of the nomadic tribes of the Union Territory, who move to higher altitudes, along with their cattle, seeking pastures during the summer season.

Whereas the northern Union Territory has been receiving rounds of snowfall in late March and April this year, it received little precipitation during the peak winter

season, locally known as Chillai Kalan. This harsh winter period lasts between December 21 to January 31, and usually should see rainfall.

According to the data of the Meteorological Department J&K, there was 34 per cent below normal precipitation (snowfall and rainfall combined) during this recent winter in Kashmir. The valley received 188.9 millimeters (mm) of precipitation against a normal of 248.9 mm between December 1, 2022 to January 31, 2023.

Similarly, in February and March this year,



In April 2023, Kashmir received 113.5 mm of precipitation against a normal of 99.6 mm, which is an increase of 14 per cent.

the valley received 40.7 mm and 78.9 mm of precipitation against a normal of 130.4 mm and 152.9 mm, respectively. This is a decline of 69 per cent and 48 per cent in precipitation during these two months, respectively.

In sharp contrast, in April 2023, Kashmir received 113.5 mm of precipitation against a normal of 99.6 mm, which is an increase of 14 per cent.

Sonam Lotus, director Meteorological Department J&K, said that there was a deficit precipitation during winter this year, but April has seen excess rainfall coupled with snow in many parts of the valley.

“Kashmir has had cloudy weather, rainfall and dip in temperature for the last two weeks resulting in recent snowfall in the upper reaches,” Lotus said.

According to weather experts, over the years, Kashmir valley has had erratic weather conditions and less precipitation during

winters, which could impact agriculture, horticulture and generation of hydro-electricity.

This winter, the Valley received very less snowfall during Chillai Kalan. After mid February, there was a sudden rise in temperature and very little precipitation. The temperature in early March reached above 25 degree Celsius.

In April, there has been above normal precipitation and the maximum temperature again dipped to 15 degrees C. There is a trend of decline in winter rainfall in the Valley.

The IMD data shows that in the previous winter, between December 2021 and January 2022, the Kashmir Valley received 262.5 mm precipitation against a normal precipitation of 288.4 mm, which is nine per cent deficit.

The year before that, between December 2020 and January 2021, the Kashmir region received 180.9 mm precipitation with a deficit of 37 per cent (compared to normal).

Irfan Rashid, who teaches at the Department of Geoinformatics, University of Kashmir, said that Kashmir has been receiving less snowfall during winter and witnessing an early rise in temperature in March due to global warming, which could have an impact on various sectors.

“Less snowfall and early rise in temperature leads to faster melting of glaciers. Besides,

it is affecting the generation of hydro power and the horticulture sector. There will be less water in streams in summer when there is early melting of glaciers resulting in agriculture and horticulture sectors being badly affected," Rashid said.

Farmers complain that above normal temperatures in March this year led to early sprouting of apples and other fruits. "Then in the second week of April, there was a sudden dip in temperature. This untimely weather condition may hit the production of various crops this year," Mohammad Amin, an apple grower from North Kashmir's Sopore, said.

Horticulture is the mainstay of Kashmir's economy with 700,000 families directly or indirectly associated with the sector. Horticulture contributes over eight percent to the Gross Domestic Product (GDP) of Jammu and Kashmir. More than 338,000 hectares of land is under the fruit cultivation in the valley, of which 162,000 hectares is dedicated for apple cultivation.

An official of National Hydroelectric Power Corporation said they will come to know the impact of dry weather in winters on generation of hydroelectricity in the coming months.

"The snow has started melting due to the difference in temperature. So there may not be proper generation of hydroelectricity when the flow of water will be less in summers," he said on the condition of anonymity.

J&K has hydropower generation potential

of 20,000 megawatt (MW) of which over 3,000 MW have been harnessed so far.

According to Lotus, the weather patterns change every year. "In one year, there is a deficit of rainfall and in another year, there is excess rainfall. These erratic weather conditions prevail due to climate change across the world," he said.

Meanwhile, Faizan Arif, Kashmir-based independent weather forecaster, said that

data suggests there has not been a significant decline in precipitation. "This winter there was less precipitation and next year we may see normal or excess as El Niño is expected to return," he said.

El Niño and La Niña are the warm and cool phases of a recurring climate pattern across the tropical Pacific — the El Niño–Southern Oscillation, or "ENSO" for short.

The pattern shifts back and forth irregularly every two to seven years, bringing shifts in ocean surface temperature and disrupting the wind and rainfall patterns across the tropics. These changes have a cascade of global side effects.

"The National Oceanic and Atmospheric Administration describes ENSO as one of the most important climate phenomena on earth due to its ability to change the global atmospheric circulation, which in turn, influences temperature and precipitation across the world. J&K receives below normal precipitation in the winter season during a La Niña year," he said. □



Less snowfall and early rise in temperature leads to faster melting of glaciers.

This story was published on 4 May, 2023

TOO HOT TO HANDLE



THE UNSAVOURY surprises of 2023 continued into the months that are supposed to be all about hope and new beginnings. It is the time when Holi, the festival of colours in North India, bids goodbye to biting cold and prepares to welcome blossoming flowers and gentler weather. Across the country, there is a sense of bustling optimism.

But not this year as big swathes of the country were cheated out of the grace period between frosty winters and the scalding summers. Spring went missing.

There were furious hailstorms and heavy rainfall events. Meanwhile, temperature in many parts of the country soared and early heatwaves hit the ripening rabi (winter) crops, which are harvested around Baisakhi in the first half of April.

A sudden rise in temperature meant spices lost their fragrance as the heat took the bite out of them. Farmers bemoaned damaged cumin and mustard crops which they had banked on for profits. Productivity of wheat was affected.

Meanwhile, people paid with their lives

and wages. Escalating temperatures led to heat strokes, increase in medical bills and loss of working days. This meant no food on the plate for thousands of families who depend on daily wage labour for survival.

Bihar and Uttar Pradesh saw a spike in heat strokes and deaths attributed to the heatwaves though not officially confirmed. Power outages did not help.

Hospitalisations increased and this led to a strain on the already stretched-thin health facilities in rural areas. People who could not afford medical help continued to toil till they dropped from exhaustion and dehydration. Governments scrambled to get protocols in place to combat the severe heat waves that were relentless.

Meanwhile, impervious to advisories on the heatwaves, thousands of the rural poor carried on regardless. Body aches, headaches, nausea, fatigue are their constant companions. But they cannot stop. If they do, there will be no dinner that night at home.





Environment is mainstream. Everything else, including our survival, hinges on it.

STORY 4

As Spring Goes Missing

Like my childhood, basant seems to belong to a bygone era. Now, winters seem to jump right into summers. From rajai and no-fan nights, we go straight into air conditioned rooms.

NIDHI JAMWAL

REMEMBER THE basant of yore? How the winter slowly gave way to spring when tiny green leaves took their own sweet time to appear on trees! Buds were not in a hurry to bloom. The flowers in the pots at home danced in the cool breeze of lazy spring afternoons, and wheat crops patiently waited for the temperature to rise so that they could turn golden yellow and be ready for harvest by April in time for Baisakhi festival.

Those days, it was too warm for blankets but one still needed a sheet at night. As kids, we

wanted to shed those thick hand-knitted sweaters, but our mothers were watchful and did not allow us to take them off. If we switched on the fan when we came back from playing outdoors with our cheeks flushed, we invited wrath: "You will fall sick; it is spring season, not summer yet."

That kind of spring has now gone missing. Like our childhood, it seems to belong to a bygone era. Now in just a couple of days the mercury jumps many degrees and the harsh Indian summer is upon us. From rajai and no-fan nights, we go straight into air conditioned rooms.

Flowers bloom for a couple of days and wilt in the scorching heat. And, more worryingly, the productivity of the rabi crops is getting affected by the sudden rise in temperature.

Last month, in February 2023, India recorded its hottest February since record-keeping started in 1901! Early heatwaves are having a catastrophic impact on foodgrain crops and our food security.

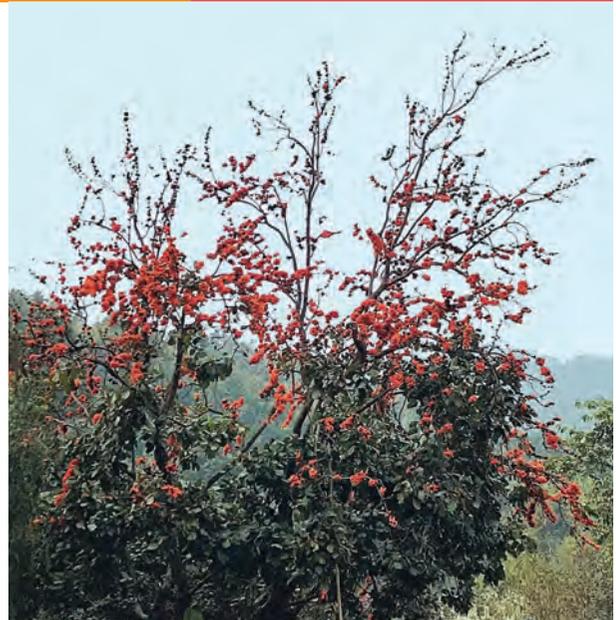
Gaon Connection has been consistently documenting these stories from the food bowl of the country. Our weather patterns have gone awry – scanty rainfall in the monsoon season followed by floods post-monsoon; no winter rain but hail when the crops are ready for harvest...

Two decades ago, I started my journey as a journalist – an environment reporter, to be precise, but back then there was no such term to describe what I did.

Environment was considered a fairly unimportant and boring beat, and hence reserved for reporters who did not do ‘breaking news’ kind of stories. Reports on the environment rarely made it to TV newsrooms, and were buried deep inside newspaper pages, where they rarely caught the readers’ attention.

I was fortunate I did not have to compete with other ‘important’ beats, as I worked with an environment and science fortnightly where environment was the overarching theme and all the other beats/stories – politics, women, ministries, foreign policy, PMO, food grains, etc – were looked at through the prism of environment.

Long before terms like ‘environmental politics’ or ‘global environmental politics’ became popular and fashionable, we



Countries across the globe are registering concern about the rising heat and its impact on all life forms on the planet.

reported on them. Pesticides in the food chain, extinction of species, increasing incidences of droughts and floods, environmental migrants, global warming and climate change, crop failure, Global North vs Global South, carbon emissions... These were our everyday stories.

Back then (and even now), it was considered mandatory for an environment journalist to have read Rachel Carson’s landmark book, *Silent Spring* (published in 1962).

Carson, a renowned nature author and a former marine biologist with the U.S. Fish and Wildlife Service, meticulously described in her book how DDT (Dichlorodiphenyltrichloroethane, a synthetic insecticide) entered the food chain and accumulated in the fatty tissues of animals, including human beings, and caused cancer and genetic damage.

She carefully documented how a single application on a crop continued to kill insects for weeks and months and remained toxic in the environment even

after it was diluted by rainwater.

In the book's most disturbing chapter, 'A Fable for Tomorrow', she described a nameless American town where all life had been "silenced" by the damaging effects of DDT.

What she wrote was initially ridiculed. But, the book did pave the way for governments to regulate and ban several pesticides. Lawsuits were filed, and environmental movements gained force worldwide.

We are now experiencing some of what Carson wrote. The spring is not just silent, it is also missing. We barely experience it anymore in the country. And worse is expected to follow, as climate scientists warn. Countries across the globe are registering concern about the rising heat and its impact on all life forms on the planet.

Our survival is threatened. CoP (Conference of the Parties) meetings are regularly organised under the UNFCCC (United Nations Framework Convention of Climate Change) with the global goal of limiting warming to 1.5 degrees Celsius above pre-industrialised levels.

A silver lining is that the environment is no more an unimportant and boring beat. Environment is mainstream. Everything else, including our survival, hinges on it.

Melting of glaciers and transboundary rivers have political implications. Rising sea levels, disappearing lands and increasing disasters are already turning people into environmental migrants. Erratic weather is a direct threat to our granaries.

Last month, in February 2023, I travelled to Nepal to attend a write-shop on energy transition in the Ganges River Basin, which is shared between India, Nepal and Bangladesh (and a small part in China).

While travelling from Kathmandu to Nuwakot, I couldn't stop appreciating the Semal (silk cotton) trees that dotted the countryside. The crystal clear waters of Trishuli river, a tributary of Gandak river that flows into the Ganga, added to the beauty of the journey.

Semal trees have a special place in my heart as we had one near our house in the hill town where I grew up. We children called it 'raja-rani ka ped' (a king-queen tree) and several spring afternoons were spent gathering its scarlet flowers.



Flowers bloom for a couple of days and wilt in the scorching heat.

During spring, the brightness of the semal's red flower is enough to set one's heart on fire as its tree stands naked, bereft of leaves, but blazing with hundreds of flowers that provide nectar to birds and also inspire poets and lovers to write verses celebrating love.

Semal signals spring, but it has been flowering early now and its magic disappears in a short period of time. At Nuwakot, while visiting a hydro project site, I spotted a carpet of semal flowers. Not very far was a carpet of palash with its flame-like flowers.

Holding the flowers in my palms, I sent out a prayer to Spring to keep its date with semal and palash and the hundreds of other flowering trees that wait the whole year to burst into life and add beauty to our mundane lives. ■

This story was published on 9 March, 2023.

STORY 5

Wilting Wheat Crops

High February temperatures haunt wheat farmers for the second consecutive year as early heatwaves damage the crops and lead to lower production.



Scientists at the Krishi Vigyan Kendras in Uttar Pradesh are advising farmers to re-adjust their agrarian calendars to cope up with an adversely changing climate.

GAON CONNECTION

VIKAS CHOUDHARY has grown wheat for 26 years straight on his 28 hectares (70 acres) of agricultural land in Taravari village in Karnal, Haryana. He said he had never seen such a hot February in all these years.

“This heat won’t allow the wheat grain to ripen fully,” said the farmer. “Last year the temperature soared in March, which reduced the production from 28 quintals

per acre to 23 quintals per acre [1 quintal= 100 Kilogrammes]. I had sown wheat on 21 hectares [52 acres] last year,” the farmer added. The difference of five quintals per acre cost him a loss of nearly Rs 500,000.

“We are increasing the frequency of irrigation and spreading parali [crop stubble] on the soil surface to maintain the moisture content,” Choudhary explained.

About 700 kilometres away from Taravari village, Mohammad Riyaz, a 60-year-old

farmer in Chiriya village in Barabanki, Uttar Pradesh, has similar woes.

“Usually, the wheat crop requires three cycles of irrigation. But such is the heat that I am already watering my wheat crop for the fourth time and the crop will be ready for harvest by April. That means I’ll have to water the crop for at least twice more. This has doubled my cost of irrigation, as I have to procure more diesel for the water pumps,” said Riyaz. The expenses were about Rs 4,200 but now I will have to spend almost Rs 9,000, he added.

In a press statement issued on February 23 this year, the India Meteorological Department (IMD) warned that the maximum temperatures are ‘very likely to be above normal by 3 –5°C over most parts of North-west, West, Central and East India during the next 5 days, and these above normal temperatures will adversely affect the wheat crop.

“This higher day temperature might lead to an adverse effect on wheat that is approaching reproductive growth period, sensitive to temperature. High temperature during flowering and maturing period leads to loss in yield. There could be a similar impact on other crops and horticulture,” IMD said.

The maximum temperature of 33.6 degrees

Celsius recorded in New Delhi on February 20, 2023 is the highest for the month of February since 2006, the weather department noted. In 2006, on February 26, the temperature recorded was 34.1 degrees Celsius.

According to Mahesh Palawat, vice president of meteorology and climate change at private weather forecast website Skymet Weather, “The anti-cyclone which is hovering around the north-eastern Arabian Sea is sending hot winds from

Sindh and Balochistan regions of Pakistan towards India’s northern plains. As a result of the flow of these winds, the cooler winds from the Himalayas are unable to provide any respite which has led to such hot weather in states like Haryana, Delhi, and Uttar Pradesh.”

He added that the agriculture sector would see serious ramifications. “Both the farmers and the government need to think of resilient measures to combat climate change. This year too, farmers who had sown wheat a bit earlier are in a better position than the ones who sowed it

late. Farmers need to readjust their agricultural calendars and timing of cultivation. The government should come up with heat resistant crops,” Palawat added.

Anuj Kumar, Principal Scientist at the Karnal-based Indian Institute of Wheat and Barley

“Usually, the wheat crop requires three cycles of irrigation. But such is the heat that I am already watering my wheat crop for the fourth time and the crop will be ready for harvest by April. That means I’ll have to water the crop for at least twice more. This has doubled my cost of irrigation, as I have to procure more diesel for the water pumps

MOHAMMAD RIYAZ,
FARMER, BARABANKI, UTTAR PRADESH



Indian Council of Agricultural Research (ICAR) has come up with a new wheat variety – HD-3385 – which can be more heat-tolerant. PHOTO: SUMIT YADAV

Research (IIWBR) said that it was still too early to predict the impact of the sudden rise in temperature on the wheat crop.

“However, if the heat spell extends longer, the yield will be impacted for sure. The wheat varieties we are using at present are heat tolerant but only to an extent,” the scientist said.

Indian Council of Agricultural Research (ICAR) has come up with a new wheat variety – HD-3385 – which Kumar said can be more heat-tolerant but he underlined that no variety can bear prolonged heat at the crucial growth stage.

Meanwhile, scientists at the Krishi Vigyan Kendras in Uttar Pradesh are advising farmers to readjust their agrarian calendars to cope up with an adversely changing climate.

Sandeep Arora, Principal Scientist at the Krishi Vigyan Kendra in Hardoi district, Uttar Pradesh said that the rising temperatures are adversely affecting the crops not only by causing heat-related damage but also by killing the crop-friendly microbes in the soil which are vital for the optimum growth of the crops.

“The weather has been irregular for the last five years or so. In such conditions, farmers need to be prudent about the reality of the weather cycle which is shifting now,” Arora pointed out. “The crop cycle which is being followed as per the traditional understanding of the farmers needs to be changed as per the present circumstances. Farmers need to sow their crop early in the year to evade the hot weather conditions in February-March,” he added.

Dheeraj Tiwari, the principal scientist at the

Krishi Vigyan Kendra in Unnao district, Uttar Pradesh said in its present state, the wheat crop requires an optimum temperature of 20 degrees to 22 degrees celsius.

“However, the temperature is constantly hovering around 30 degrees these days. To make matters worse, it is windy as well. Such high temperatures will dry the wheat grain after fruition which will have a serious impact on the yield. The farmers need to keep their fields moist by watering them whenever needed and it should be ensured that they don’t irrigate when hot winds are blowing,” he said and advised the farmers to sow their wheat crop earlier in the year.

By November, the sowing should be complete as it takes almost three months for the wheat to ripen for harvest. This way, farmers can evade the hot weather conditions in February–March, the principal scientist said.

But there are difficulties in early sowing. Randheer Yadav, a 42-year-old farmer from Unnao’s Bhagedi Kheda village complained that sowing wheat in November was impossible for him as the paddy couldn’t be harvested till December.

“The monsoon rains did not arrive till September. We somehow kept the paddy crop alive by incessant irrigation. However, there is no substitute for the rain

when it comes to paddy. The fields were submerged till October and the paddy couldn’t be harvested till December. How could I have planted wheat in December? I am worried that I will have to choose between paddy and rice as both the crops are hard to sustain in this rapidly changing weather,” Yadav said.

Meanwhile, the Union government, on February 20, 2023 formed a committee

FREEPIK



By November, the sowing should be complete as it takes almost three months for the wheat to ripen for harvest. This way, farmers can evade the hot weather conditions in February–March, the principal scientist said.

to assess the damage caused by the ongoing hot weather conditions. Following the announcement of the formation of the committee, Union Agriculture Secretary Manoj Ahuja told the press that the committee will come up with advisories to help farmers by using micro-irrigation techniques.

Gyanendra Singh, Director of Karnal-based IIWBR, one of the committee members, said, “We are preparing recommendations along with an advisory for the farmers to find solutions which can

tackle the impact of heat on the wheat crop. We will be coming up with solutions by early next week”.

Last year, similar weather conditions had compromised India’s wheat production by 2.75 million tonnes or 2.5 per cent of the total output. □

This story was published on 23 February, 2023.

STORY 6

Mustard Farmers Feel the Sting

Unseasonal rains during the flowering of the mustard plants followed by early heatwaves affect mustard cultivation and threaten the crop yield.



Unseasonal rainfall in February during mustard flowering followed by early heatwaves affected the mustard crop. PHOTOS: MANISH DUBEY

MANISH DUBEY

KANPUR, UTTAR PRADESH

IN NAKTU village in Kanpur district, a pall of gloom surrounds it. The mustard crops have had a poor yield. Farmers in the area are preparing to harvest the mustard, and some have already begun the process. But they know that the arrival of early heatwaves in the country could spell bad news for them.

“Look how insubstantial the plant looks. The seeds are not too healthy either. This will have an impact on the quality of the mustard oil too,” said Ram Asre, a 71-year-old farmer from the village.

Unseasonal rainfall in February during mustard flowering followed by early heatwaves – was perhaps the reason this was happening, he said.

Prakash from Dhar Mangalpur village in Kanpur district had planted mustard in two bighas of land (1 bigha = 0.25 hectare). “The quality of the mustard plant is poor as you can see,” he said, pointing towards his wilting crop. Summers are still a while away in India, yet this year it has gotten unseasonably hot as early as February, when crops are still maturing. This is likely to impact both production and productivity.



High temperature during flowering and maturing period leads to loss in crop yield.

The India Meteorological Department (IMD) has warned against the adverse impact of sudden rise in temperature on the crops. A press statement issued by the IMD on February 26, 2023 stated that maximum temperatures are above normal by 3–5°C over many parts of Northwest India and over some parts of Central India... Maximum temperatures very likely continue to remain above normal by 3–5°C over most parts of Northwest during the next 2 days.

The IMD warned that this higher day temperature might lead to adverse effects on the wheat crop as it is approaching reproductive growth period, which is sensitive to temperature. High temperature during flowering and maturing period leads to loss in yield. There could be a similar impact on other crops and horticulture.

Last year too, heatwaves arrived early, in March, and had impacted a number of crops including wheat, mango, mustard and litchi.

“When the mustard flowers bloomed in January, there were unseasonal rains.

The rain was followed by extreme heat in February, also unusual. The crop did not get a cycle of normal weather patterns and this has led to a weak mustard crop,” 59-year-old Kamlesh Kushwaha, from Jargaon village in Kanpur Dehat, said.

“I will be happy if I can recover what I spent in sowing the crop. I have no hopes for any profit.” According to him, last year he got about four quintals out of one bigha. “This year I don’t expect it to be more than 2.45 quintals,” he said.

According to Ram Asre, his mustard harvest this year is expected to be less than three quintals as against the usual four quintals he gets from his 1.5 bigha land. The extent of his loss will be known only once he harvests his entire crop. However he said, “The yield will not recover the cost. I may have to borrow money to feed my family.”

Ashok Kumar, president, Krishi Vigyan Kendra, Kanpur confirmed that unseasonal rains during the flowering had affected the mustard yield this year. “It is safe to assume that this time the loss to the farmers will face about 10 to 15 per cent losses this year.

The exact figures will be known when the committee under the district magistrate assesses the loss and announces it," he said.

Only once this is done will the matter of compensation to the farmers come up, he added.

According to Ashok Kumar, the mustard crop is sown between October 1 and October 20, and it is ready to flower in about 60 to 70 days, between December and the first week of January. The crop gets ready to be harvested by the end of February and beginning of March.

"This time the rains took their toll on the flowers in January and the temperatures immediately after the rains rose to over 35 degrees Celsius while ideally it should be between 25 to 30 degrees," Ashik Kumar pointed out. That scorched the mustard and that has had an impact on the quantity and the quality of the mustard seeds, which are much smaller in size," he added.

The vagaries of weather have affected the farm labourers too. "We work day and night and wait for the harvest. But you can see for yourself how hollow and insubstantial the harvest has been this year," farm labourer Komal from Jargaon said. "We will not get any share in the yield this year. The owners will keep it all and we will have to make do with our wages alone," she said.

The impact of the early heatwaves on mustard crop might lead to a rise in mustard

oil prices. "There will be an impact on the selling and buying of mustard," Archana Bhatnagar, senior marketing officer of Kanpur Mandi Samiti, said. "We have to wait and see what happens. Things will become clearer depending on the response of the government to the crisis," she said.

Mustard is cultivated extensively in north India. Rajasthan leads in mustard cultivation with 46.06 per cent, followed by Haryana with 12.60 per cent, Madhya Pradesh with 11.38 per cent, Uttar Pradesh with 10.49 per cent and West Bengal with 7.81 per cent.

Mustard is cultivated extensively in north India. Rajasthan leads in mustard cultivation with 46.06%, followed by Haryana with 12.60%, Madhya Pradesh with 11.38%, Uttar Pradesh with 10.49% and West Bengal with 7.81%.

In early January this year, a severe cold wave and ground frost had led to extensive damage to the mustard crop in Rajasthan. Farmers complained of 40 per cent loss of their mustard crop. And now, an early heatwave has affected the mustard crop in Uttar Pradesh.

Added to the problem of low yield due to early heatwaves, the farmers are also dealing with the menace of stray cattle. "We have to stay awake all night between seven in the evening and six in the morning, keeping an eye on our crops. As the crop gets ready for harvest the danger of stray animals grazing on them increases," said Ramchandra of Jargaon village.

"It has been an unmitigated disaster for me. I borrowed Rs 10,000 on five per cent monthly interest to sow mustard on two and a half bighas of land," he said. ■

This story was published on 28 February, 2023.

STORY 7

A Catastrophe for the Cumin Crop in Rajasthan

A cold wave, followed by early heatwaves and then hailstorms have left cumin farmers in Rajasthan in distress.



India is estimated to produce more than 70 per cent of the world's cumin. Within the country, Gujarat and Rajasthan are the two top cumin seed-producing states with 90 per cent national production share. PHOTOS: PARUL KULSHRESHTA

PARUL KULSHRESHTA

JAIPUR, RAJASTHAN

FOR MANY cumin farmers of Rajasthan, the scale of devastation of their cumin crop this season has been devastating. Nearly 50 per cent of the cumin crop has been laid to waste.

Cold waves, heatwaves, and rainstorms and hail in the space of a few weeks have played havoc in Rajasthan that is the

second highest cumin producing state in the country after Gujarat.

The crop that is sown in October takes about 150 days to be ready for harvest, in March. However, cumin cultivation, that is particularly suited to the dry environs of Rajasthan, faced an onslaught of weather episodes.

In January, there was an extreme cold wave. The next month, in February, there

were heatwaves and the final nail in the coffin was the rain and hailstorm in March that wiped off a large chunk of the crop.

“Cumin is sowed at the end of October or start of November. But, from the end of December right up to about January 20, there was a severe cold wave. Then in February there was an unprecedented rise in temperatures and the following month in March we had rainfall and hail-storms,” said cumin farmer Hastimal Rajpurohit, from Barmer.

“Rain, hailstorms, and the dips and rise in temperatures have not allowed the cumin to grow to its full potential. The seed was not allowed to develop properly and hence the quality of cumin is poor. We will not get a good rate for it this time,” Ratan Singh, another farmer from Kaniwara village in Jalore, said.

Cumin is produced prominently in Barmer, Jaisalmer, Pali and Jalore districts. It is a drought tolerant crop that requires less water. It has been a very profitable crop for the Rajasthan farmers.

According to Prahlad Siyol, spokesperson of Bhartiya Kisan Sangh, Jodhpur, there are about 400,000 jeera (cumin) farmers in the state.

The contribution of cumin farmers of Rajasthan is immense. India is estimated to produce more than 70 per cent of the world’s cumin. Within the country, Gujarat

and Rajasthan are the two top cumin seed-producing states with 90 per cent national production share.

In 2021-22, approximately 1,036,713 hectares of land in the country was under cumin cultivation, which yielded 725,651 tonnes cumin seed. The same year, Rajasthan produced 303,504 tonnes of cumin.

But things do not look good this year. It was the first time in his life that 37-year-old Bhagirath Singh from Askandra village in Jaisalmer had seen something like this.

“I have never seen anything like this before.

Many farmers grow cumin in my village as it is profitable, but there are going to be big losses this time and survival is going to be difficult,” Bhagirath Singh worried. “The production is low and we will not get good rates in the market. How are we to pay our electricity bills or bank loans,” he asked.

“Even last year we harvested two to three quintals of jeera per

bigha of land, but this year if we are lucky, we may be able to salvage about a little more than a quintal a bigha,” Mahendra Kumar from Bhala village in Mohangarh tehsil, Jaisalmer, said.

“We have had a cold wave, a heat wave and hailstones and rainfall, close on each other’s heels and that has played havoc with the crop,” he added. A good fifty per cent of the crop is destroyed in his village,

The contribution of cumin farmers of Rajasthan is immense. India is estimated to produce more than 70% of the world’s cumin. Within the country, Gujarat and Rajasthan are the two top cumin seed-producing states with 90% national production share.



Farmers said their only hope rested with the government.

the 40-year-old farmer said.

Kishan Jat, a farmer from Gudamalani village in Barmer, said nearly 60 per cent of the cumin crops were destroyed in and around his village. "Those who had harvested it early managed to save something, but others are looking at a major loss," the 25-year-old said.

Apart from cumin, isabgol and castor seeds have also taken a hit in Rajasthan. "In our area more than 70 per cent of the isabgol crop has been destroyed. We met the collector asking for some resolution to our problems. He has assured us but we need help as soon as possible. We pay around Rs 600 as crop insurance premium but don't get adequate returns," said farmer Ratan Singh from Jalore.

"I have not seen such destruction happening in the area. In the blink of an eye our crops were destroyed. We had sown cumin, isabgol, barley and wheat. Crops were ready to be harvested but as it was Holi and labourers were not available, we thought

we would wait to harvest the crop. Now, we may have to use the labourers just to clean up our field," Prahlad Siyol, spokesperson of Bhartiya Kisan Sangh, Jodhpur, said.

On March 9, 2023 in Gudamalani village in Barmer, hundreds of farmers staged a protest demanding financial assistance from the government. "We have sent letters to the area MLA and MP to take up our issue with the state and central governments. Thousands of farmers are affected by the untimely weather episodes," said Hastimal Rajpurohit, a farmer from Barmer.

"We are currently trying to get an estimate of the losses caused to farmers. There are areas where cumin crop is affected but in other areas losses are not so much," Padam Singh, joint director at the Rajasthan State Agriculture Department, Barmer, said. "We are compiling a report and it will be published in a few days. Measures will be taken on the basis of that report," he added. ■

This story was published on 18 March, 2023.

STORY 8

Rural Workforce Faces the Brunt of the Heatwaves

The heatwave conditions are wreaking havoc in rural India. Villagers face loss of wages, faltering health and a dip in productivity. A ground report from Bundelkhand.



The heat wave conditions are wreaking havoc in rural India, giving hard time to daily-wage workers. PHOTOS: AISHWARYA TRIPATHI

AISHWARYA TRIPATHI AND PRATYAKSH SRIVASTAVA

LAMORA (MAHOBA) AND LUCKNOW, UTTAR PRADESH

GANGA CHARAN Raikwar drank water from a pipe on his field and looked for some shade under a tree, to rest a bit. The 17-year-old share cropper from Lamora village, wiped the sweat off his face with a gamcha and dragged himself back to tend to the two bigas (half a hectare) of land.

He rejoined his 16-year-old brother Mohit Raikwar and their 40-year-old mother Harikunwar Raikwar who were busy sowing the mentha (peppermint) crop.

Being sharecroppers, the Raikwars knew the quality and the quantity of the mentha would decide how much money they would make, as the harvest would be equally divided between the landlord and Raikwars. Any delay or carelessness on their part could lead to losses that they could



The heat makes 27-year-old Ram Dayal Kushwaha, a daily-wage laborer, feel sick, but he can't do much.

ill afford. There was no question of sitting in the shade because of the heat.

"The hot water in the pipe makes me feel sick. I have to stand in the dhoop the whole day with just an hour's break for lunch," Ganga Charan, whose village is located in Mahoba district, in Bundelkhand region of Uttar Pradesh, complained.

Bundelkhand is one of the most parched regions in the country with temperatures soaring upwards of 45 degrees C in peak summers and causing frequent droughts. And the people in the area are reeling in the unremitting heat. But, they have no choice but to carry on working. No work means no food on the table.

It is only April and already, according to the India Meteorological Department (IMD), East Uttar Pradesh (where Mahoba is located) is experiencing heat wave conditions. IMD has been issuing heatwave alerts

and warning people to stay indoors.

But all these warnings and statistics mean nothing to Bhuri Devi who sits in front of a wok of bubbling oil and ladles out samosas in Supa village, in Mahoba. She keeps a two-litre plastic bottle of water by her side to quench her thirst.

Bundelkhand is one of the most parched regions in the country with temperatures soaring upwards of 45°C in peak summers and causing frequent droughts.

Bhuri Devi fries samosas for two hours every day in order to make ends meet. When the mercury is hovering around 40 degree Celsius, she and her sister-in-law Bineeta go to collect firewood for the chulha (mud oven) over which the samosas have to be fried, she said. "We walk

four kilometres in this heat to find and chop the firewood. If we don't do this, how will the chulha burn," Bineeta asked.

A 2019 report by the International Labour Organization (ILO) titled *Working on a Warmer Planet - The Impact of Heat Stress on Labour Productivity and Decent Work*, warns that India is expected to lose 5.8 per



The heat wave crisis is not merely a meteorological phenomenon but also a socio-economic challenge.

cent of working hours in 2030 due to heat stress. Because of its large population, in absolute terms, the country is expected to lose the equivalent of 34 million full-time jobs in 2030 due to heat stress.

This is not all. Another 2022 report by the World Bank warns that by 2030, over 160-200 million people across India could be exposed to lethal heat waves annually.

Studies point out that India has witnessed a 55 per cent rise in deaths due to extreme heat between 2000-2004 and 2017-2021. Exposure to heat also caused a loss of 167.2 billion potential labour hours among Indians in 2021, resulting in loss of incomes equivalent to about 5.4 per cent of the country's GDP.

“Earlier, the peak agricultural activity which usually involves sowing and harvesting of

the crops was designated for that time of the year when the weather is not oppressive but now early heat waves have severely disturbed the schedule of agriculture. This trend is here to stay and states will have to formulate policies to provide respite to the farmers,” Mahesh Palawat, vice president of climate change and meteorology at Skymet Weather, a private weather forecasting agency, said.

“Regions that have been known for bountiful harvest like the northwest parts of the country such as Punjab and Haryana will record a dip in production while states like Madhya Pradesh and Rajasthan will register a spike in production,” Palawat added.

Chandra Bhushan, the chief executive officer of Delhi-based International Forum for Environment, Sustainability & Tech-

nology (iFOREST), said that rural residents are bearing the brunt of the heatwaves in the last few years.

“The Indian farming community’s practice of following traditional wisdom in agriculture that has held it in good stead all these years, no longer works. With the changing climate, the schedule, the techniques, the modus operandi, everything will have to be realigned to suit the changing climate,” Bhushan observed.

At a makeshift hut, 62-year-old Somvati Sulleri had hung up some of her colourful sarees in the hope they would cool down the interiors of the hut, where she rests while watching over her fields.

“I feel nauseous and dizzy. Yesterday, I reached home, poured buckets of water over my head to cool myself down and applied thanda tel [cool oil] on my head. Eventually, I had to take some medicine to feel better,” Somvati said.

“The heat is unbearable. This time I have not been able to work for more than 20 days in the month. There are times when I feel sick but still show up because my house runs on my daily wage,” said Ram Dayal Kushwaha, a mason from Lamora village. Kushwaha hopes to earn Rs 600 for having spent all day balanced precariously on a ladder, building a wall, in the unforgiving heat.

“The heat wave crisis is not merely a meteorological phenomenon but also a socio-economic challenge which needs

the State to intervene and subsidise cooling solutions which are now becoming an existential question for the rural population which includes more than 60 per cent of the Indian population,” said Abinash Mohanty.

Mohanty is an expert reviewer of the Inter-governmental Panel on Climate Change’s sixth assessment report, and the sector head of Climate Change and Sustainability at Delhi-based IPE-Global, an international development organisation.

“The first measure should involve the mapping of the evolving heat wave landscape in the country which should be

followed by planning on a micro level considering the sectors which witness intense heat waves,” said Mohanty.

“Another measure will have to be equitable distribution of cooling solutions in the form of low cost appliances. The state support will

have to be crucial,” he added.

The heat wave situation in India is comparable to inhospitable conditions in the developed parts of the world such as western Europe and the Scandinavian countries where the state supports central heating in the households without which it would become impossible to inhabit those countries in the harsh winters, Mohanty said, adding, “While the socio-economic conditions in these countries cannot be compared to India’s, state support is much needed here.” □

Studies point out that India has witnessed a 55 per cent rise in deaths due to extreme heat between 2000-2004 and 2017-2021.

This story was published on 21 April, 2023.

STORY 9

The Centre Demands Daily Surveillance on Heat-related Illnesses

As temperatures hit new records, the central government issues advisories to the states and the Union Territories to check the adverse impact of rising heat on health.



It is important to mention that the records for the highest temperatures for this time of the year are being broken even as the peak of the summer is yet to arrive.

GAON CONNECTION

IN THE wake of unusually high temperatures in the country, the Union Ministry of Health and Family Welfare yesterday, on February 28, 2023 wrote to the states and the Union Territories to conduct daily surveillance on the cases of heat related illnesses.

“Temperatures have already touched unusual highs at some places in the country and substantial deviations from expected normal temperatures for this time of the year are also being reported from some States/ Districts,” the letter signed by Rajesh Bhushan, the Union Health Secretary mentioned.

The health departments of the state

governments have been asked to continue sensitisation and capacity building of medical officers, health staff, grass-root level workers on heat illness and its early recognition and management.

The ministry also stated that the preparedness of the health facilities must be reviewed for availability of adequate quantities of essential medicines, intravenous fluids, ice packs, ORS (oral rehydration syrup) and all necessary equipment. There were directives to ensure availability of sufficient drinking water at all health facilities and functioning of cooling appliances in critical areas.

The national capital on February 20, 2023 registered a maximum temperature of 33.6 degrees Celsius which as per the India Meteorological Department (IMD) was the third hottest day ever recorded in February in the last 55 years.

Also, the country at large has reported the hottest February this year since 1901 with average maximum temperature touching 29.54 degrees Celsius, the IMD stated.

In a press release dated February 28, 2023 the IMD warned that in the upcoming hot weather season, above normal maximum temperatures are likely to cover most parts of northeast India, east and central India and some parts of northwest India.

“Monthly maximum temperatures for March 2023 are likely to be above normal over most parts of the country except peninsular India where normal to below normal maximum temperatures are likely. Above normal monthly minimum temperatures are most likely during March, 2023 over most parts of India except south peninsular India where normal to below

normal minimum temperatures are likely,” the IMD noted.

Mahesh Palawat, vice president of meteorology and climate change at private weather forecast website Skymet Weather, said that the formation of an anti-cyclone in the Arabian Sea is the primary reason behind the arrival of hot winds across the northern plains in India.

“This anti-cyclone which is hovering around the north-eastern Arabian Sea is sending hot winds from Sindh and Balochistan regions of Pakistan towards India’s northern plains. As a result of the flow of these winds, the cooler winds from the Himalayas are also unable to provide any respite which has led to such hot weather in states like Haryana, Delhi, and Uttar Pradesh,” Palawat explained.

Talking about the changing weather patterns in the light of an adversely changing climate, Palawat added that the agriculture sector is set to face the most serious ramifications.

“Both the farmers and the government need to think of resilient measures to combat climate change. This year too, farmers who had sown wheat a bit earlier are in a better position than the ones who sowed it late. Farmers need to readjust their agricultural calendars and timing of cultivation. The government should come up with heat resistant crops,” he said.

Last year, as a consequence of the devastating heatwaves adversely affecting the production of paddy in the country, the Union government had enforced a ban on the export of rice. ■

This story was published on 1 March, 2023.

STORY 10

68 Dead, 500 Hospitalised Due to Extreme Heat in Ballia, Uttar Pradesh

The deaths in eastern Uttar Pradesh have set off the alarm but so far, authorities have denied the heat wave to be the cause of a medical emergency.



REPRESENTATIONAL IMAGE

Rising heat and the prolonged heatwaves are affecting productivity of rural Indians.

GAON CONNECTION

AT LEAST 68 deaths and as many as 500 hospitalisations have been recorded in Ballia district of Uttar Pradesh. Initially, Diwakar Singh, the chief medical superintendent in Ballia had attributed these deaths to the prevailing heat wave conditions. But, he was relieved of his post on

June 17, 2023, and the district magistrate said that the deaths were due to a combination of reasons, and not just the heat.

“There is no concrete evidence to attribute the deaths to the heat wave. The chief medical superintendent has been removed from his post for issuing statements without concrete proof,” Ravindra

Kumar, district magistrate told the press today, on June 19, 2023.

“The hospitals in the district are stocked with fresh supplies of the necessary medicines and ORS [oral rehydration solution] to combat the heat wave conditions,” he added.

Brijesh Pathak, the Deputy Chief Minister assured the press that the government is prepared to tackle the heat wave and that the medical facilities have the supplies to tackle the surge in hospitalisations.

“People don’t need to buy medicines from private pharmacies. The government is keeping its supplies stable and all medical arrangements are in place,” Pathak said.

In a press statement, Jayant Kumar, the chief medical officer, Ballia district, stated that 14 people had lost their lives in the last 24 hours. “About 178 people have been admitted to the hospitals in the last 24 hours due to extreme heat,” he said.

Meanwhile, the India Meteorological Department (IMD) warned that ‘heat wave to severe heat wave’ conditions would prevail in many parts of east Uttar Pradesh, Bihar, Jharkhand, Odisha, Gangetic West Bengal, Coastal Andhra Pradesh and Yanam, Telangana, Chhattisgarh and eastern Madhya Pradesh.

In the wake of the deaths and hospitalisations in Uttar Pradesh, the state administration has issued a letter to all districts urging the concerned authorities to ensure preparedness to tackle any emergencies arising out of the heat wave conditions.

“Ensure that the medicines, ice packs, ORS, salts, are abundantly available at the

hospitals. Also, ensure that the electronic devices are available and functional. Ensure that air conditioners and coolers are working,” stated the letter issued by the chief secretary on June 18, 2023.

In December last year, the Union government had said that the National Disaster Management Authority (NDMA) and the IMD were working with 23 states that are vulnerable to heatwave conditions to develop state-level action plans. These include Uttar Pradesh, Delhi, Rajasthan, Punjab, Madhya Pradesh, Gujarat, Maharashtra and Jharkhand.

“The Heat Action Plan is a comprehensive early warning system and preparedness plan for extreme heat events. The plan presents immediate as well as longer-term actions to increase preparedness, information-sharing, and response coordination to reduce the health impacts of extreme heat on vulnerable populations. NDMA and IMD are working with 23 states prone to high temperatures leading to heat-wave conditions to develop heat action plan,” Jitendra Singh, Minister of State (Independent Charge) in the Union Ministry of Science and Technology and Earth Sciences stated in a written reply to a question asked in the Rajya Sabha on December 12, 2022.

The minister said that the heat action plan will be operational in 2023. However, while the heat action plan is yet to be implemented in Uttar Pradesh, the standard operating procedures [SOPs] on heat wave management have been issued by the state government. The SOPs are a detailed guiding document which seek to ensure a coordinated response. ■

This story was published on 19 June, 2023.

STORY II

48 People Dead in the Space of Two Days in Deoria, UP

As temperatures soared to 45°C in Deoria district of Uttar Pradesh, the district hospital recorded the deaths of as many as 48 people on June 17 and June 18, 2023.

Was it the heat that killed some of them?



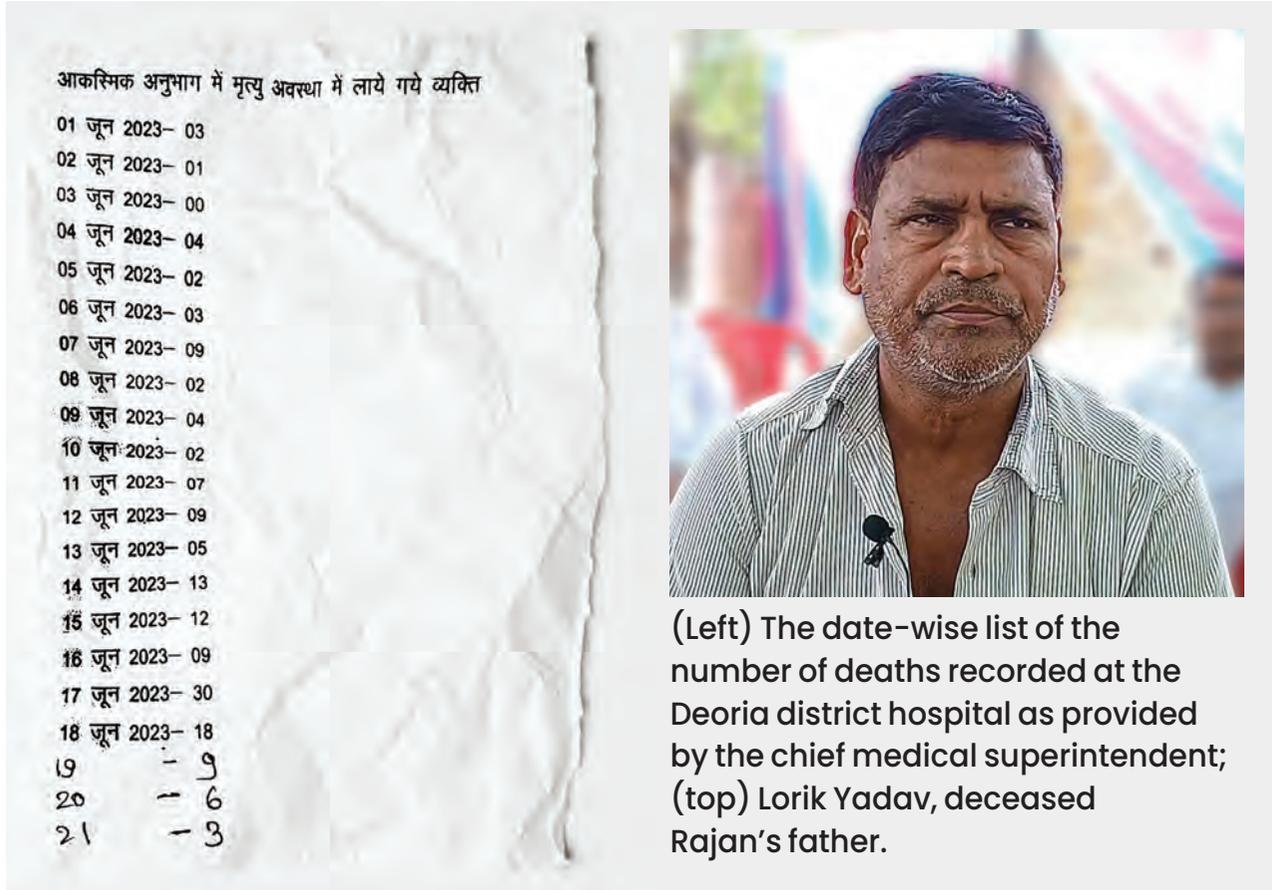
The grieving family of Rajan Yadav holding his photograph. PHOTOS: BRIJENDRA DUBEY

BRIJENDRA DUBEY

SINGHPUR (DEORIA), UTTAR PRADESH

ON JUNE 18 this year, 30-year-old Rajan Yadav went to meet his wife at her parents'

place. On his bike. On his way back, he began to feel uneasy and decided to stop and rest under a tree. He was found there, seemingly sleepy and little did the villagers who offered him some water realise that



(Left) The date-wise list of the number of deaths recorded at the Deoria district hospital as provided by the chief medical superintendent; (top) Lorik Yadav, deceased Rajan’s father.

he was going to die.

“My brother must have died around 2 pm and we got to know about it at 5 pm. We thought he was out with his friends. Someone traced us and called.

We took him to the district hospital where he was declared dead,” said Rajesh Yadav, Rajan’s cousin.

Rajan ran a tea-shop and he is survived by his 28-year-old wife Ramavati Devi, six-year-old son Ashish, and five-year-old daughter Kriti.

He was one of the 48 people in Deoria district who died on June 17 and June 18 this year when the mercury surged to 45 degrees Celsius. The India Meteorological Department (IMD) had issued an alert for severe heatwave conditions in eastern Uttar Pradesh.

SK Mishra, the chief medical superintendent of the district hospital in Deoria said that most of those who died were elderly people who had prior illnesses.

“Most of the people died on June 17. The death toll that day was 30 and the second highest number of people died the following day on June 18 when 18 people were recorded as dead at the district hospital. However, most of them had a medical history and were already sick,” Mishra said.

The chief medical superintendent said that the typical symptoms of a heat stroke victim was anxiety, breathlessness, body pain and fever. “Such a patient should be provided with ORS [oral rehydration solution] and should be taken to a hospital as soon as possible,” he said. □

This story was published on 23 June, 2023.

STORY 12

“She fainted and never recovered. The doctors declared her dead.”

In June 2023, the district hospital in Ballia, Uttar Pradesh reported a surge in deaths leading to a probe. The government denied any link between the deaths and the heatwave.



The Nath household mourns the loss of its matriarch Rajmuni Devi. PHOTOS: BRIJENDRA DUBEY

BRIJENDRA DUBEY

BALLIA, UTTAR PRADESH

JHAJHO DEVI, breathed her last at the district hospital in Ballia, about 270 kms from the state capital Lucknow. The district has been in the news due to a spate of deaths in June 2023 when extreme heat conditions were prevailing in north India including Uttar Pradesh. Her son-in-law, Sunil Singh a resident of Nafrepur village in

Ballia, Uttar Pradesh, is inconsolable.

“She had high fever and nausea and on June 15, we first took her to the community health centre in Rasra from where she was referred to the district hospital. The emergency ward of the hospital was like an oven and so overcrowded,” Singh recalled. The doctors told him his mother-in-law was sick because of the loo (hot summer winds in northern India). The



The Singh household poses with a photograph of deceased Jhajho Devi. A probe is already underway to determine the exact cause of these deaths.

following morning, she died.

Sixty eight people have reportedly lost their lives in the space of a couple of days at the district hospital in Ballia. Families think it is the heat that did them in. “She had no health problems. We had never thought that summer heat could take her away from us,” said 35-year-old Seema Singh, daughter of Jhajho Devi.

The official stand however is that attributing the deaths to the heatwave is wrong. A probe is already underway to know the exact cause of these deaths.

“There are many reports that people have died due to heat wave conditions in Ballia. There is no concrete evidence to attribute the deaths to the heat wave,” Ravindra Kumar, district magistrate, told the press on June 19, 2023.

SK Yadav, chief medical superintendent of the district hospital, said two days later, on June 21: “AC, fans, desert coolers, are all working now and patients are not facing any hardship inside the hospital due to heat.”

But these assurances mean little to Joginder Nath, a 42-year-old grocery store owner in Tikadevri village of Ballia, who lost his mother on June 16, 2023. The 60-year-old Rajmuni Devi died at the district hospital in Ballia, too.

“She had a fever. I took her to the samoohik swasthya kendra [Community Health Centre] in Rasra but they referred her to the district hospital. I got her admitted at the hospital but next evening at around 4 pm, she lost consciousness and then died. The doctors declared her dead,” he said.

Nath’s sufferings did not end there. He complained that he had to wait for hours to get an ambulance to bring his mother’s dead body home. “I was told that all the ambulances were busy and had gone to fetch the patients. They asked me to wait for four hours but I couldn’t let my mother lie there like that and hired a private ambulance and got her home,” he said. □

This story was published on 23 June, 2023.

STORY 13

“He just collapsed and died”

Families in Ballia district of Uttar Pradesh recall the last moments of their loved ones who, they allege, died due to the heatwave. The district administration has denied any such link.



Authorities have denied any link between deaths and the heat wave. An investigation is already underway in Ballia, Uttar Pradesh, which had reported the highest death toll. PHOTOS: BRIJENDRA DUBEY

BRIJENDRA DUBEY

BALLIA, UTTAR PRADESH

SATYAJIT SINGH is yet to come to terms with the death of his 65-year-old father. Abhimanyu Singh. “It is like he suddenly got lost somewhere,” he muttered to himself.

“He was having trouble breathing and was perspiring. We tried to cool him down with a hand fan as he sat on his bed. But he suddenly fell back on his bed and by the

time we took him to the hospital, he was dead,” Satyajit, a resident of Haripur village in Ballia, said.

Ballia district in Uttar Pradesh had reported a temperature of 45 degrees Celsius on June 17, 2023, and a minimum temperature of 32 degrees Celsius. A heat wave had been sweeping across several states in north India with the India Meteorological Department (IMD) issuing a series of warnings and weather advisories.



(Above) Satyajit Singh is yet to come to terms with his father's demise; (left) Girija Shankar Singh (right), the elder brother of Harinder Singh.

The southwest monsoon this year is delayed, and the heat and humidity together are adding to the heat stress. In the past couple of days, a series of deaths have been reported in Uttar Pradesh and Bihar. Unconfirmed reports claim over 100 people have died in these two states.

Authorities however have denied any link between these deaths and the heat wave. An investigation is already underway in Ballia, Uttar Pradesh, which had reported the highest death toll.

"The situation is normal in our district hospital and we have all the wherewithal to handle the patients. The entire clinical burden in the Ballia district is concentrated in the district hospital which has led to the high rate of hospitalisations," SK Yadav, the chief medical superintendent in Ballia, said.

"The private hospitals are not as good in the district and the facilities in the district hospital are far better," the official said.

"There are many reports mentioning that people have died due to heat wave condi-

tions in Ballia. There is no concrete evidence to attribute the deaths to the heat wave," Ravindra Kumar, district magistrate, told the press on June 19, 2023.

Meanwhile, just three days before Abhimanyu Singh collapsed and died, Harinder Kumar Singh, a 45-year-old resident of Bhojpur village in Ballia too died under mysterious conditions on June 14, 2023.

"It was just another day. He just had his lunch, went to the village pond to spend some time near water and upon reaching home, he just collapsed and died," Shail Kumari, Harinder's sister-in-law, said, adding that it had been an extremely hot day.

KN Tiwari, the director of the department of medical health and family welfare in Ballia said the recent deaths amidst the heatwave conditions, were a coincidence.

"The rise in the number of deaths at the district hospital could also be a coincidence and to link it with the heatwave would not be appropriate. Also, the district hospital serves a large area in Ballia and the

private hospitals here are not as equipped as this government hospital. That is also a reason behind the high death toll in the last few days,” said Tiwari.

The senior official said that medical teams were investigating the cause of these deaths and the blood and urine samples of the patients who were admitted were constantly being tested for a variety of pathogenic illnesses.

“It is very much possible that some other disease might go unnoticed while the media and the people in general are attributing these deaths to the heatwave. We are thoroughly investigating these cases for any infection which might later lead to a bigger outbreak,” he added.

Satish Gadi, a Gurgaon-based physician who is retired from the Indian Army and has served as the Chief Medical Director of the Indian Railways, explained how heat affects the human body and can be fatal.

According to the public health expert, extreme heat can cause heat stroke and heat exhaustion. “When the extreme heat is coupled with high humidity, dehydration in the body is very dangerous. It can quickly thicken the blood, reduce the electrolytes in the body, damage blood cells and unless quickly replenished, the person is prone to severe dehydration and even death,” Gadi said.

“The body temperature needs to be brought down as soon as possible. Even ice water or ice can also be used to cold

down the body,” he added.

The doctor underlined that a combination of heat and humidity is extremely risky especially in a rural setting where instant arrangements for oral rehydration and medical help are not as good as in the urban areas.

“In heat wave conditions, air conditioning indoors is not a luxury but a need. Unfortunately, we are a developing country where people especially in the rural areas are not equipped with the resources needed to help prevent the damage to health caused by the heat waves,” Gadi said.

Narad Rai, a former state minister in the Samajwadi Party said innocent lives are being lost. “There is a direct link between these deaths and the heatwave. The government is just trying to manipulate people. We have submitted a list of measures desperately needed to defuse the situation,” said Rai.

Meanwhile, in wake of the heatwave conditions prevailing in the state, Uttar Pradesh Chief Minister Yogi Adityanath has instructed the authorities to ensure that there were no unnecessary power cuts in the state. Adityanath also mentioned that there should be a provision to purchase more electricity for the state government if needed.

However, villagers continue to suffer seven to eight hours of daily power outages. ■

A combination of heat and humidity is extremely risky especially in a rural setting where instant arrangements for oral rehydration and medical help are not as good as in the urban areas.

This story was published on 21 June, 2023.

STORY 14

Rising Heatwaves Take a Toll on Women Farm Labourers

As heatwaves increase in India, women farm labourers are the worst hit. Their health and wages are dropping. But, they continue to sweat it out to earn a living.



Women predominantly perform tedious manual tasks like seedling transplanting, weeding, harvesting, transporting, threshing, and drying hay. PHOTOS: AISHWARYA TRIPATHI.

AISHWARYA TRIPATHI

UNNAO AND MAHOBA, UTTAR PRADESH

HALF-BENT at her waist, Ram Janki plucked green moong beans from a patch of land in Kurmapur village in Unnao district, Uttar Pradesh. Despite the heat, the 72-year-old farmer did not stop working though she complained of a headache and weakness.

Heatwaves swept across Ballia and Deoria districts claiming lives in mid-June this year. Those who lived suffered silently like Ram Janki who after finishing with the beans, moved on to threshing the pods to get the lentils.

“Din bhar lag jayega itni [10 kgs] moong peetne main [It takes all day to work on

these 10 kgs of lentils],” said Ram Janki, as she wiped her sweaty face with her saree. “If we wait too long fungus can form and the entire harvest will be spoiled,” she explained.

It was a race against time as 110 kilograms (kg) of moong had to be threshed before the arrival of the monsoon. So far, only 10 per cent of the threshing works had been completed. Ram Janki couldn't afford to pay attention to either the heat, or her headache.

Accompanying Ram Janki on the five bighas of leased land, was 35-year-old Mohini, her daughter-in-law. The women had to share half of their crop harvest with the landowner.

India is an agrarian economy with about 54.6 per cent of total workforce engaged in agricultural and allied sector activities, as noted in the Census 2011. Rural women form the backbone of the country's agriculture sector.

The annual report by the Ministry of Labour and Employment released in 2023, indicates that 41 per cent of the female workforce is involved in agricultural labour.

Additionally, data by Indian Council for Agricultural Research shows that women make up 75 per cent of those who produce major crops, 79 per cent of those who engage in horticulture, 51 per cent of those who do post-harvest work. And in a changing climate, with rising atmospheric temperatures and increasing heatwaves, women engaged in outdoor farming activ-



Seeta's dwindling health made her miss out on 23 workdays, amounting to a loss of Rs 250 per day, collectively adding to Rs 5,750.

ities face the maximum brunt.

“Most of the backbreaking and manual labour in agriculture is assigned to women which puts them at the forefront of the climate change and oppressive heat,” said Shilpa Vasavada, a gender and community institutions specialist.

“Heatwaves are increasing both in duration and intensity, which is not only affecting their health but also their earnings as the majority of these women work as daily wage labourers,” she pointed out.

Over 200 kilometres from Ram Janki's village lies Mirtala village of Mahoba district, where Seeta, a mother of four, had to miss 23 days of workdays.

On April 14, 2023, Seeta collapsed on the farm she was working on. “Do botal pani chada tha [I had to be put on a drip]. Soon after, I contracted high fever and cramps in my legs,” said the 30-year-old farm labourer.

Around the time Seeta fell ill, India Meteorolo-



In a changing climate, with rising atmospheric temperatures and increasing heatwaves, women engaged in outdoor farming activities face the maximum brunt.

logical Department (IMD) had alerted East Uttar Pradesh (where Mahoba is located) about heat waves and warned people to stay indoors. But agricultural labourers like Seeta had no option.

Her income is vital for the survival of her family of six. Having to miss work for 23 days, meant a loss of Rs 5,750 at Rs 250 per day. Worse, her medical expenses came up to Rs 1,700, adding to her financial burden. "Even now I don't feel better. My legs feel weak and I don't have the energy to take up any daily-wage work," she said.

The Climate Transparency Report 2022 projects around 142 million more people than the 1986 – 2006 average to be annually exposed to heatwaves hazard; and 1.7 million more people expected to be exposed to crop failures.

"Small and marginal farmers, who comprise

85% of India's farmer population, are particularly vulnerable," the report noted.

Heat waves result in the loss of labour hours as it comes in the way of efficiency due to sweating, exhaustion, and dehydration. Between 2001 and 2020, India lost around 259 billion hours of labour annually due to humidity and heat waves, costing India Rs 46 lakh crores, as recorded by the Social Policy Research Foundation.

An April 2023 report by IMD said that "the frequency of heatwaves, their duration and their maximum duration are increasing, which is attributed to global warming". The Intergovernmental Panel on Climate Change (IPCC) model projections indicate an increase of about two heat waves and heat wave duration by 12-18 days by 2060.

The Climate Trends Report 2022 particularly mentions Lucknow, the capital of

Uttar Pradesh, to be amongst the cities predicted to reach wet-bulb temperatures of 35°C if emissions continue to rise.

Wet-bulb temperature is a combination of dry air temperature (as recorded on a thermometer) with humidity. It tells the point at which human bodies will be unable to cool themselves posing risks like heart strokes.

The report elaborates that “a wet-bulb temperature of 31°C is extremely dangerous for humans, while a value of 35°C is unsurvivable for more than about 6 hours, even for fit and healthy adults resting in the shade”.

“This could be fatal for outdoor workers like those in construction and employed in agricultural fields. Climate change is also causing migration, putting more burden on women in terms of household responsibility, agricultural-allied services and tackling their finances,” said Anjal Prakash, Research Director and Adjunct Associate Professor, Bharti Institute of Public Policy, Indian School of Business, Hyderabad. Prakash is an expert in climate change and adaptation issues.

The International Labour Organization estimates that India will lose around 5.8 per cent of its total labour hours in 2030 due to heat and humidity. The loss of labour hours in the agriculture sector due to heat stress has severe implications for India.

Heatwaves are taking a toll on the health of

women farm labourers like Ram Janki and Seeta. Ram Janki’s 80-year-old husband Mani Ram recalled that she was down with fever and loose motions, for which she wasn’t even ready to see a doctor. “After much persuasion she went to a jholachap [quack] in the village to get some medicines,” he said.

Ram Janki belongs to the 90 per cent of India’s labour force, engaged in the informal sector and does not receive any social or health insurance. Her limited income makes her reluctant to spend on her health. “I don’t fall sick, I am used to the heat,” Ram Janki said.

Tedious manual activities such as transplanting of seedling, weeding, harvesting, transporting harvest, threshing, drying of hay, are wholly or mainly done by women.

“These tasks have been assigned to the women traditionally, which they don’t even have the liberty to deny,” Vasavada said.

Despite the directions by the approval committee at the Ministry of Environment, Forest & Climate Change, a March, 2021 report by Social Policy Research Foundation (a Delhi-based public charitable trust), highlighted that the adaptation strategies proposed in most states for the agriculture sector lack a comprehensive approach to addressing gender-based issues within the sector. ■

This story was published on 19 July, 2023.

STORY 15

How Good are the Heat Action Plans?

There are a total of 37 Heat Action Plans across various states, cities and districts to check the stress caused by extreme heat on public health. But a recent assessment of these plans found them wanting.



As per World Health Organization's official note on the heat waves, global temperatures and the frequency and intensity of heat waves will rise in the 21st century as a result of climate change. ANTHONY TUIL/UNSPASH

GAON CONNECTION

MORE THAN 100 people have lost their lives in the states of Bihar and Uttar Pradesh with Ballia district registering the highest number of fatalities till date. Cases of hospitalisations in Ballia have soared to at least 500.

In such a situation, the Heat Action Plans (HAPs) – a strategy to reduce the disastrous effects of the heat waves on public health – are in the spotlight.

At present, there are 37 HAPs across 18 states which are most vulnerable to the impact of extreme heat. These states



Due to several gaps in the heat action plans prepared by India over the last decade, the country could face significant economic losses, including decreasing labor productivity, frequent disruptions to agriculture, and the challenge of unbearably hot cities, as heat waves become more frequent and intense.

KEAGAN HENMAN/UNSPLASH

include Delhi, Rajasthan, Punjab, Uttar Pradesh, Madhya Pradesh, Gujarat, Maharashtra and Jharkhand.

According to the Centre for Policy Research (CPR), a Delhi-based think tank, HAPs are guidance documents by state, district, and city governments to help prepare for, respond to, and recover and learn from heat waves.

CPR in its assessment report said that one of their most important functions is to direct scarce healthcare, financial, information, and infrastructural resources to those most vulnerable to extreme heat in that jurisdiction. This requires regular assessment of who is vulnerable and whether HAP interventions are reaching them.

The first HAP was launched by the Ahmedabad Municipal Corporation (AMC) in 2013 with assistance from national and international academic experts. Now there are at least 37 HAPs across various Indian

states, districts and cities.

According to a research conducted by the CPR titled *How Is India Adapting to Heatwaves?: An Assessment of Heat Action Plans With Insights for Transformative Climate Action*, "India has made considerable progress by creating several dozen heat action plans in the last decade. But our assessment reveals several gaps that must be filled in future plans," Aditya Valiathan Pillai, associate fellow at CPR and co-author of the report, said in a news report.

"If we don't, India will suffer damaging economic losses due to decreasing labour productivity, sudden and frequent disruptions to agriculture (like we saw last year), and unbearably hot cities as heat waves become more frequent and intense," he added.

The CPR report released this year found:

- Most HAPs are not built for local context

and have an oversimplified view of the hazard

- Nearly all HAPs are poor at identifying and targeting vulnerable groups
- HAPs are underfunded
- HAPs have weak legal foundations
- HAPs are insufficiently transparent
- Capacity building is sectorally-targeted

“None of the HAPs reviewed explore policy integration across all listed interventions. Many actions in agriculture, water, housing, infrastructure, and urban design could usefully be linked to existing policies to unlock capacity and finances,” the CPR report pointed out.

Between 1992 and 2015, the heat waves caused 24,223 deaths across the country. This comes to 1,053 deaths per annum, or almost three deaths per day! This is recorded in a study report titled *Beating The Heat - How India Successfully Reduced Mortality Due To Heat Waves*, which was published by the National Disaster Management Authority.

“Until 2015, the deaths and diseases heat waves brought were not accorded due recognition at the national level as hazards. That was unfortunate, as annual deaths in India due to heat-wave conditions were high and could have been avoided with effective planning, coordination and implementation,” the report mentioned.

According to the study, the HAPs help the state governments to develop measures

and strategies for heatwave assessment, forecast, preparedness and mitigation through coordinated efforts with multiple agencies. In this way, states and local authorities are able to undertake long-term mitigation measures to reduce the negative impacts of heat-wave conditions.

The World Health Organization’s official note on the heat waves says global temperatures and the frequency and intensity of heat waves will rise in the 21st century as a result of climate change.

Between 1992 and 2015, the heat waves caused 24,223 deaths across the country. This comes to 1,053 deaths per annum, or almost three deaths per day! This is recorded in a study report titled *Beating The Heat - How India Successfully Reduced Mortality Due To Heat Waves*

“High air temperatures can affect human health and lead to additional deaths. Extended periods of high day and nighttime temperatures create cumulative physiological stress on the human body which exacerbates the top causes of death globally, including respiratory and cardiovascular diseases, diabetes mellitus and renal disease,” warns the WHO.

Heatwaves can acutely impact large populations for short periods of time, often trigger public health emergencies, and result in excess mortality, and cascading socioeconomic impacts (e.g. lost work capacity and labour productivity).

They can also cause loss of health service delivery capacity, where power-shortages which often accompany heatwaves disrupt health facilities, transport, and water infrastructure. □

This story was published on 19 June, 2023.

STORY 16

‘Cool-Roofs’ can save lives. Here’s how

Cool roofs reflect sunlight and absorb less heat. Depending on the setting, cool roofs can help keep indoor temperatures lower by 2 to 5°C as compared to traditional roofs.



Cool roofs help beat the sweltering heat of summer. ASCI-IIIITH

GAON CONNECTION

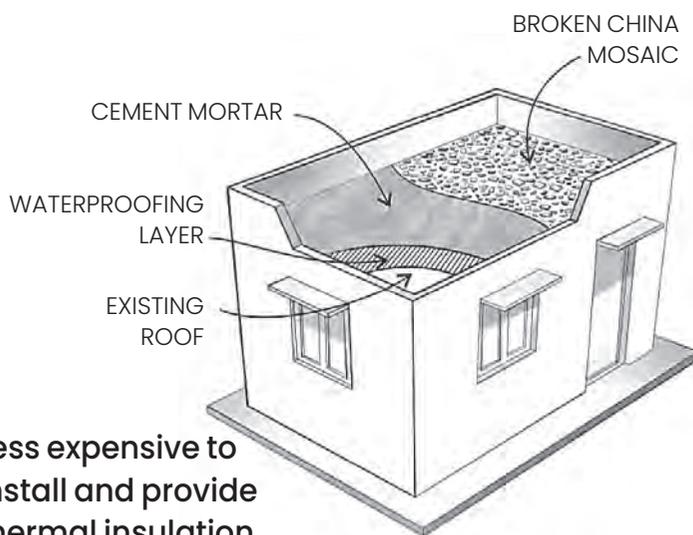
SEVERAL STATES in north India are sweltering. And the heat has allegedly taken many lives. News reports say that nearly a 100 people have died due to heatwaves in Bihar and Uttar Pradesh.

Rapid rise in heat gain due to exposure to hotter than average conditions compromise the body’s ability to regulate temperature and can result in a surge of illnesses. During a heatwave, there is a significant increase in stress, anxiety, and depression

that may trigger or exacerbate mental, behavioural, and cognitive disorders.

But, there are simple and cost-effective methods to reduce the impact of the heat and save lives.

‘Cool roofs’ is one such intervention to beat the sweltering heat of summer. Cool roofs reflect sunlight and absorb less heat. Depending on the setting, cool roofs can help keep indoor temperatures lower by 2 to 5°C (3.6 - 9°F) as compared to traditional roofs.



Less expensive to install and provide thermal insulation.

According to National Disaster Management Authority's (NDMA) Heatwave Action: House Owners' Guide to Alternate Roof Cooling Solutions, published in April 2021, "Roof contributes up to 70% of the heat gain of a building during high temperatures. Solar radiation striking a surface is either reflected, absorbed, or transmitted. Cool Roofs through use of reflective materials and techniques, help in reducing heat absorption and improving overall thermal comfort of the building."

The NDMA document suggests various cooling solutions for existing homes. These include:

- Bamboo/Thatch Screening, Green Net Shading, Roof Paint, Gravel Roof, Heat Insulation Tiles, Hollow Concrete Tiles, Broken China Mosaic, Mud Phuska, etc.
- Bamboo, thatch and palm leaves are locally available across India and can be installed as a secondary roof screen thereby reducing the heating effect.
- Roof mist cooling system reduces the roof surface temperature by spraying an extremely small amount of water across

the roof. Spraying allows the roof to cool as the water evaporating from the surface captures the heat.

- Cool roof coatings are applied to steep as well as low sloped roofs in good condition. Coatings can be applied to both new roofs and existing roofs.
- Hollow concrete/terracotta tiles have high thermal insulation and sound insulation property which is very effective in limiting heat flow. The air inside the cavities provides the insulation to heat.

● Using earthen pots to keep roofs cool has been traditionally practised in hot and dry areas. Locally available earthen clay pots are affordable and exhibit high thermal insulation property.

● LoChina mosaic terrace provides a reflective layer to the roof which reflects a considerable amount of solar radiation falling on the roof. The reflective layer is formed by broken and randomly sized pieces of light coloured ceramic tiles, laid on a cement mortar bed, with joints between tiles sealed with white cement.

Telangana is the first state in the country to launch a 'cool-roof' policy. The policy, launched on April 1 this year, will be applicable for a period of five years (2023-2028).

The cool roof policy aims to create a thermally comfortable and heat-resilient state while reducing energy consumption, serving as a model for other states in the country.

The cool roof policy in Telangana is now mandatory for all government, government-owned, non-residential and

commercial buildings irrespective of the site area or built up area.

Occupancy certificates will be issued only after ensuring compliance with the policy. For residential buildings that have a plot area of 600 square yards and above, cool roof application is mandatory. For buildings that have a plot area of less than 600 square yards, it is optional or voluntary.

According to Telangana's policy, there are three different types of material which could be used for cooling the roofs. In the first type, roofs can be coated with a material or paint having high reflectivity. These are liquid applied coatings made of simple materials such as lime wash, or an acrylic polymer or white plastic coating.

In the second type, prefabricated materials such as poly-vinyl chloride (PVC) membranes or bitumen-based sheeting can be used to cover an existing roof in order to increase the roof surface's solar reflectance and thermal emittance.

The third type of cool roofs involve the application of high albedo, ceramic mosaic tiles or shingles on top of an existing roof or to a new roof, the policy document said, further adding that the choice of an appropriate cool roof material depends on some range of factors, such as the existing roof material, durability and maintenance and availability of skilled labour.

Meanwhile, leading cities in India are developing and demonstrating cool roof programs for local conditions. For example, Ahmedabad has a cool roofs programme for over 3,000 low income homes as part of its heat action plan.

Hyderabad has a demonstration pilot aimed

to design a broader program as part of its building energy efficiency program. The national government is working toward sustainable cooling with the National Cooling Action Plan and energy efficiency programs for buildings, air conditioners and fans.

Cool roofs save energy and costs by reducing cooling load requirements in a building. By keeping the temperatures inside the top floor of a building lower, cool roofs reduce the need for air conditioning, providing more affordable cooling. They also reduce the energy loads in buildings that do have air conditioning.

Cool roofs help reduce the urban heat island effect, improve air quality and combat climate change. By keeping city temperatures lower, cool roofs also help in reducing air conditioning energy consumption in buildings.

Cool roofs enhance durability and appearance of roofs. By keeping roof structures from heating up through applying cool roofing techniques, cool roofs can prevent excessive expansion and contraction of the materials and reduce cracking incidences, prolonging the roof's life.

Cool roofs increase energy access by reducing peak load on the grid. By reducing cooling needs in air-conditioned buildings, cool roofs can reduce peak load on the grid during the heat season, enabling lesser load shedding during the peak summer months.

Cool roofs help build community resilience to extreme heat, increasing community resilience to cope with heat waves can lead to fewer heat-related illnesses and casualties. □

This story was published on 20 June, 2023.



According to Bihar's disaster management department, 28 people died in fires in 2020, and 54 people lost their lives in 2021. In 2022, the number of fatalities due to fire-related incidents was 83.

STORY 17

Firefighting in Rural Bihar

Rising temperatures and the westerly winds fan the flames and the incidence of fires increases 40–50%. Farmers lose standing crops, homes and livestock to these fires.

RAHUL JHA
PATNA, BIHAR

FARMERS IN Bihar are losing their crop harvest to increasing incidence of fires. Earlier this month, on April 11, 2023, more than 10 bighas of agricultural land in Nalanda district burnt down (1 bigha = 0.25 hectare).

"It took the fire fighters one and a half hours to arrive at the spot and more than 10 bighas of land with harvested wheat were destroyed by fire," said Lal Babu, a 53-year-old farmer from Devariya village in Ben block. Two bighas of that were his.

"When I called for help, the phone line of the fire department kept getting cut, it was only the quick help from villagers here that helped us control the fire," he said. But, by then he had already lost Rs 71,000 worth of wheat in the fire.

Just five days before that, on April 6, three fires had broken out in Patna, the state capital. In one, no more than four kilo-



Care should be taken to ensure the cooking fires are completely doused after the food is made.

metres away from the state secretariat, 80 homes in a slum were burnt to the ground. Seven cattle also perished in the fire.

The second fire broke out near the Survey Office at Rajvanshi Nagar where 30 huts were destroyed, and the fire at the Niyojan Bhawan near Income Tax Golambar, was quickly brought under control before it could do any real damage.

“The incidence of fires increases forty to fifty per cent in the summers, and stubble burning and short circuits are the major cause of that. The westerly winds that blow in at this time, make the situation worse,” said Patna-based environmentalist Dharmendra.

“There are 170 hotspots identified in Bihar where the chances of fires breaking out are high. Twenty of them are in Patna. And, though we have approximately 700 fire fighting vehicles, they fall short at times,” an official at the Patna district fire department, who did not want to be named, said.

According to him, in 2021, there were more than 700 fire incidents within Patna Corporation limits. Interestingly, amid the rising incidence of fires being reported, April 14 to April 20 was celebrated as Fire Service Week or Fire Prevention Week across the country.

In Bihar, Chief Minister Nitish Kumar congratulated the fire services of the state and spoke of how fires devastated life and property, and how it was the duty of every citizen of the state to contribute to making Bihar fire-safe.

Small farmers face the threat of fires more, said Rahul Patel, a 26-year-old from Devariya village in Nalanda. “The big farmers use machines to harvest their crop and soon after that, set fire to the stubble that has remained behind, as they are in a hurry to sow their next crop of moong,” Patel said. The smaller farmers manually harvest their wheat and it is more time consuming.

“Sometimes the spark from the stubble fires spreads to the still standing crops of

the smaller land holdings,” Patel explained.

Close to Patel’s village, in the second week of April, at least 20 houses were reduced to ashes in a matter of minutes. “A thresher was working on the fields nearby, and a spark from it set off the fire,” Hiralal Mukhiya from Bhaptiyahi Panchayat in Supaul district, recalled. Mukhiya lost three homes, and along with it stored grains and other belongings.

“Not a day goes by without a fire incident in the rural areas. Most of the houses here are still thatched,” said Chandrasekhar Mandal, member of the Indian Red Cross Society, in Supaul district. “And, in these villages there is neither any proper fire fighting mechanism, nor a hospital where burn victims can be given emergency treatment,” he said.

The Indian Red Cross Society reaches the fire affected areas to offer its help to the victims. Pintu Kumar, circle officer of Saraigarh sub division in Supaul, said that relief was being provided to those affected by the fires. “The government will also be paying them compensation,” he said.

Nandlal who is a daily wage labourer and his wife Kiran Devi who works as a domestic help lost all their belongings in the fire as theirs was one of the 80 gutted huts in the fire at Shastri Nagar in Patna on April 6.

“I had collected some things for my daughter’s trousseau, they are all gone,” Kiran Devi said. “We got a compensation of Rs 9,800 from the government,” she added.

“The fire had started from a stove in one of the homes in the area and by the time the fire engines came 80 dwellings were beyond help,” Ajay Kumar, whose home was also destroyed, said. According to him,

compensation was given to them by the office of the district magistrate.

According to the disaster management department, 28 people died in fires in 2020, and 54 people lost their lives in 2021. In 2022, the number of fatalities due to fire-related incidents was 83.

On March 28, 2023, over 100 houses were reduced to ashes in a fire in Ward one and Ward two of Patra Uttar Panchayat in Pipra Block, Supaul. It was an electric fire at three in the afternoon that caused the damage.

“The fire was so fierce that we could go nowhere near Mohammad Farid’s house,” Mohammad Jafar, who tried to help his neighbour Farid douse the fire, said. The fire engine came nearly an hour later, and it took three hours to put it out, he said. “But the district administration and several NGOs came to our help and supplied us with relief materials,” he added.

“Theft of electricity is one of the main reasons for these kinds of fires,” said Shailesh Jha, who once worked with the electricity department at Saharsa in Supaul district. “The department has orders to repair and strengthen the loosely hanging wires in rural areas in this season as they can lead to short circuits and subsequently dangerous fires,” he said.

The summers also mean forest fires in the state. And, the occurrences of forest fires have increased over the years. According to the Disaster Management Department, in the year 2019–20 about 425.3 hectares (ha) of forests were on fire. In 2020–21, the area under forest fires was 572.4 ha. This increased to 665 ha in 2021–22. ■

This story was published on 25 April, 2023.

**DELAYED
MONSOON,
BELOW
NORMAL
RAINFALL**



“**T**HE MONSOON is delayed”... Dread words no Indian farmer wants to hear. But then this has been a year of nasty surprises, and so it continued in the southwest monsoon season between June and September.

Monsoon is often termed as the finance minister of India as it sustains the farming sector of the country that feeds the country's 1.4 billion people and also provides livelihood to millions in rural India.

About 61 per cent of India's farmers practise rain-fed agriculture and 52 per cent of the total land under agriculture is rain-fed. Also, India ranks first in rain-fed farming, both in area and value of produce.

Of the total pulses, oilseeds and cotton

produced in the country, 80 per cent pulses, 73 per cent oilseeds and 68 per cent cotton come from rain-fed agriculture, as recorded in a NITI Aayog document.

Moreover, rainfed areas in the country support 75 per cent goat population, 64 per cent sheep population and 78 per cent cattle population.

In such a scenario, if the monsoon gets delayed, or rainfall patterns change, which they have been due to climate change, our food security is threatened.

This year's southwest monsoon season started at a sombre note as Cyclone Biparjoy, which formed in the Arabian Sea, led to a delay in the arrival of monsoon in the country. Late onset caused delayed sowing of kharif (monsoon) crops and several farmers

in peninsular India also reported failure of the first sowing and had to go for re-sowing, which means double the cost.

On the one hand, heavy rainfall in the pre-monsoon season ruined rabi crops that were ready for harvest, on the other hand, delayed southwest monsoon, which finally ended 'below normal' caused distress among the farmers and drought like conditions in several states.

July brought unprecedented floods in north India when several states in the region were marooned. August saw the lowest monsoon rainfall since the IMD started record keeping, and the very next month, in September, torrential rainfall in several states flattened the kharif crops.

Climate change is playing unnerving games, but with deadly consequences. On one hand rural women and girls are being forced to walk for hundreds of kilometres to find water and fodder for their cattle, while on the other cloud bursts and glacial lake bursts are



wiping out habitation in the Himalayan region.

The loss to human lives, livestock and property has been immeasurable. The governments are doing what they can to manage the outcome of disasters. But that is never quick enough or sufficient enough to make up for tragic loss.

But one thing is crystal clear. Many of the disasters are a consequence of irresponsible human action and destructive development projects that disregard the local ecology.

Deforestation, encroachments, generation of huge waste, creating concrete jungles where rivers should have been allowed to flow freely and vegetation allowed to flower... There is no getting away from the fact that while climate change is the scapegoat for everything that is going wrong on the planet, the blame is equally on us humans and the governments who are yet to learn a lesson and work sincerely towards climate resilience.



[SECTION 3.1]

A CYCLONE...



June 1 is the official date when southwest monsoon strikes the Kerala coast, bringing respite from the scorching summer season.

STORY 18

Cyclone in the Arabian Sea — Will it Affect the Onset of the Monsoon?

The southwest monsoon is delayed this year. Meanwhile, a cyclonic storm is brewing in the Arabian Sea which has raised concerns about how it will impact the monsoon.

PRATYAKSH SRIVASTAVA

ACCORDING TO India Meteorological Department (IMD), the official weather agency, June 1 is the date when southwest monsoon strikes the Kerala coast, bringing respite from the scorching summer season. However, as of June 6 this year, the south-

west monsoon had not arrived.

Meanwhile, a cyclone is brewing in the Arabian Sea that is also interfering with the monsoon.

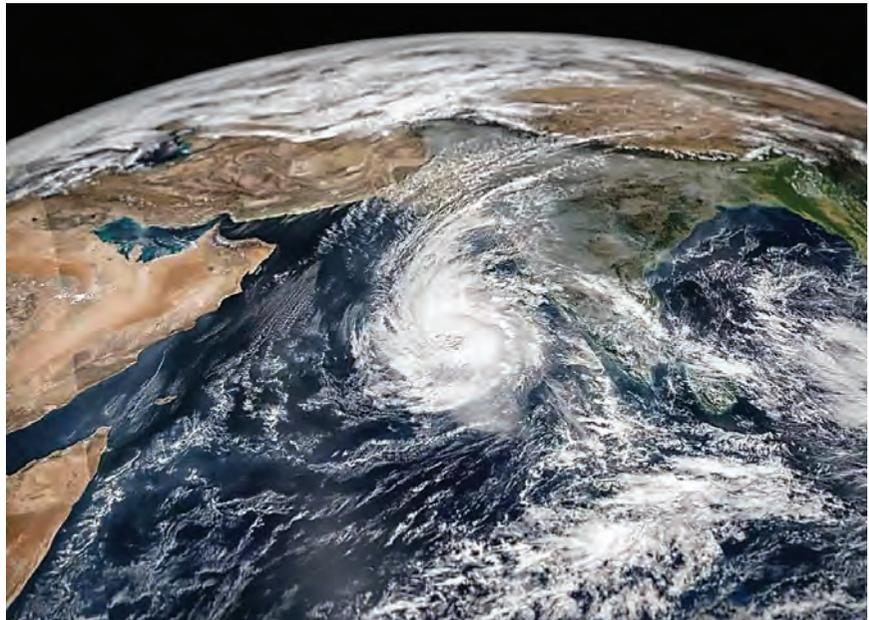
Skymet Weather, a leading private weather agency, stated on June 4, 2023 that

“Monsoon onset will not have a thumping start over Kerala. The reason being a low-pressure area is likely to form over the Southeast Arabian Sea around June 6 or 7. This low-pressure area will move in the North Northwest direction and will gradually intensify into a depression.”

The website noted that the weather system over the Arabian Sea will restrict the flow of south-westerly winds over the Indian mainland. These south-westerly winds are responsible for the further progress of monsoon over the interior Peninsula.

Mahesh Palawat, vice-president of climate and meteorology at Skymet Weather explained how the diversion of winds laden with moisture towards this cyclonic system will definitely have an impact on the monsoon onset but the impact shall be short lived. The normalcy of the monsoon is likely to resume towards the end of the next week (June 13).

Roxy Mathew Koll, scientist at the Indian Institute of Tropical Meteorology said that this year, the onset of the monsoon is definitely not ideal. “The diversion of wind systems away from peninsular India and towards the cyclone in the Arabian Sea will of course impede the onset of the monsoon but the impact will be non-existent beyond a few days. The onset and intensity both shall be affected initially till the time this cyclonic system doesn’t fade away,” Koll said.



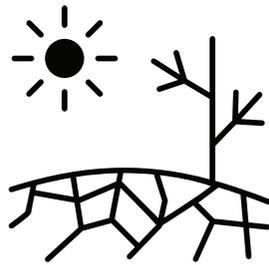
Skymet Weather website noted that the weather system over the Arabian Sea will restrict the flow of south-westerly winds over the Indian mainland.

The weather scientist underlined that the warming of the Indian Ocean as a direct consequence of global warming is a worrying crisis.

“The increased frequency of the cyclones in the Arabian Sea is a direct consequence of climate change. It is constantly interfering with the monsoon rainfall in India. The sea temperature, which should ideally hover at around 28 degrees celsius to 29 degrees celsius, is presently around 32 degrees celsius. In ocean temperatures, a mere rise by 2-3 degrees can be huge and chances of cyclonic activity increases,” he added. ■

NOTE: *Cyclone Biparjoy made a landfall on June 15 near Jakhau port in Gujarat and caused extensive damages. Mass evacuations were carried out to reduce loss of lives. The cyclone damaged 5,120 electricity poles and left 4,600 villages without power.*

This story was published on 6 June, 2023



[SECTION 3.2]

DROUGHT...

STORY 19

A Cloud of Despair Cloaks Maharashtra as the Monsoon Drags its Feet

Delayed monsoon means disruption of planting schedules, an impact on crop growth, and the fear of lower yields. Farmers in Maharashtra are worried.



Ramesh Jagtap blamed the late arrival of southwest monsoon this year for ruining the lagan (wedding) plans of his second daughter.

D SARIKA

PUNE AND SATARA (MAHARASHTRA)

RAMESH JAGTAP said plans to wed his daughter during Diwali may have to be dropped. “The delayed monsoons have ruined our plans,” said the 44-year-old farmer from Khatav, in Satara, Maharashtra.

“The monsoon is already late and I am yet to sow anything in my field. If it rains, I will have to sow bajra. And if it does not rain properly in the next 15 days, I will be able to sow only the rabi [winter] jowar. And that too needs sufficient rainfall, towards the end of the monsoon season,” Jagtap worried. His four-acre agricultural land depends entirely on the rains.



A delayed monsoon can disrupt planting schedules, impact crop growth, and potentially lead to lower yields.

Millions of farmers across India are anxious about the southwest monsoon that is delayed, hence affecting the kharif crop sowing.

Maharashtra has reported minus 86 per cent deficient rainfall till mid June this year, sowing of kharif crops is delayed, and this is going to have tremendous impact on agriculture.

About 180 kilometres southeast of Jagtap's dry and barren land, Bhagwan Raut's two-acre land is also ploughed and kept ready for sowing. Last year, by June 12, the farmer from Mulshi in Pune had already sown soybean, but this year, on June 17 nothing had happened.

"For the past few weeks, my wife and I have been toiling in the field to prepare it for sowing the kharif crop. But there is no rain," complained the 64-year-old farmer.

"Many farmers in our area have already started sowing but because of delayed rain they may have to go for double sowing which increases cost of production. Also, this delayed sowing for soybean may increase chances of pests and diseases which finally affect the crop yield," he said.

The monsoon is not merely an annual

weather event; it is the very essence of agricultural success for millions of farmers who depend on it to cultivate their crops.

A delayed monsoon can disrupt planting schedules, impact crop growth, and potentially lead to lower yields, affecting both food security and the financial stability of farming communities.

This year, the farmers are facing an unnerving delay. The onset of monsoon over Kerala was delayed by a week this year. And it is now almost the last week of June but due to slow progress of the monsoon and a lack of proper rainfall, a large number of farmers in Maharashtra are yet to undertake kharif sowing.

"Delayed monsoon affects the entire crop cycle and can also disturb our rabi crops," said Raut. His wife Chaya Raut complained, "Already in the last year, we have lost our crops due to unseasonal rains. Now with this delayed monsoon I am worried about how we will repay our loan."

According to the India Meteorological Department (IMD), out of the 36 districts in Maharashtra, 35 have reported a large rainfall deficit and one district has been categorised as 'No Rain'.

The state has a large deficient monsoon of minus 86 per cent. As against its normal monsoon rainfall of 102.30 millimetre (mm) rainfall, the state has received only 14.50 mm rainfall between June 1 and June 18 in this southwest monsoon season.

Both Marathwada and Vidarbha regions, which are notorious for recurring droughts and farmers suicides, have reported a rainfall departure of minus 90 per cent so far. Madhya Maharashtra has minus 84 percent deficient rainfall, whereas Konkan and Goa meteorological subdivision has minus 80 percent rainfall departure.

The Maharashtra government has cautioned the farmers not to rush for early sowing of kharif crops in June. The agriculture department issued guidelines warning farmers to ascertain the intensity of rainfall before sowing.

“Ensure there is at least 100 mm of rainfall before sowing. Don’t start sowing after a few spells of showers,” advised state agriculture minister Abdul Sattar. The meteorological department has also urged farmers to keep a watch on the department’s day to day monsoon related updates and plan their sowing accordingly.

But some farmers have already begun to sow their kharif crops.

Ganpat Aba Thopte from Saswad area of the Pune district decided not to wait.

“We have taken the risk. We cannot leave our farm empty. This week we are expecting rain, and hope we don’t have to undertake double sowing,” Thopte said.

In Maharashtra, 14.202 million hectares of land is to be cultivated in the kharif season.

If sugarcane planting is added to it, then it goes to 15.297 million hectares. However, the delayed arrival of monsoon has led to difficulties in implementing the planned cultivation.

So far, only 0.077 million hectares have been sown, according to government sources. In the Konkan region, while the cultivation area is 0.414 million hectares, only 0.003 million hectares (0.77 per cent) has come under cultivation this season.

Similarly, in the Nashik division, total cultivation area is 2.065 million hectares, out of which only 0.062 million hectares (2.99 per cent) have been sowed. Sowing in the Pune division is yet to commence.

In Kolhapur division of 0.728 million hectares, sowing has been done only on 0.007 million hectares (0.91 per cent) area. Chhatrapati Sambhaji Nagar witnessed sowing on 0.001 million hectares (0.06 per cent) of area out of a total 2.090 million hectares of cultivable area for kharif season this year.

As far as Latur area in Marathwada is concerned, out of the total cultivable area of 2.767 million hectares, only 0.002 million hectares (0.07 per cent) area has come under sowing. The Amravati division has a total cultivable area of 3.259 million hectares, out of which as of now only 0.002 million hectares (0.06 per cent) land has come under kharif sowing.

Similarly, in the Nagpur division, where the cultivable area spans 1.925 million hectares, only 0.03 per cent have been sown. Clearly, it is going to be a difficult year ahead for the farmers of Maharashtra. □

This story was published on 19 June 2023

STORY 20

Farmers in Marathwada on Tenterhooks as Monsoon Plays Hooky

Marathwada is no stranger to droughts and crop losses, and the farmers here know too well that a delayed monsoon will mean a death knell for their kharif crops.



As of June 20, 2023, according to the India Meteorological Department, Maharashtra has experienced a rainfall deficit of -88% between June 1 and June 20.

SUSHEN JADHAV

CHHATRAPATI SAMBHAJI NAGAR (AURANGABAD), MAHARASHTRA

SHAHADEO DHAKANE has about five hectares of land on which he has sown several crops. But the 50-year-old farmer from Devgaon village in Chhatrapati Sambhaji Nagar district (formerly Aurang-

abad) in Maharashtra, is far from happy about the condition of the cotton, tur (toor) dal, mosambi trees and mulberry trees. They are shrivelling up in the heat, he said.

“None of the crops on my land is expected to do well this year. The monsoon rains have played truant. Whatever I had sown is wilting and dying,” said the farmer.



Millions of farmers in Maharashtra are desperately waiting for the rains so as to be able to salvage the kharif crop seeds they have sown, or undertake double sowing.

Dhakane said that he had spent around Rs 10,000 on buying seeds for tur dal and another Rs 15,000 for buying cotton seeds. He is now staring at heavy losses.

Millions of farmers like Dhakane in Maharashtra are desperately waiting for the rains so as to be able to salvage the kharif crop seeds they have sown.

The onset of southwest monsoon over India was late by a week this year; and thereafter, due to the formation of Cyclone Biparjoy, its progress has been slow. This has triggered panic in the Marathwada region where a large chunk of farmers depend on rainfall for farming.

Delay in monsoon rainfall, or long dry periods often translate into crop failure, which in the past have led to farmer deaths by suicide. Last year, in 2022, news reports pegged the suicide cases to 2,023

in Marathwada.

As per the India Meteorological Department (IMD), the rainfall deficit in Maharashtra (between June 1 and June 20) is recorded as minus 88 per cent. The IMD data shows that against a normal rainfall of 119.20 millimetres, the state has so far recorded merely 14.90 millimetres. Marathwada has a rainfall departure of minus 90 per cent.

According to Dhakane, for farmers in Marathwada, this time of the year, called 'mrig nakshatra', is special. "Twenty days following the arrival of monsoon rains [usually on June 7] is known as mrig nakshatra. It is believed that if we sow our kharif [monsoon] crops till June 20, the chances of a good harvest are plenty," the farmer explained.

But, instead, this year, the farmers believe

it will be a harvest of losses. Deepak Joshi, another farmer from Devgaon village, said that he had ordered seeds of urad (black gram split) and moong (green gram) pulses for Rs 20,000, but his sowing has gone to waste.

“The seeds dried up and I have ploughed my field again and this time I am arranging for funds to buy some seeds of tur dal now,” said Joshi. “For farmers who are still waiting for the moong and urad seeds to germinate they might also lose out on tur dal as the timing of sowing is crucial and the time is fleeting. Not everyone has the money to invest in one seed after another,” he added.

Gokul Salunke, 36-year-old farmer from Ghaygaon village in Vaijapur tehsil pointed out that the delay in monsoon rains has wreaked havoc on crops like maize. Salunke said that he had so far spent Rs 10,000 on maize seeds and another Rs 8,000 on cotton seeds. The owner of 14 acres (almost four hectares) of land said that his biggest expense was on the fertilisers, a whopping Rs 100,000.

“The monsoon rainfall used to arrive here by June 7 but this year it has been very dry. The rainfall that happened was very little and it has in a way duped farmers. It would have been better if it didn’t rain at all. At least farmers wouldn’t have invested in seeds. This year, I am expecting a fall in production of maize by 30 per cent,” Salunke said.

His friend Bhishma Mapari said he knew the money he spent on buying soybean seeds was a waste now. Dhakane said that he had never witnessed such heat during the mrig nakshatra. “The rainfall so far has been very poor. The seeds of my tur crop are not germinating. Also, cotton, which I had sown after it rained a couple of weeks back, is now wilting,” he added.

Dhakane, who had also ordered 300 silk larvae paying nearly Rs 20,000 in the hope of raising profits worth Rs 150,000 if it rained on time, is now regretting it.

“I rear silkworms for mulberry silk. The larvae feed on mulberry plant’s leaves but this oppressive heat is drying the leaves of mulberry and the worms are now dying of hunger. It’s as if nature just doesn’t want any crop to do well this year,” said the frustrated farmer.

“I cannot even water the plants from the well or the pond because the pond has dried up and the tubewell only runs for 30 minutes a day as the electricity is available only for this much duration,” he said.

According to a report issued by the divisional commissioner of the Vaijapur tehsil in Chhatrapati Sambhaji Nagar district, 547 villages and 1,404 hamlets are being supplied with 426 water tankers, as local sources such as ponds and dugwells have completely run out. ■

Delay in monsoon rainfall, or long dry periods often translate into crop failure, which in the past have led to farmer deaths by suicide. Last year, in 2022, news reports pegged the suicide cases to 2,023 in Marathwada.

This story was published on 20 June, 2023

STORY 21

A Long Walk to Find Pastures

Thousands of cattle rearers in parched south Bihar migrate hundreds of kilometres to the northern districts along the Kosi river in search of fodder and water for their cattle.



Ghanshyam Yadav, 70, walked 200 km from Jamui in south Bihar to Darbhanga’s Kosi riverbank, ensuring his cattle’s survival. PHOTOS: RAHUL JHA

RAHUL JHA

DARBHANGA, BIHAR

THE MONSOON has arrived and it is time at last to return home for Ghanshyam Yadav. More than two months ago, in a sweltering April, the 70-year-old farmer accompanied by 32 buffaloes and twelve other herders had walked for fifteen days

in search of fodder for their cattle.

They covered 200 kilometres from Jamui district in south Bihar abutting Jharkhand to the Kosi riverbank in north Bihar’s Darbhanga district.

“Everything had dried up in our village. The fodder is so expensive that I cannot buy it



Thousands of cattle rearers from the southern districts of the state such as Jamui, Munger, Banka, and Bhagalpur migrate to the Kosi region chasing food for their livestock in the summer months.

for my buffaloes. We had no option but to migrate to the greener areas near the Kosi river to keep our animals alive. Selling their milk is the only source of livelihood I have,” Ghanshyam Yadav, from Garhi village in Jamui district, said.

Thousands of cattle rearers from the southern districts of the state such as Jamui, Munger, Banka, and Bhagalpur migrate to the Kosi region chasing food for their livestock in the summers.

Ironically, Bihar is India’s most flood-prone state with the River Ganges flowing right across it. But it is north Bihar that floods annually, while south Bihar faces drought conditions.

“We build machans in the mango orchards

of the farmers who reside near the Kosi and live on those for two months. We pay for our keep with the milk from our cattle. When the monsoon arrives, we head home, again walking two hundred kilometres,” said Ghanshyam.

Chhote Yadav, another cattle rearer from Jamui, had a litany of woes. “A sack of hundred kilograms of fodder costs Rs 3,000 and my ten buffaloes consume 50 kgs a day. But I earn only Rs 1,000 a day by selling milk,” he said. Apart from six kgs of dry fodder and 15–20 kgs of green fodder a day, each buffalo also drinks 100 litres of water daily in the summer season.

“There is no way I can survive without migrating to Darbhanga. Also, last monsoon, it rained less than usual. We

are struggling to get enough fodder,” he added. “We may be able to return home only in July when there is enough rain and vegetation for our cattle to eat in our villages,” he said.

Parmanand Premi, a literary figure and a social commentator from Bhagalpur district, said that although the tradition of the cattle rearers from Jamui migrating to Kosi river banks is centuries old, their crisis has deepened over the years.

“The sheer number of cattle rearers migrating has skyrocketed. These farmers are facing an unprecedented crisis of shortage of fodder now,” said Premi.

Sanjay Kumar, dairy director in the Animal and Fisheries Resources Department, Patna, said that this was perhaps the longest distance the cattle herders have travelled this year.

“The dairy farmers from the southern districts usually do migrate but it is for the first time that we are witnessing the migration of almost 200 kilometres. Officially, we are not aware of such long migrations,” he said.

One of the reasons for this distress migrates the changing rainfall patterns in the state. Last year, the state remained largely dry during the four months of the southwest monsoon period triggering fears of drought. The state government declared 11 districts as drought-hit. But floods hit other parts of the state in October 2022.

This year the situation is equally worrisome. According to India Meteorological Department (IMD), the state has reported a rainfall deficit of minus 78 per cent between June 1 and June 27 this southwest monsoon season. Against a normal rainfall of 130.80 millimetres, the state has so far recorded only 28.60 millimetres till June 27, 2023.

According to data provided by the Water Bodies - First Census Report, out of 45,793 water bodies in Bihar, 50.2 per cent (22,994) are in use while the balance 49.8 per cent (22,799) are not in use on account of being dry, silted up or ‘destroyed beyond repair and other reasons’.

Out of the 45,793 water bodies in Bihar, 50.2 per cent are in use while the balance 49.8 per cent are not in use on account of being dry, silted up or ‘destroyed beyond repair and other reasons’.

Ideally, the animals should be bathed twice a day in the peak summers, said Phooldar Yadav, a Supaul-based veterinarian. “But there is no water available to them in their villages between March and July. The ponds, canals, and dugwells are dry.

The animals are falling ill from the heat. In such conditions, the cattle rearers have to migrate,” said Phooldar Yadav.

So they travel, carrying their food grains along with them. They arrange for straw and bamboo once they get to the Kosi River to build their machans, and sell the milk in the villages nearby. “It is something we have to do. But it is painful to leave our families back home for such a long time,” said Ghanshyam Yadav. “We will wait for the rains,” he concluded. ■

This story was published on 28 June, 2023

STORY 22

Farmer Groups in Maharashtra Demand Declaration of Drought

While several states in north India reel under massive floods, in Peninsular India farmers stare at drought conditions due to deficient monsoon rainfall.



Maharashtra farmers express concern as below-average rainfall hampers kharif crop sowing.

AISHWARYA TRIPATHI

FARMER ORGANISATIONS in Maharashtra are gearing up for a statewide demonstration to bring to attention the growing agrarian crisis in the state due to deficient rainfall this monsoon season. They are demanding declaration of drought because of low kharif sowing.

“We are planning to join other farmers’ organisations in Mumbai on July 24 to plan a statewide demonstration on July 26, considering the agrarian crisis due to poor rainfall,” said Rajan Kshirsagar, General Secretary of Maharashtra Rajya Kisan Sabha.

“The soybean farmers in Marathwada have

not been able to sow their crops due to insufficient rainfall. How can the government declare that 80 per cent of kharif sowing is done in Maharashtra,” asked the farmer leader, who is based in Parbhani.

He was referring to state deputy chief minister Devendra Fadnavis’s statements on July 17, the first day of the Monsoon Session of the state assembly where he said that despite scanty rainfall, 80 per cent of sowing had taken place compared to last year in the kharif season.

According to India Meteorological Department (IMD), of the 36 districts in Maharashtra, 18 districts have reported ‘deficient’ rainfall (minus 59 to minus 20 per cent), and two districts – Sangli and Hingoli – have recorded ‘large deficient’ rainfall (minus 99 per cent and minus 60 per cent), between the period of July 1 and July 18 in this southwest monsoon season.

Within the state, Madhya Maharashtra and Marathwada regions have reported a rainfall departure of minus 28 per cent and minus 26 per cent, respectively. Both fall in the deficient rainfall category. “The government is hesitant to acknowledge that this is a drought because it holds them accountable to provide crop insurance to the farmers,” said Kshirsagar.

“We demand the government declare a drought and provide compensation to

the farmers who couldn’t sow their crops because of no rainfall,” he said.

Deficient rainfall in the monsoon season is not limited to Maharashtra alone. Several other states in Peninsular India and also in eastern India are awaiting monsoon rains. This is in sharp contrast to north India where Punjab, Haryana, Himachal Pradesh, Uttarakhand, Delhi and parts of Uttar Pradesh are rain-battered and facing massive floods.

The government hesitates to acknowledge this as a drought, as it would require them to provide crop insurance to farmers. We urge the government to officially declare a drought and compensate farmers unable to sow crops due to the lack of rainfall.

RAJAN KSHIRSAGAR,
GENERAL SECRETARY, MAHARASHTRA
RAJYA KISAN SABHA

According to IMD, North Interior Karnataka and South Interior Karnataka meteorological subdivisions have a rainfall departure of minus 32 and minus 35 per cent, respectively.

Predictably, sharing of Cauvery’s water between Karnataka and Tamil Nadu has also hit the news headlines. News reports state that Karnataka has declared that it is not in a position to release Cauvery water to the neighbouring downstream state of Tamil Nadu due

to the water deficit.

“Tamil Nadu has been demanding Cauvery water and has even appealed to the Cauvery Monitoring Committee. But, we are not in a position to release water. A decision will be taken after holding discussion with the chief minister and water resources minister,” state agriculture minister N Cheluvarayaswamy was quoted in local news reports.

“Tamil Nadu has been demanding its share of water at a time Karnataka is facing shortage of drinking water. The situation will ease only if there is good rain this month,” the agriculture minister added.

Meanwhile, Rayalaseema in Telangana also has a rainfall deficit of minus 33 per cent in this southwest monsoon so far. Kerala has a rainfall departure of minus 38 per cent.

There is trouble brewing in eastern India too. As on July 18, Bihar, Jharkhand, and Gangetic West Bengal reported a cumulative rainfall departure of minus 36 per cent, minus 42 per cent, and minus 36 per cent, respectively. Paddy sowing and transplantation in Bihar is way below the target as 31 of its 38 districts are rain-deficient.

As monsoon rainfall plays truant, sharing of Cauvery’s water between Karnataka and Tamil Nadu has hit the news headlines.

Mahesh Palawat, vice president of meteorology and climate change at private weather forecast website Skymet Weather, said “A low significant weather system has developed over the Bay of Bengal resulting in the rain deficit. This year, the weather system developed in the northern Bay of Bengal which gave rainfall in Jharkhand and Chhattisgarh regions. In the coming days, we might see heavy showers over coastal Telangana and Andhra Pradesh. But Tamil Nadu, Rayalaseema, interior Karnataka will remain in a rain deficit.”

“Moreover El Niño will set in August and the monsoon rainfall will further deplete. We

might see good rain in the next two days in Marathwada and Madhya Maharashtra. But El Niño hitting soon will decrease the monsoon rain throughout the country so the states should be prepared,” he concluded.

El Niño refers to a warming of the ocean surface, or above-average sea surface temperatures, in the central and eastern tropical Pacific Ocean. It is often linked to low monsoon rainfall in the Indian subcontinent.

Farmer groups are demanding action from the government. On July 17, Maharashtra Rajya Kisaan Sabha shot off a letter to Maharashtra Chief Minister, Speaker of Maharashtra Legislative Assembly, and District Magistrate of Parbhani asking them to immediately declare drought in the state and come up with a contingency plan for the drought situation in the state.

The letter expressed that due to no rainfall in June, the sowing of kharif crops was not possible for the farmers. Moreover, due to scarce or no rainfall till July 15, the farmers face the problem of double sowing their crops.

On the first day of the Monsoon Assembly Session, Fadnavis had said, “Maharashtra has formed a contingency plan because of the delayed monsoon. The state is ready for situations like double sowing, crop failure, and spurious seed supply that would affect production. The plan is in place.”

But Kshirsagar reiterated that “the state government needs to prepare a contingency plan specific to Maharashtra, and not merely accept suggestions from the Union Government”. ■

This story was published on 18 July, 2023

STORY 23

Farmers in Bihar Stare at Drought in the Face

Of the 38 districts in Bihar, 31 have reported deficient rainfall. Farmers are in distress as paddy sowing and transplantation remain way short of the target.



Bihar is India’s most flood-prone state but is reeling under the impact of drought due to a lack of monsoon rainfall. PHOTOS: PAWAN KUMAR

PAWAN KUMAR

PATNA, BIHAR

DHIRENDRA KUMAR Birana is angry and helpless. The farmer from Kumhrar village in Sheohar district had sowed seeds on his 11 bighas of land and they have not germinated (1 bigha = 0.25 hectare).

to do agriculture,” Birana fumed. “I wanted to sow paddy on eleven bighas of land, but could manage to do so only on about 2.5 bighas due to shortage of water. And even that sowing I did has gone to waste as more than half of my seedlings have withered. Now there is no more water to irrigate what has survived,” he said.

“I feel I am a sinner who has been forced

Birana is not alone as paddy farmers

across Bihar are reeling under the severe lack of rainfall. As of July 17 this year, the state has recorded a deficient rainfall of minus 34 per cent. Last year also the state had deficient rainfall throughout the four months of the southwest monsoon season from June to September.

By mid-July, agricultural lands ideally should have been yielding tender green paddy shoots of the kharif crops. But the situation is grim in Bihar.

According to information by the department of agriculture in Patna, paddy should have been sown on 3.6 million hectares of land in the state, but as of July 15, the transplanting of the saplings has happened only on 0.8 million hectares. Despite 80 per cent of paddy sowing already being done, only 22.22 per cent of it has been transplanted.



“Due to hailstones, I had already faced a lot of damage,” said Vinod Kumar of Muzaffarpur.

Farmers are worried as paddy is their main crop which feeds their families and also earns them a living.

Vinod Kumar Sharma of Belahi Lachcha village in Muzaffarpur is in distress. “I had prepared 18 bighas of my land to plant paddy. I had already faced a lot of damage to my wheat and maize crops due to hailstones. My hopes were pinned on paddy,” he said.

Sharma said that he had sown paddy seeds on 18 bighas of land, but most of them did not take root. “I once again sowed seeds on 10 bighas of land, but due to no rains, everything has been destroyed,” the

farmer complained.

The India Meteorological Department’s (IMD) monsoon rainfall data, reported Muzaffarpur district as having a deficient rainfall of minus 53 per cent (between June 1 and July 17).

“The target for paddy planting is 147,940 hectares, but only 95,400 hectares have been planted, which is only 64.09 per cent of that. But if the rainfall stabilises and we get enough rain in July, we should be able to meet the target,” said Rajan Balan, agriculture officer of Muzaffarpur district.

Of the 38 districts in the state, only seven have had normal rainfall this monsoon season. Three districts — East Champaran, Sheohar, and Sitamarhi — have ‘large deficient’ rainfall (minus 99 per cent to minus 60 per cent).

The 38 districts of Bihar are divided into nine divisions of which the Purnia division has seen the maximum paddy planting with 55 per cent of the transplanting already done. Bhagalpur division brings up the rear with only 1.5 per cent of the transplanting having been completed so far.

Tirhut division has planted 50 per cent of its paddy, Saharsa 45 per cent, Saran 27 per cent, Magadh three per cent, Patna nine percent, Munger three per cent, and Darbhanga 15 per cent.

“There was a time not so long ago when we were proud of being farmers. But now

there are so many of us who are thinking of selling off our ancestral lands,” said Birana from Sheohar district that has reported minus 68 per cent deficient rainfall.

The farmer feared that if it did not rain sufficiently soon, there would be many farmers who would take their own lives. “Our maize crops had only started growing when hailstones damaged them. No one went out to harvest the wheat crops either. Then we thought paddy would come to our rescue but...,” he trailed off.

According to Birana, none of the government tube wells set up every five to seven kilometres, works. They have not worked for nearly 15 years, he complained. “If farmers had to depend on them for water, we would not get even one bundle of grains,” he said.

“Not just in my panchayat, I don’t think the tube wells work anywhere else in the division either. We dig our own borewells and manage. But the groundwater has depleted so much that we hardly get any water,” said Rajaram Rai from Khararu village.

Rai said that he had bought 28 packets of seeds to sow, but nine packets of seeds withered away due to lack of rains. “What remained also did not do so well,” he added. He had planned on planting hybrid paddy on 20 acres of land. “I have managed only 25 per cent of the planting,” he said.

Kamlesh Prasad, district agriculture officer, Sheohar, said, “In Sheohar, the target for paddy has been set at 24,894 hectares. In June, we received 49.9 mm rainfall and in July so far we have received 73.4 mm. It is much lower than the average rainfall we should have had.” According to him, farmers had managed to cultivate 11,147



Rajaram Rai from Khararu village said, “Not just in my panchayat, I don’t think the tube wells work anywhere else in the division either.”

hectares of land with the help of pumpsets and some scattered rainfall.

“But, we are confident that by the first week of August the district’s target will be met,” said the district agriculture officer. The monsoon has been bleak this year, said Gulab Singh, meteorologist at the Dr Rajendra Prasad Agriculture University, Pusa, Bihar.

“There was a heatwave in May in Bihar and that was followed by poor rainfall in June. This has adversely affected paddy cultivation, but there is a possibility that in the next few days there will be adequate rainfall that may help matters,” he said.

The monsoon season has so far not brought any great rainfall to the state, said Ghanshyam Singh, associate professor at the Mandan Bharti Agriculture College, Saharsa. “Barring a couple of districts, the rainfall has been insufficient across the state and though it has rained in the last couple of days, farmers have suffered considerable losses,” said Singh. ■

This story was published on 18 July, 2023

STORY 24

Next to No Rains in Eastern UP Leave Both Paddy Farms and Cattle Parched

The central and eastern districts of Uttar Pradesh have registered below-average rainfall this monsoon. Farmers are praying for rain so that they can sow paddy.



The insufficient rainfall has caused the infestation of paddy crop. RAMJI MISHRA

BRIJENDRA DUBEY

MIRZAPUR, UTTAR PRADESH

ASHARAM YADAV, a 35-year-old dairy farmer from Handora village in Uttar Pradesh’s Mirzapur is not sure how he is going to save the life of the three buffaloes he owns. He thinks they will die of thirst.

“It has barely rained in Mirzapur this year, and my buffaloes need at least 50–70 litres of water a day to survive the heat. All the ponds in my village have dried up and I now depend on a single hand pump in my house,” said Yadav, whose only source of income comes from selling the milk from the buffaloes.



Dependence on diesel-powered tube wells has raised the input costs of the farmers.

According to the India Meteorological Department (IMD) rainfall report on August 1, Mirzapur is amongst the three districts in the state which has recorded 'large deficient' rainfall of minus 69 per cent. Only Mau district with minus 72 per cent rainfall is faring worse than Mirzapur.

The National Dairy Development Board said that buffaloes, which are Yadav's most prized asset, require a daily intake of 100 litres of water to survive in the summer months.

"The Bansagar canal's water isn't very far from my house and my buffaloes used to bathe there and also drink water from the canal but it has been dry for weeks now. I also own five bighas [almost an hectare] of land which I would have sown paddy on. There are 12 people in my family and the land used to produce enough paddy for us to eat for the entire year but it is all barren this year," Yadav said.

"The price of fodder is increasing every day and soon my buffaloes will have neither

food nor water to drink," he lamented. "The fodder costs me Rs 1,400 per quintal. It barely lasts a week. A buffalo needs almost five kilogrammes of fodder daily but I am feeding them barely a kilogramme each. The lack of rainfall has dried up all grasslands," he said.

"I have to use another hand pump which is about half a kilometre away. My arms hurt all the time. I carry almost 20 buckets of water to my house every day," said Kumari, another beleaguered cattle breeder.

According to her, no farmer in the village has sowed paddy yet. "I own almost 10 bigha [two hectares] of land but it is of no use sowing anything right now. We are desperately waiting for the rains or the government to provide some respite from the shortage of water," she said.

IMD data reported that at least 25 districts in the state are witnessing rainfall deficit between minus 50 to minus 20 per cent (deficient) while eight districts are exhibiting rainfall deficit of more than minus 60

per cent (large deficit).

Meanwhile, in a video that went viral on social media, Divya Mittal, the district magistrate of Mirzapur was seen reprimanding the officials of the Bansagar Canal Project for diverting the flow of water towards Prayagraj.

“On what basis was the water diverted towards Prayagraj when farmers in Mirzapur are complaining about their wilting crops. Why was the water released without the district magistrate’s approval,” she demanded to know.

Meanwhile, farmers from districts like Sitapur and Barabanki in central Uttar Pradesh have also complained about the insufficient rainfall raising their input costs.

“My paddy crop is wilting due to insufficient rainfall. The expenses on diesel and insecticides have increased. I am having to spray more insecticides because of the humid conditions and lack of rainfall. A single spray of insecticides costs me Rs 800,” Mohit Singh, a farmer from Paina Khurda village in Shahjahanpur district said.

“If it doesn’t rain in a day or two, my hopes of getting profits from this crop will end,” the 21-year-old added.

Meanwhile, about 100 kilometres away from Sitapur, Hariom Awasthi, a paddy



Asharam Yadav (left) said that he had never witnessed such parched conditions in his village; (right) Sunita Kumari, another affected villager.

farmer from Umri village in Barabanki said irrigation can never make up for lack of rainfall. “No matter how much I irrigate my fields, unless it rains, the yield will not be good. I am irrigating my field every fifth day now,” Awasthi said.

“**My paddy crop is wilting due to insufficient rainfall. The expenses on diesel and insecticides have increased. I am having to spray more insecticides because of the humid conditions and lack of rainfall. A single spray of insecticides costs me Rs 800**”

MOHIT SINGH,
FARMER, PAINA KHURDA VILLAGE,
SHAHJAHANPUR

Vijay Kumar, the crop safety officer in the agriculture department in Barabanki warned that if the farmers did not irrigate their fields properly then the insecticides and fertilisers would destroy the crop. “The farmers have to regularly irrigate their crops. Otherwise they will suffer losses. Also, if they do not have enough water, they should not over fertilise, because that will be counter-productive,” Kumar said. □

With inputs from Ramji Mishra in Sitapur and Virendra Singh in Barabanki

This story was published on 2 August, 2023

STORY 25

Sit-in Protest for Drought Declaration in Marathwada

Because of deficient rainfall in the monsoon season, the All India Kisan Sabha has demanded Marathwada be declared drought-hit. The region has already reported 685 farmer suicides till August 31 this year.



Farmer groups are planning large scale protests in various blocks of Marathwada from October 12 because the government is not listening to their demands.

GAON CONNECTION

SOUTHWEST MONSOON has come and gone and several districts in Maharashtra received deficient rainfall affecting the kharif crops. Farmers groups in Marathwada region of the state are demanding

the region be declared drought-hit.

“There is crop failure in more than 24 districts in Maharashtra. We have witnessed a 50 per cent decrease in the crop yield. We haven’t got any crop insurance relief. Marathwada is drought

prone but the Maharashtra government is unwilling to declare it so," said 54-year-old Rajan Kshirsagar, general secretary for All India Kisan Sabha (AIKS), Maharashtra state. The AIKS is the farmers' wing of the Communist Party of India.

"We will do sit-in protests in various blocks of Marathwada from October 12 because the government is not listening to us," he added. The eight districts of Marathwada include Chhatrapati Sambhaji Nagar (formerly Aurangabad), Jalna, Parbhani, Beed, Dharashiv (Osmanabad), Nanded, Hingoli, and Latur.

On October 5, AIKS issued a press statement warning of unrest among the farmers because their demands were not being met.

This entire monsoon season has been a season of woes for farmers in Marathwada. The monsoon arrived late in June and affected the kharif sowing. Out of 36 districts in Maharashtra, 35 districts reported a large rainfall deficit and one district was declared 'No Rain' category in June.

The India Meteorological Department's (IMD) rainfall data showed that against its normal monsoon rainfall of 102.30 millimetre (mm) rainfall, the state had received only 14.50 mm rainfall between June 1 and June 18 this year, when kharif

sowing takes place in the state. July brought good rainfall to the state but August again went dry.

Worse, several districts in the state reported snail attack on crops with some of the worst affected districts being in Marathwada. Farmers in Latur, Dharashiv, Jalna, and Chhatrapati Sambhaji Nagar districts are the worst affected.

"There has been less rain in our region, the reservoirs have less than 34 per cent storage which should ideally be more than 40 per cent in capacity. The water availability is less and crops have been immensely affected," said Kshirsagar.

The farmers association is demanding the government first declare the Marathwada region as drought-hit and then provide the farmers with crop insurance relief along with compensation of the crops that have been damaged, and a fair

price for their produce.

As per news reports, as many as 685 farmers have died by suicide this year till August 31 in Maharashtra's Marathwada region, with the highest deaths at 186 reported from Beed, the home district of state Agriculture Minister Dhananjay Munde. □

This entire monsoon season has been a season of woes for farmers in Marathwada. The monsoon arrived late in June and affected the kharif sowing. Out of 36 districts in Maharashtra, 35 districts reported a large rainfall deficit and one district was declared 'No Rain' category in June.

This story was published on 11 October 2023

STORY 26

Rainfall Deficit Heats Up Cauvery Dispute Between Tamil Nadu & Karnataka

The pro-Kannada outfits are planning to organise a statewide bandh over Cauvery river water sharing with the neighbouring state.



Against a normal rainfall of 655.2 millimetres, the southern interior Karnataka has received a rainfall of 481.3 millimetres. The region is the origin of the revered Kaveri (Cauvery) river. PHOTO: FLIKCR/FRANÇOIS MO

GAON CONNECTION

IN THE midst of the controversy around the Cauvery water sharing agreement between Karnataka and Tamil Nadu, Bengaluru went on strike on September 26, 2023. While the restaurants and private

cabs remained functional, the majority of the employees in the tech-hub worked from home.

The strike was called by Karnataka Jala Samrakshana Samiti, an umbrella outfit of farmers' organisations.



The Cauvery water dispute, which dates back to more than 130 years, has resurfaced because Karnataka is facing a deficit monsoon rainfall this year.

WIKIMEDIA COMMONS

The Cauvery water dispute which dates back to more than 130 years has resurfaced because Karnataka is facing a deficit monsoon rainfall this year, and is not willing to share the river's water with the downstream state.

In the wake of protests, the Cauvery Water Regulation Committee of the central government has reduced the quantity of water to be released for Tamil Nadu from 5,000 cusecs (1 cusec = 28.317 litres) to 3,000 cusecs per day. Still unhappy with this, the pro-Kannada outfits are planning to organise a statewide bandh on September 29.

While the southwest monsoon season (June to September) draws to a close, rainfall data maintained by the India Meteorological Department (IMD) shows that the meteorological subdivision of the southern interior Karnataka has witnessed a rainfall deficit of minus 27 per cent between June 1 and September 26. Against a normal rainfall of 655.2 millimetres, the southern

interior Karnataka has received a rainfall of 481.3 millimetres.

The region is the origin of the revered Kaveri (Cauvery) river which is 805 kilometres long and flows from Karnataka into Tamil Nadu before joining the Bay of Bengal. The Cauvery Water Regulation Committee under the Ministry of Jal Shakti was set up in 2018.

The opposition parties in Karnataka such as the JD(S), BJP, and AAP along with a host of farmers' organisations have extended support to the bandh.

Apart from the political parties, the bandh call was supported by the Sugarcane Grower's Association, members of the Jai Karnataka organisation, a pro-Kannada outfit, private transport associations and other organisations. It is reported that in several pockets of Bengaluru, the police took protesters in custody under Section 144 CrPC. ■

This story was published on 26 September, 2023



[SECTION 3.3]

...AND FLOODS.

STORY 27

As They Sow, So They Weep — Ground Report from Flood-hit Villages in Haryana

In the villages of Ambala in Haryana, floods have left behind a blanket of malba on the once green paddy fields. Kharif sowing has to be repeated and seed costs have shot up.



In Harbans Singh’s Ismailpur village in Ambala district, Haryana, not a single farmer has been spared by the recent floods. PHOTOS: BRIJENDRA DUBEY

BRIJENDRA DUBEY

AMBALA, HARYANA

THERE IS silence. And, there is mud, tonnes and tonnes of it, slathered over every available surface. A few farmers stand here and there, curiously expressionless.

“We have to start from scratch,” Harbans

Singh said, as he stood ankle deep in the slush that was once his paddy field.

In Harbans Singh’s Ismailpur village in Ambala district, Haryana, not a single farmer has been spared by the recent floods. Several states in north India including Himachal Pradesh, Uttarakhand, Punjab, Haryana and parts of Uttar Pradesh



There is a blanket of malba on the once green fields.

have been hit too.

Excessive and continuous rainfall led to several rivers rising by several feet and washing away everything in their way. The flooding of the Ghaggar river resulted in the Satluj Yamuna Link Canal (SYL Canal) breaching its banks and inundating Ismailpur village and its surrounding areas earlier this month.

Ismailpur in Ambala district is one of the 416 villages in Haryana that is waterlogged. Thirteen districts in the state have been lashed by rains and according to official data 29 deaths have been reported due to the rains and flooding. Hundreds and thousands of hectares of land are drowned. An official estimate is yet to be released.

There is a blanket of malba on the once green fields and according to the farmers there, even their homes have not been spared. They have been without water or food. Silt has flooded all the fields and homes of the villagers. Roads are covered with several inches of slippery mud.

This is bad news. Punjab and Haryana, are considered the food bowl of India, and such excessive damage to the paddy crops can only spell worry for the country. The farmers in the area said that earlier this year their wheat crops had not fared well either, again due to excessive and unseasonal rainfall. They had pinned their hopes on the paddy, and now the floods.

Sacks of fertilisers, pesticides, even fodder for the cattle have been either washed away or completely damaged in Ismailpur as well as the neighbouring Chourmastpur village. The flood fury may have abated and the waters receded, but it has left unspeakable chaos and despair in its wake. No one knows where to start.

“All we know is, we cannot keep the fields unplanted. If we have to eat, we have to plant the paddy again,” Jagdish Singh, who had cultivated about 4.5 acres of paddy in Ismailpur, said.

“I have not seen a flood like this in all my life. We came to know when my neighbour



The flood fury may have abated and the waters receded, but it has left unspeakable chaos.

woke me up. There were places where the water was five feet deep," Madan Das, a 64 year-old farmer from Chourmastpur, recalled. Thousands of acres of land in Ismailpur and Chourmastpur had paddy growing, but not even a blade of grass is visible.

"We have to start all over again," Harbans Singh repeated, partly to himself.

"Everything is gone, not a single grain of paddy survived. I must have spent about Rs 50,000 on my eight acres of land. I had planted hybrid paddy. I had paid for the labour, the seeds, and so many other things," he trailed off.

Farmers are angry. "No one from the government has even enquired if we are dead or alive. Whether we need water or food," Harbans Singh lashed out. "It is only thanks to the Kisan Union that we have been able to feed our families. They distributed rations worth Rs 2.5 lakhs in the village," he added.

Tractors will just get bogged down and are of no use anymore this time around,

Jagdish Singh said. Nearby, a yellow JCB stood, perhaps waiting to at least get rid of some of the silt.

"Labour charges have doubled. Seeds are selling at anything between Rs 3,000 and Rs 4,000 a kilo. I have no idea how much I will have to spend to clean my field and start the sowing again," he said. "But sow I must. I can't be sitting around hoping the government will give me something. They never do," he said and turned away.

The farmers have to get seeds from as far as Kurukshetra, Hissar, Karnal and other places in the state. "It is costing us anything up to Rs 6,000 a kg. And this is without the transportation costs," Harbans Singh said

Both villages are in shambles. In places there is knee deep slush and silt in the fields. Homes have been abandoned. Garbage is washed up. "But, we will deal with all that later. Our main focus is now on replanting as quickly as we possibly can. The rest is up to God," said Jagdish Singh. ■

This story was published on 19 July, 2023

STORY 28

“There are Several Villages Submerged Under 15 Feet of Water”

Tejveer Singh, spokesperson for the Bhartiya Kisan Union (Shaheed Bhagat Singh), talked to Gaon Connection about the extent of flooding in rural Haryana. Excerpts.

BRIJENDRA DUBEY

CHOURMASTPUR (AMBALA), HARYANA

■ **What is the extent of damage due to the recent floods?**

Seven districts in Haryana are severely affected and more than five lakh (500,000) acres of farmland are destroyed. If we only talk about Ambala district, 100 villages are still submerged. From farmlands, houses, to cattle, the loss is on multiple fronts.

■ **When did the flooding begin?**

There was incessant rainfall for three days due to which the rivers and the dams were flowing beyond their capacity. The rainfall on July 11, 2023 was so severe it caused the water levels to rise in the dams and rivers.

The roads are flooded with water and there is no proper drainage system. The rail traffic is also affected as tracks are submerged at various locations.

Right behind us is the Sutlej Yamuna Link canal. There is no provision for proper drainage there either, because of which the canal flooded and water entered the villages. These floods have shown up the loopholes in administration.



“There are several villages which have been submerged under water as deep as 15 feet such as Sekha, Jugna Mugna, and Mansa.”

Even urban localities do not have proper drainage systems. Small business owners have been affected, the colonies and houses have been submerged due to the floods. The common people are bearing the brunt of it.

■ **We heard of Tahra village which is below 12 feet of water...**

There are several villages which have been submerged under water as deep as 15 feet such as Sekha, Jugna Mugna, and Mansa. This same flood water has also reached Rajasthan’s Hanumangarh, Ganganagar, and areas around Tarn Taran.

■ What kind of aid did the government provide to the people?

The government hasn't declared the floods as a disaster [in our area]. All they provide is assurance. Various diseases could spread due to dead animals lying and rotting on the road. Even a lot of stray animals have died. The government is occupied with meetings and we do not know when they will listen to their people, look into their issues and solve them.

■ What is the condition of the agricultural lands?

When the flood hit the villages, the soil got washed away and so this time the paddy cannot be planted, they can only plant wheat.

■ Do you have any demand from the government?

Do you think that the government will provide us with aid? All it hands out is false hopes and assurance.

We have not got any compensation for the paddy and wheat. The Central government should immediately send relief material and aid packages for the people who are victims of the catastrophic floods. Farmers should be compensated for the destruction of their storage rooms. Small farmers should be compensated for their crop and animal losses.

The sewage system should be repaired along with the houses that have got cracks due to the flood water. The power supply

is not working, people have lost all their belongings, the refrigerators, televisions, beds and even the mattresses are not there.

We demand that Rs 10 lakh should be given to the houses where people have died and a government job should be made available as compensation.

■ What help do you hope for to clear the fields and prepare them for the next sowing?

The government says that it can't help us with desilting the drains. Villages along the Sakraha ghat, Khaspara and Naggarare were earmarked to be developed as Industrial Model Townships. That is why the government is not declaring it as a flood-stricken area. What they actually want is that the farmers should sell their lands at low prices because there is water logging in their lands and they will be left with no option other than selling it to the government.

We have not got any compensation for the paddy and wheat. The Central government should immediately send relief material and aid packages for the people who are victims of the catastrophic floods. Farmers should be compensated for the destruction of their storage rooms.

■ What about compensation?

We don't have any hopes from the government. It is known very well that there has been extensive flooding, but it has not declared this area as flood-hit. Compensating the farmers is a distant dream. Compensations have been announced, but it remains to be seen how much money and when the people will actually receive it. ■

This story was published on 20 July, 2023

STORY 29

Tangri River Changed its Course; Farmers in Ambala Flooded with Trouble

The Tangri river has washed away freshly sown paddy in the villages of Ambala and farmers claim it might take years for their agricultural land to recover.



Bhartiya Kisan Union (BKSU) has demanded that the farmers should be compensated by the government to the tune of Rs 50,000 per acre. PHOTOS: BRIJENDRA DUBEY

BRIJENDRA DUBEY

JATWAR (AMBALA), HARYANA

THE ROAR of the waters of the Tangri river has subsided and an eerie silence has replaced it. Balkar Singh, a 60-year-old farmer from Jatwar village in Ambala stands staring at where his paddy field once was.

“It is unprecedented. I don’t even visit the fields as it depresses me. In my 60 years

of life so far, I have never witnessed such destructive flooding. There was so much water here that it seemed like this is where the river actually flows,” said Singh, who had sowed paddy on five acres of land.

“The paddy is all washed away and the fertile layer of the soil has gone along with the river. It will take four-five years for us to be able to cultivate anything in these lands now,” he added.



The paddy is all washed away and the most fertile layer of the soil is eaten away by the river.

The Tangri river which originates in the south-west region of Himachal Pradesh flooded due to the above-normal rainfall in the states of Himachal Pradesh, Punjab and Haryana.

According to the India Meteorological Department (IMD), as on July 25, 2023, Himachal Pradesh has recorded an excess of 73 per cent rainfall while both Punjab and Haryana witnessed 44 per cent of excess rainfall each.

This excess rainfall caused the Tangri river to split into two streams near the Jatwar village in Haryana's Ambala district and engulfed areas.

"I am yet to calculate my losses. I had taken six acres of land on rent at a price of Rs 45,000 per acre. I will have to wait for another four or five years for these fields to produce a harvest that I can sell to pay off my debt. There are two unemployed sons at my house," Singh said.

"The tube wells and electricity poles in the village are ruined. Sand has entered the tube wells and we will have to get them repaired. I am a retired soldier from the army, I had taken 12 acres of land on rent. I have lost Rs 700,000 due to floods," said

Jaspal Singh, another farmer.

The farmers were caught unprepared by the change in the course of the river on July 10. "The land here is very fertile. Paddy and corn flourish here... I just cannot believe that the river would split and flow through these lands. It split near our village and rejoined after two kilometres. Whatever came in its way just got swept away. At least 200 acres of fertile land has been ruined by the river's flow," said Gurvinder Singh, who had planted paddy on six acres of land.

Harmanpreet Singh, who had not only sowed paddy but also sugarcane, said how there is not a single leaf or sapling still standing on his eight acres of land. "There is sand up to five feet in height," he said.

Meanwhile Tejveer Singh, the spokesperson of a farmers' organisation named Bharatiya Kisan Union (Shaheed Bhagat Singh), demanded compensation for the farmers.

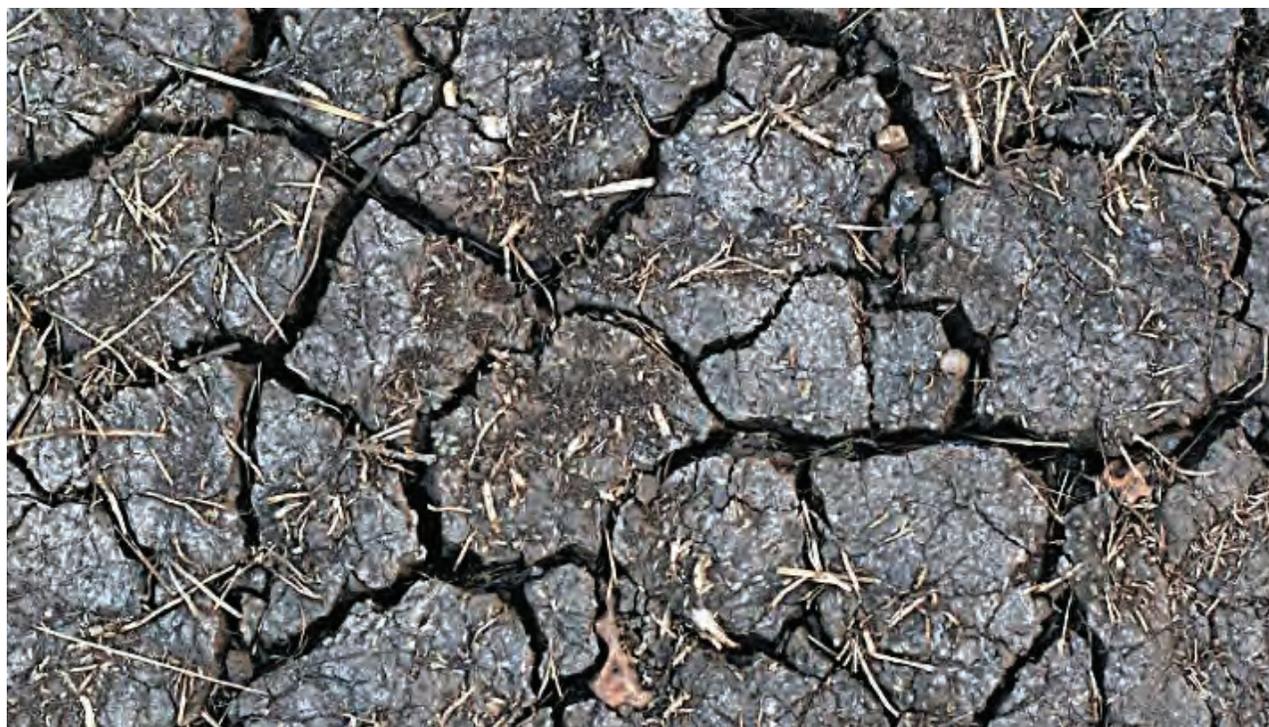
"The government should start compensating farmers. The tube wells are damaged and need to be repaired at the earliest. The damages sustained by the farmers should be compensated," he said. □

This story was published on 25 July, 2023

STORY 30

‘Rainfall Pattern Changing, Paddy Producing States Witnessing Low Rainfall’

The Union Ministry of Earth Sciences said in Parliament that top paddy producing states such as West Bengal, Uttar Pradesh and Bihar are witnessing declining trends in rainfall in between 1989-2018.



As per the Union Ministry of Agriculture and Farmers’ Welfare, more than half of the farmers in the country depend entirely on rainfed agriculture. The erratic changes in the rainfall patterns adversely affect the farmers in India who depend on the timely arrival and withdrawal of rainfall for sowing, irrigating and harvesting their crops.

GAON CONNECTION

IN RESPONSE to a question posed in the Monsoon Session of the Parliament, Union Minister of Earth Sciences in Lok Sabha Kiren Rijju stated on July 26, 2023, that five states – Uttar Pradesh, Bihar, West Bengal,

Meghalaya and Nagaland have shown significant decreasing trends in southwest monsoon rainfall during a 30-year period (1989-2018).

“The annual rainfall over these five states along with the states of Arunachal Pradesh

and Himachal Pradesh also show significant decreasing trends,” the minister said.

Statewise, as per the Union Ministry of Agriculture’s Fourth Revised Estimate on rice production in 2021–22, West Bengal contributed the lion’s share of rice production in the country with a contribution percentage of 12.87 per cent followed by Uttar Pradesh at 11.72 per cent.

According to the Union Ministry of Agriculture and Farmers’ Welfare, more than half of the farmers in the country depend entirely on rainfall for sowing, irrigating and harvesting their crops. The erratic changes in rainfall patterns therefore adversely affect them.

Rijju told Lok Sabha that associated with the climate change ‘due to global warming, temporal and spatial diversity in severe weathers including extremely heavy rainfall have been observed in the country’.

The recent IPCC (Intergovernmental Panel on Climate Change) climate change report indicates that these trends will continue in future and those are not preventable.

Rijju responded to another monsoon-related question in the upper house on July 20 saying, “It can be noticed that in recent years, the number of heavy rainfall events have increased especially in the month of October, mainly due to delayed withdrawal

of southwest monsoon.”

October witnessed 607 heavy rainfall, 129 very heavy rainfall and 10 extremely heavy rainfall events, in 2017. However, in 2022, the post-monsoon month saw 786 heavy rainfall, 133 very heavy rainfall and 13 extremely heavy rainfall events.

The events of heavy rainfall in monsoon season (June, July, August, September) have increased from 5,833 in 2018 to 7,251 in 2022 – a 24 per cent rise; very heavy rainfall events

in monsoon season have increased from 1,642 in 2018 to 1,874 in 2022 – a 14 per cent rise; and extremely heavy rainfall events in monsoon season have risen from 288 in 2018 to 296 in 2022.

According to the data provided by the ministry, the pre-monsoon month of May reported 505 heavy rainfall events and 91 events of very heavy rainfall in 2022, as compared to 195 and 12 such events in 2017. Such events in May had dipped in 2019 but again saw a rise henceforth.

Statewise, as per the Union Ministry of Agriculture’s Fourth Revised Estimate on rice production in 2021–22, West Bengal contributed the lion’s share of rice production in the country with a contribution percentage of 12.87 per cent followed by Uttar Pradesh at 11.72 per cent.

As per the India Meteorological Department (IMD), moderate rainfall is 15.6 to 64.4 mm (millimetres); heavy rainfall is 64.5 to 115.5 mm; very heavy rainfall is 115.6 to 204.4 mm. The rainfall of more than 204.5 mm is recorded as an event of extremely high rainfall. ■

This story was published on 1 August 2023

STORY 31

Floods and cyclones claimed 1,224 lives from January to July 2023

The highest number of 502 deaths were reported in Bihar, followed by Madhya Pradesh — 97 and Gujarat — 94.

GAON CONNECTION

NITYANAND RAI, Minister of State in the Ministry of Home Affairs in response to a question in Parliament said that 1,224 persons died in natural disasters such as cyclones and floods in the first seven months of this year. The highest number of 502 deaths were reported in Bihar, followed by Madhya Pradesh — 97 and Gujarat — 94.

Himachal Pradesh, the state which witnessed the worst floods in the month of July registered a loss of 88 lives.

According to the Union ministry, 404,676.54 hectares of crop area was affected in 2023 so far due to cyclones, floods and thunderstorms. These disasters also claimed 25,558 cattle lives and damaged over 61,136 houses, across the country.

Uttar Pradesh, Chhattisgarh, Arunachal Pradesh and Uttarakhand witnessed the least impact of such events in terms of loss of lives and damaged houses.

Responding to a question regarding the compensation to the victims and kins of the victims, the minister said, "The financial assistance under the SDRF and the NDRF in the wake of notified natural disasters is given by way of relief, and not for compensation of loss as suffered/ claimed. In the case of loss of human lives, the extant norm



The data provided by the Union ministry recorded that a total of 4,04,676.54 hectares of crop area was affected in seven months.

provides ex-gratia payment to the families of deceased persons Rs. 4.00 lakh per deceased."

Explaining the preparedness of the government to minimise losses in the wake of such disasters, the minister said that the measures taken by the central and state governments have improved the disaster management practices, preparedness, prevention and response mechanisms. This has reduced casualties during natural calamities.

"Strengthening of disaster management is a continuing and evolving process of governance," the minister said. ■

This story was published on 8 August, 2023

STORY 32

Sikkim Floods: What Triggered the Disaster?

Chungthang Dam, part of Sikkim’s biggest hydropower project on the Teesta river, was washed away in a Glacial lake outburst flood in October 2023.



About 14 bridges in Sikkim have either been washed away or are submerged in the flooding. Many habitations near Teesta river have disappeared.

GAON CONNECTION

A LITTLE after midnight, on October 4, 2023, Chungthang Dam, part of Sikkim’s biggest hydropower project on the Teesta river (the 1,200 MW Teesta 3 HEP) was washed away in a Glacial lake outburst flood (GLOFs).

In its blog on October 4, South Asia Network on Dams, Rivers and People (SANDRP) discussed what could have triggered the

disaster.

According to SANDRP, the GLOF originated at the South Lhonak Glacial Lake located in the northwest of the Himalayan state of Sikkim. The lake has been identified as one of the fastest expanding lakes in the Sikkim Himalaya region susceptible to GLOF.

The Lhonak Glacial Lake has been increasing rapidly in size due to the melting of the South



India's National Disaster Management Authority stated that excessive rainfall and a GLOF in Lhonak Lake at an altitude of 5,200 metres (17,060 ft), caused the floods.

Lhonak glacier. GLOFs occur when lakes formed by melting glaciers burst open as they are unable to hold the entire volume of water. It is almost certain, that is what caused the flooding, say the experts.

India's National Disaster Management Authority stated that excessive rainfall and a GLOF in Lhonak Lake at an altitude of 5,200 metres (17,060 ft), caused the floods.

The Chungthang Dam was swept away in no more than ten minutes and the waters also washed away the 200-metre long bridge that connected the powerhouse to the dam, said Sunil Saraogi, executive chairman of Sikkim Urja Limited. The powerhouse is also completely submerged, he added.

About 14 bridges in Sikkim have either been washed away or are submerged in the flooding. Many habitations near the river have disappeared.

According to the Gangtok District Administration, connectivity to Sikkim, including its capital Gangtok, has been affected and the Teesta river has swept in its wake parts of NH-10 that connects the state to the rest of the country.

A disaster waiting to happen?

Twenty years ago, in an inventory carried out of the glacial lakes in Sikkim, 266 lakes were mapped of which 14 were deemed as potentially dangerous. Following reports on these lakes in 2013 and again in 2017 reiterated the warning, said Ashim Sattar, scientist, Divecha Centre for Climate Change, Indian Institute of Science, Bangalore.

Sattar has published two papers – the latest in 2021 being a study of six avalanche scenarios leading to GLOFs. □

The story was published on 7 October, 2023.

STORY 33

Flash Floods in Guwahati, Assam

Encroachment on water bodies has increased the incidence of urban flooding in Guwahati which has an intricate network of rivers and beels (wetlands) for natural drainage.



In the last few decades, water bodies in Guwahati have been encroached upon, leading to frequent flooding.

GAON CONNECTION

GUWAHATI, ASSAM

THE SOUTHWEST monsoon season officially ended on September 30, but incessant rains in the northeastern state of Assam have caused flash floods in Guwahati with several areas in the city knee-deep in water.

“Banpanit rickshaw solabo bohot kosto hoe [it is very difficult to ride the rickshaw in floods],” said Bipin Das, in his 70s, who pulls a rickshaw to earn a livelihood. Incessant rainfall inevitably causes flash floods, disrupting not merely his source of liveli-

hood but also damaging property.

“I have been working here for the last 45 years and I must say the city has changed drastically, especially in the last ten to fifteen years. Earlier flash floods were less but now the situation is completely different and difficult,” the rickshaw puller added.

Das is amongst hundreds of people affected by the flash floods that hit the city on October 6, 2023. The floods are being blamed on heavy rainfall in a short span of time.

The Regional Meteorological Centre in

Guwahati, recorded 167.80 millimetres (mm) of rainfall in two days. The heavy rainfall that began on October 3 and lasted till the morning October 4, inundated prime locations and major roads within Guwahati, including Zoo Road, Rajgarh, Chandmari, Pub Sarania, Bhangagarh, and Satgaon.

Sunit Das, a scientist working at the Regional Meteorological Centre in Guwahati said that the situation is likely to improve in the next 48 hours.

An intricate network of rivers and beels (wetlands) forms the natural drainage system of Guwahati city on the banks of the Brahmaputra river. In the last few decades, these water bodies have been encroached upon, leading to frequent flooding.

The Bahini-Bharalu, Guwahati's main river, carries a large chunk of untreated sewage and empties it into the Brahmaputra river. "In the last decade, flash floods in Guwahati have increased in intensity," said Digambar Patowary, a resident of Pub Sarania locality.

"The primary cause of massive floods is the city's flawed drainage system. Despite being located at the city's heart, areas like Rajgarh, Chandmari, and Pub Sarania are perennially plagued by floods due to inadequate drainage," Patowary added. He urged the Guwahati Municipal Corporation (GMC) and Guwahati Metropolitan Development Authority (GMDA) to take immediate actions to solve this crisis.

Partha Prawal Goswami, another resident from the Zoo Road area, worried about how floods in Guwahati had become a recurring problem.

"Successive governments have failed to address the issue. Even citizens share some



An intricate network of rivers and beels (wetlands) forms the natural drainage system of Guwahati city on the banks of the Brahmaputra river.

blame, as they neglect to keep drains and water outlets clean. Moreover, unplanned construction in the city exacerbates the problem," he pointed out.

The location of Guwahati is like a saucer surrounded by hills around it. A 2016 research article published in the Journal of Ecosystem & Ecography has documented various hills in the city.

"The central part of the city has small hillocks namely Sarania hill (193 m), Nabagrah hill (217 m), Nilanchal hill (193 m) and Chunsali hill (293 m). The Buragosain Parbat in the East and the hills of Rani and Garbhangra in the south form the major hill formations of the city. These hills make contiguous formations with the hills of Meghalaya. There are a total of 18 hills in the city," recorded the paper.

Because of its location, Guwahati is naturally prone to flash floods because runoff gushes down the hills and reaches the city in no time. However, the city also has a natural system of rivers and beels to drain the excess water into the Brahmaputra. But, in the last few decades, as the city has expanded, it has eaten into these water bodies and urban flooding has increased.

Another report titled Review of Studies on

Urban Floods in Guwahati, prepared by the Ahmedabad-based All India Disaster Mitigation Institute, highlighted that Guwahati lacks a well-planned drainage system. The report was way back in 2014.

Residents also point out that paddy fields in and around Guwahati, which used to hold excess rainwater, have now been built over with no room for water to flow.

The Assam government launched the ambitious 'Mission Flood Free Guwahati' in July, last year. This mission entrusts various agencies, including the Guwahati Metropolitan Development Authority, Water Resources Department, Public Works Department, and Guwahati Municipal Corporation, with distinct responsibilities aimed at mitigating the city's flooding woes.

The mission encompasses desilting rivers and rivulets, maintaining existing feeder drains through cleaning, removing garbage and blockages, constructing new drains, establishing roads with side drains and culverts for improved drainage, and enforcing rainwater management structures in newly constructed buildings, as per building bye-laws.

Talking about the floods in the city, Anjan Sarma, a Guwahati-based independent expert in urban development explained that Guwahati is not a planned city and there is no strict enforcement of the available master plan.

"Therefore, we hardly see any land use regulation in the city, promoting mixed land use. Due to the haphazard and unplanned development in the city, the open spaces, water bodies are either encroached or developed to be used as residential or commercial areas resulting in flash floods

or water stagnation," Sarma said.

"Even our hills are now encroached upon and vegetation is removed for construction of houses which is adding to the increased velocity of water to the city drains that deposit lots of silt," he said.

With the increase in concrete cover in the city, the water absorption has decreased and runoff velocity increased. Urban runoff is defined as surface runoff of rainwater inside the ground due to gravity.

"Also in the last few years, there has been severe encroachment of natural streams and water bodies. The width of Bharalu and Bahini river which runs in the middle of the city has been reduced drastically. This problem of flash flood is likely to increase further in the coming days if we don't take steps to increase green cover in hills, increase water retention capacity of the city or increase carrying capacity of the natural streams," he added.

According to Sarma, in the current scenario, the city authority can focus on how quickly the water can be drained off at the earliest and this can give some quick relief to the citizens from the fear of getting submerged.

Though residents are questioning the authorities and the government for not addressing the poor drainage system, Sarma, however, is of the view that the common people are equally responsible for the condition. "It is the public who settle on encroached water bodies and hills and deposit garbage in the drains. Citizens also have equal responsibility to stop flash floods along with the authorities who must implement strict enforcement of land regulation and protect natural water bodies," he said. ■

This story was published on 7 October, 2023.

NO SWEET TIDINGS



CLIMATE CHANGE has spared none. But its maximum brunt is being borne by the farming community, which is not only facing a decline in crop productivity, but is also suffering the consequences of export curbs and duties levied to ensure food security in the country.

India has the world's largest public distribution system (PDS) through which subsidised foodgrains are provided to over 800 million people.

The Targeted Public Distribution System (TPDS) operates under the National Food Security Act, 2013, which is supposed to provide subsidised foodgrains to 75 per cent of the rural population and up to 50 per cent of the urban population.

But extreme weather events such as floods and droughts, have become a serious threat to the country's food security. The central government has been announcing export bans, duties and unrestricted import policy to stabilise domestic

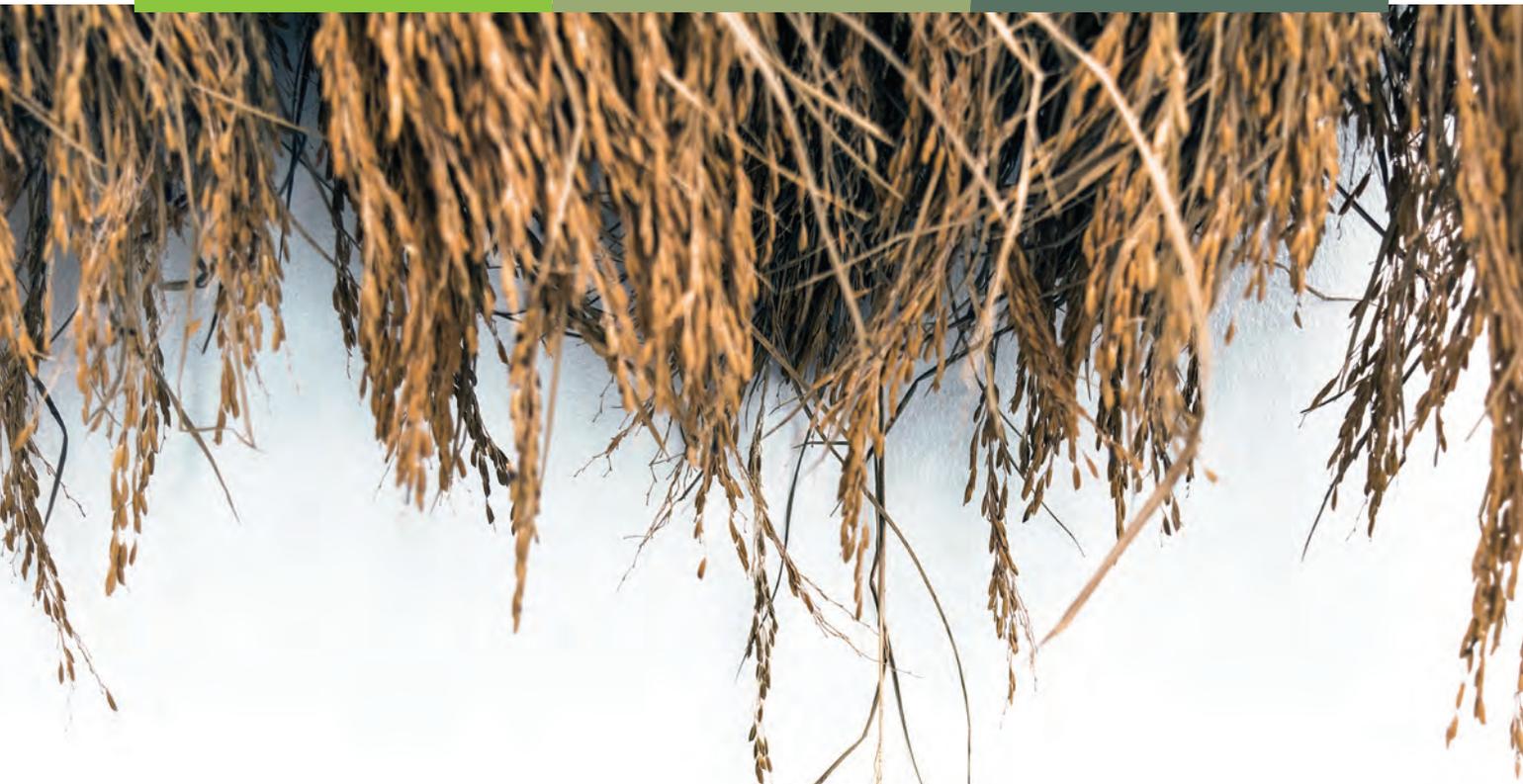
food prices and meet its domestic requirements, and this has eventually hurt the farmers.

A 2022 report by Organisation for Economic Co-operation and Development (OECD) has documented that last year, Indian farmers were implicitly taxed 169 billion US dollars in the garb of export bans, duties or permits on commodities like wheat and rice – which were aimed at stabilising prices for consumers.

For instance, on May 13 last year, the Ministry of Commerce and Industry indefinitely prohibited exports of all types of wheat (pending export shipments were exempted) because early heatwaves caused a decline in wheat production in the country.

Two months later, on July 6, 2022, India introduced export licensing requirements on wheat flour effective from 12 July 2022. This was to stabilise fluctuations in domestic prices and control the quality





of exports. Wheat flour had been excluded from the wheat export ban implemented in May.

Again, within two months, on September 9, 2022 India imposed a 20 per cent export duty on non-basmati rice (except for parboiled rice) to boost domestic supplies when there was a fall in areas planted with paddy in the kharif (monsoon) season.

A couple of weeks later, exports of broken rice were banned to ensure adequate availability for the domestic poultry industry, other animal feedstock, as well as ethanol production.

This year, the situation seems bleak too. PM Modi's promise of 'free' foodgrains for five more years comes just a week after the Union Agriculture Ministry reported in its first advance estimate for the kharif crops that the production of rice will decline this year due to erratic rainfall.

The production of rice this year is estimated to be 106.31 million tonnes — 3.7 per cent lower than last year's production of 110.5 million tonnes. The estimate is lower this year despite a rise in acreage by 200,000 hectares.

For those who wondered idly why there did not seem to be as many mangoes as usual at home, or why the prices of cherries and strawberries had shot up, or how come even the ubiquitous muskmelon, usually so plentiful and welcome in the hot summer months had not shown up on the table, there is just one answer — climate change.

No crop seemed to have been spared this year. They either withered away in the heat, were reduced to a soggy mess in the rains, or just blown down in the winds.

Loans mounted, pest attacks increased and the future looks bleak for the farming community.



Unexpected rainfall, unexpected heat, and then a sudden drop in temperatures, have taken their toll on the mango crop. PHOTOS: SUMIT YADAV

STORY 34

Bad News for Mango Lovers

Early heatwaves in March, followed by unseasonal rainfall and a dip in temperature in April and early May affected mango flowering and fruit formation.

SUMIT YADAV

UNNAO, UTTAR PRADESH

MANGO LOVERS in the country may be left wanting this year. Farmers in Unnao in Uttar Pradesh, which is India's top mango producing state worry that the fruit may not be that plentiful this season. Unnao district is known for its multiple varieties of mangoes, but since January this year, unexpected rainfall, unexpected heat, and then a sudden drop in temperatures, have

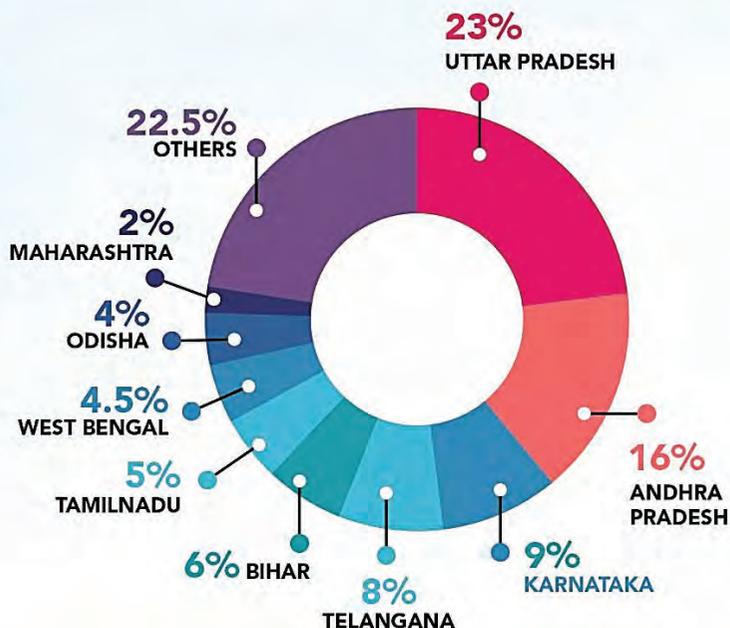
taken their toll on the mango crop.

"Whatever has to happen will happen," shrugged Yogendra Das, from Jhabba Kheda village in Safipur tehsil of Unnao district. "When the mango flowers blossomed, they looked good and I thought it would be a bountiful harvest, but just when the trees flowered in March, there was unprecedented heat and most of the flowers all dried up," the 65-year-old farmer, who owns four bighas of an

Share of Indian states in mango production (in %)



Source: Source: ABC Fruits, 2021



orchard, said.

“The few flowers that survived are what will give the mangoes but the yield will be less,” he said.

Das spent Rs 25,000 a bigha (1 bigha = 0.25 ha), and all he is praying for is a recovery of that cost. Profits are a far fetched thought, he said.

If the heat again sharply rises after the rains, there is fear of the remaining mangoes breaking off even before the seed inside them have fully formed and they have ripened.

Last year a sudden rise in temperature in the month of March affected the mango crop. March 2022 was recorded as the hottest ever March month in India in the past 122 years.

About ten kilometres away from Jhabba Kheda village lies Darauli, where Ram Jeevan Tiwari owns a mango orchard of

about eight bighas.

“The rains damaged the flowers and those that remained suffered pest infestation,” the 62-year-old farmer said. Pesticides did not help much, but the rains in May did wash away some of the pests, he added.

“But this unpredictable heat and rains are affecting the quality of the fruit. And the sudden rains and rise in temperatures affect the yield,” said Tiwari.

Jai Kumar Yadav, scientist at the Krishi Vigyan Kendra in Dhaura, Unnao, said, “At the time of the blossoming of the mango flowers there should not be too much heat, but there was this year and the flowers withered.”

While there was a profusion of flowering this year the temperature rose more than 30°C in March which ended in disaster. Even in February the temperature was much more than what it should have been, the scientist said.



Any change in mango production in India becomes international news as almost half of the world's mangoes are produced in India.

"The flowers that withstood the heat and survived had to face the onslaught of rains in late March, and many of them perished in that. Then there was the pest infestation because of the wet weather."

Das from Jhabba Kheda village observed how it was getting hotter and hotter every year. "Also, the mangoes seem more prone to pests. There was a time the mangoes would ripen naturally without any artificial aid. I had to spray the mangoes thrice this time," he said.

Meanwhile, the recent rains have brought some relief to farmers like Raghuvir Singh. "The rains brought some relief and saved those fruits that had barely survived the scorching heat, otherwise I would have lost everything," the 74-year-old said. Singh owns two bighas of mango orchards.

But, he too said that the pest infestations had increased, and the pesticides they used were becoming less effective. The increased use of pesticides had also increased their expenses, while bringing down the yield, he said.

Data shows that India produces almost half of the world's mangoes with annual

output touching 20.26 million tonnes in 2019-20 (July-June). Almost 1,000 varieties of the fruit are grown here, but only 30 are used commercially.

According to the Indian Horticulture Database, which is maintained by the Indian Agricultural Research Institute (ICAR), Uttar Pradesh is the top producer of mango in the country followed by Andhra Pradesh, Telangana, Karnataka and Bihar.

Five blocks in Uttar Pradesh's Unnao district — Safipur, Hasanganj, Miyaganj, Bangarmau and Auras — are known as the mango belt. The economy here depends almost entirely on mango production.

Exports of fresh mangoes from India increased from 20,302 tonnes in 1987-88 to 46,789.60 tonnes in 2019-20, according to the Ministry of External Affairs.

But will it be so this year? The prognosis is not good for the mangoes from Uttar Pradesh, Yadav, the KVK scientist said. "The changing climate patterns have caused considerable damage and losses to the mango farmers this year," he said. □

This story was published on 6 May, 2023.

STORY 35

Indian Government to Ban Export of Non-Basmati Rice

A year after it imposed a 20 per cent duty on export of non-basmati rice, India has prohibited its export this year as inclement weather conditions have adversely affected the sowing of rice.



India is the leading exporter of rice in the world with a market share of as much as 40 per cent.

PRATYAKSH SRIVASTAVA

ON JULY 20 this year, the Union government banned the export of non-basmati rice. As some of the major paddy growing states in the country are reeling from either floods or droughts, this is seen as a

preemptive measure to ensure food safety.

Last year, the Union Ministry of Consumer Affairs, Food & Public Distribution had placed a 20 per cent tax on the export of non-basmati and non-parboiled rice, and banned the export of broken rice.

But a recent press release announced that in order to ensure adequate availability of non basmati white rice in the Indian market and to allay the rise in prices in the domestic market, the Government of India had amended the Export Policy and prohibited the export with immediate effect.

Press release also stated that in the current financial year (2023-24), between April and June, the export figure of non-basmati white rice increased by 35 per cent and stood at 15.54 lakh metric tonnes (LMT) as against 11.55 LMT in 2022-23 between April and June. This 'sharp' increase in exports can be ascribed to high international prices due to the geopolitical scenario, and extreme climatic conditions in other rice producing countries.

"India accounts for nearly 40 per cent of global rice exports, so the ban will likely impact global rice prices. Within Asia, the Philippines is likely to be most impacted, while Singapore, Hong Kong and Malaysia also depend on imports to meet much of their rice needs. Thailand could gain because it is a net rice exporter," said financial holding company Nomura.

The floods in Punjab and Haryana, and insufficient rainfall in Bihar, Jharkhand and West Bengal have adversely affected the sowing of kharif paddy this southwest monsoon season.

Statewise, as per the Union Ministry of Agriculture's Fourth Revised Estimate on rice production, West Bengal contributes

the lion's share of rice production in the country with a contribution percentage of 12.87 followed by Uttar Pradesh at 11.72 per cent.

India Meteorological Department (IMD) recorded that departure from normal rainfall in West Bengal, between June 1 and July 21 this year, is at minus 17 per cent. While it should have received a rainfall of 571.30 millimetres West Bengal had only received 471.70 mm of rainfall in this monsoon season.

Uttar Pradesh has reported a rainfall departure of minus five per cent, whereas for Bihar and Jharkhand it is minus 41 per cent and minus 45 per cent, respectively.

A large number of farmers in these states depend on the rainfall for the cultivation of their kharif paddy.

The situation is just the opposite in Haryana and Punjab where

several districts are still inundated due to the massive floods that hit north India earlier this month.

A report published by National Bank for Agricultural and Rural Development (NABARD), titled Water Productivity Mapping of Major Indian Crops, Punjab and Haryana together roughly contribute almost 15 per cent of production of rice in the country. Punjab contributes 9.89 per cent of rice production in India.

Farmers in flood-hit districts have lost the paddy they had planted and are now

The floods in Punjab and Haryana, and insufficient rainfall in Bihar, Jharkhand and West Bengal have adversely affected the sowing of kharif paddy this southwest monsoon season.

forced to undertake a second sowing. This is likely to affect the next crop cycle of rabi wheat too.

According to the IMD, Punjab has so far recorded an excess rainfall by 47 per cent in this monsoon season, while Haryana has witnessed 57 per cent of excess rainfall resulting in a deluge.

These inadvertent weather events have severely affected the sowing of paddy as reflected in the Kharif Crop Situation report released by the Union Ministry of Agriculture on July 14. About 123.18 lakh hectares of land is under rice this year as compared to 131.23 lakh hectares last year, that is a decrease of 8.05 lakh hectares.

Pankaj Goel, the general secretary of Delhi-based The All India Rice Exporters' Association, said the decision to ban export of non-basmati rice is a 'learned decision' by the Union government. "Despite the 20 per cent export duty imposed last year, the export was still rising. Food security in the country is the topmost priority of the government," Goel said.

"About 80 per cent to 90 per cent of Indians consume non-basmati rice. So, the decision to ban the export of non-basmati rice is apt and safeguards the collective interests of exporters, local population and the country's commercial viability," said the

general secretary.

However, the exporters who are expected to bear the brunt of the ban, are unhappy. Vishal Tiwary, an Unnao-based exporter of rice, said that these decisions will pave the way for other rice producing countries to eat off India's share.

"The commercial affairs in the world market are ruthless. This is the second year in a row that the government has curbed export of rice. The countries which are desperate for a steady supply of rice will look for exporters elsewhere and it will hurt not just exporters like us but also the commercial interests of India at large," complained Tiwary.

Meanwhile, Balram, a Jharkhand-based activist working for the non-governmental organisation, Right To Food, believed that a mere ban on export of non-basmati rice is not enough to guarantee food security.

"The list of beneficiaries of the public distribution system has not been updated for more than a decade now. It can only be updated after the Census exercise has concluded. The census hasn't taken place since 2011 but the population has soared since then. There are at least 1,600,000 families in Jharkhand alone who are poor and need to be added in the PDS list," he said. ■

About 80 per cent to 90 per cent of Indians consume non-basmati rice. So, the decision to ban the export of non-basmati rice is apt and safeguards the collective interests of exporters, local population and the country's commercial viability

PANKAJ GOEL,
GENERAL SECRETARY, THE ALL INDIA RICE EXPORTERS' ASSOCIATION

This story was published on 21 July, 2023.

STORY 36

The Man Who Owns 435,000 sq ft of Land May Not have Rice to Eat This Year

At a time they are usually scrambling from floods, Bihar's farmers are facing a drought. Urban India can probably not comprehend the annual crises for the farmer in Bihar, now normalised in India's monsoon headlines.



PHOTOS: PAWAN KUMAR

Bihar has had scanty rainfall this year, affecting kharif (monsoon season) crops.

PAWAN KUMAR

MUZAFFARPUR/SHEOHAR, BIHAR

NITISH KUMAR Yadav owns 16 bighas of land in rural Bihar – that is 435,520 square feet – an area that could easily accommodate four thousand odd comfortable apartments in the city.

However, the area of his land has no

bearing on the fact that Yadav will perhaps not be able to grow enough rice for himself and his family to eat this year.

"I had sown 16 bighas of paddy, thinking it would make up for my poor wheat harvest in the last rabi (winter crop) season," said Yadav, from Belahi Lachchi panchayat in Muzaffarpur. "I was going to barter the paddy for wheat so that we would have

enough rotis to eat.”

But it has barely rained this year in Bihar, irrigation is a nightmare and farmers like Yadav are standing by helplessly watching their paddy saplings dry and wilt in the heat. The state may be heading into a drought.

“Now it looks like I won’t have rice to eat either,” Nitish Kumar Yadav who is in his mid-30s, said.

Paddy is a primary monsoon crop. On an average, a kg of rice needs about 2,500 litres (by rainfall and/or irrigation).

When the monsoons fail, farmers are forced to extract groundwater through diesel pumpsets to irrigate their fields, which is an added burden to them. Diesel sells at over Rs 95 a litre in Bihar.

Large areas of rural Bihar are eerily silent. Where once green paddy fields dotted with toiling farmers stretched on either side of the road for five kilometres from Belahi panchayat in Muzaffarpur district to Bariyapur in Sheohar district in north Bihar, there is hardly a soul.

Scanty rainfall this year has affected the kharif crop. Two months into monsoon season, Bihar has reported a deficient rainfall of minus 48 per cent between June and July 30, said the India Meteorological Department (IMD).

Of the 38 districts in the state, only two (Buxar and Kishanganj) have had normal rainfall so far this monsoon. North Bihar region is considered India’s most flood-prone area but almost all the districts are facing drought conditions there. The state had received deficient rainfall in the



Wheat first, then maize and now paddy, all three crops have failed and Shivaji Kumar, a farmer from Narwara village in Sheohar district worries about how he is going to support his family.

monsoon season last year as well.

Seventy-year-old Gagandev Rai’s paddy crop has also died without water. “I have watered my crops twice or thrice, have used fertilisers and pesticides to keep them healthy, but it has all gone,” he said.

The severe water crisis is forcing farmers yet again to turn to precious groundwater.

Farmers in Pashchim Champaran are also spending sleepless nights. “It costs us Rs 200 an hour to get our fields irrigated through diesel pump sets. We are bleeding money to irrigate our crops,” said Bacchu Sahni, a farmer from Naya Tola Bishambharpur village in Pashchim Champaran. His village is located next to the Gandak river, a tributary of the Ganges, but that is not helping his fields.

Districts such as Sitamarhi, Sheohar, Purba Champaran, Muzaffarpur have reported a rainfall departure of minus 83 per cent, minus 75 per cent, minus 70 per cent, and

minus 65 per cent, respectively.

Wheat, then maize and now paddy, all three crops have failed and Shivaji Kumar, a farmer from Narwara village in Sheohar district is terribly worried.

“What will our children eat, how will I get medicines for them if they need it,” he asked. Shivaji Kumar had sown paddy on three bighas of land and not even one bigha has yielded anything. “No one cares about us, we have no one to turn to for help,” he said.

The state government is not unaware of the challenging situation in the state. Last week, the state cabinet approved Rs 100 crore for giving diesel subsidies to farmers to irrigate their land in view of the drought-like conditions prevailing in the state.

According to the agriculture department, the government will provide a subsidy of Rs 75 per litre to the farmers. The farmers using pump sets for irrigating their lands will receive up to Rs 750 an acre. The money will be transferred directly into their bank accounts. Applications have started coming in for the subsidies.

“So far about 142 people have applied for diesel subsidies. If we get additional support from the state government, we will ensure the farmers get the benefits as quickly as possible,” said Kamlesh Prasad, district agriculture officer, Sheohar.

“We have already requested the government to provide the farmers arhar dal and other less water-intensive pulses for them to cultivate,” he added.

In Muzaffarpur about 4,700 farmers have applied for diesel subsidy. According to

Rajan Balan, district agriculture officer, Muzaffarpur, there are no other schemes from the government to tackle the drought conditions for now.

In Sitamarhi district, about 2,000 farmers have applied for diesel subsidy, said Brajesh Kumar, the district’s agriculture officer.

But a mere diesel subsidy may not solve the problem. It could accentuate the water crisis instead, said Eklavya Prasad, founder of Megh Pyne Abhiyan, a non-profit that works on water and sanitation issues in Bihar.

“Single or a uniform intervention such as diesel subsidy might not achieve its intended objective because of the diverse ground realities. Strategies should be such that they address the challenge of delayed or weak monsoon in its entire complexity,” he pointed out.

Prasad explained that the 38 districts of Bihar can be classified into four broad categories – flood prone, regular floods but also vulnerable to drought, drought prone, and extensively drought prone but face the risk of floods. “Thus, the potential for double hazards of drought and flood should be considered when planning any intervention,” he said.

For now, none of that matters to Bihar’s farmers, battered by the climate, failure of agriculture and governance lapses. “Without water, how do we grow crops and feed our families?” asked Chandmati Devi, a share-cropper from Naya Tola Bishambharpur. “The gods seem to be angry with us.” ■

This story was published on 31 July, 2023.

STORY 37

Not Quite the Weather for Tea

As demand for pesticide-free tea grows, tea gardens in North Bengal are switching to organic farming. But, erratic weather conditions are hindering their business.



In North Bengal, there are 87 tea gardens in Darjeeling and they produce the world famous Darjeeling tea. PHOTOS: GURVINDER SINGH

GURVINDER SINGH

DARJEELING AND ALIPURDUAR,
WEST BENGAL

DARJEELING TEA is world famous and now with a surge in demand for tea that is organically grown, tea planters in Darjeeling and other parts of North Bengal are moving away from the use of chemical fertilisers.

Majherdabri estate which has 327 hectares under tea, is one such. With an annual

production of 950,000 metric tonnes, the tea estate has launched its organic tea brand called Dabri.

“We were using chemical fertilisers for several years, and this has affected the quality of soil and the yield of tea,” said Chinmoy Dhar, general manager of Majherdabri tea estate in Alipuduar district of West Bengal.

“There has been a shift in what the



India is the second largest producer of tea globally.

customers want as they become more health conscious. We are switching to organic tea as more and more international buyers prefer certified organic produce,” he said.

But switching to organic tea comes with its own set of challenges for the tea growers of north Bengal, who complain that the yields are falling and the initial input cost has increased. Vagaries of weather are further adding to their worries.

According to the Tea Board, in North Bengal, there are 87 tea gardens in Darjeeling and all of them are organic and produce Darjeeling tea, while the plains have 449 gardens that produce Crush Tear Curl (CTC) tea. Only two gardens in the plains have obtained organic certification.

“It takes at least three years to turn completely organic, during which time no chemical pesticides can be used,” said Sumon Majumder, general manager, marketing, Poddar HMP Group. This group owns the Namring Tea Estate in Darjeeling, which is organic.

“The production comes down by 30-40 per cent and the cost per kilo of production rises by Rs 20-30 in the case of plains, and almost Rs 50 higher in Darjeeling as it takes additional cost to transport organic material to the hills,” he explained.

India is the second largest producer of tea globally. From 1,325.05 million kilogrammes (kg) in 2017-18, tea production has jumped to 1,344.4 million kg in 2021-22. After Assam, West Bengal is the second highest tea producing state in the country.

According to Harisadhan Malakar, senior soil scientist, Tocklai Tea Research Institute, Jorhat, Assam, North Bengal has 536 tea gardens out of which 449 are located in the plains that produce CTC tea, and the rest are in the hills growing what is broadly referred to as the premium Darjeeling tea, which is mostly exported.

Total organic tea produced in India is around 11.07 million kg. Of this West Bengal produces around 4.9 million kg. In the last fiscal year (2021-22), West Bengal produced around 163 million kg of tea.



Darjeeling tea is much in demand in foreign countries especially in Russia, Iran and Germany and switching to organic has been getting producers much higher prices.

“We now spray organic pest repellents such as neem leaves mixed with cow urine, cow dung and molasses. This is good for the soil as it helps it to breathe and increases its life-cycle. But, we have to be extra cautious and keep a close watch,” said Dhar.

“Chemical fertilisers have a fixed cycle and have to be sprayed after a certain interval but organic fertilisers have to be used whenever there is a pest attack. The production also declines by 25 per cent during the switchover,” the general manager of Majherdabri tea estate said. Tea experts agree that switch-over to organic production raises the cost and brings down yield.

“It takes about three to five years for the garden to turn completely organic after fulfilling the terms and conditions as set by the organic certified agency,” senior soil scientist Malakar, from the Tocklai Tea Research Institute, Jorhat, Assam, said.

He said that the production of tea drops about 30-50 per cent initially before getting established as organic. “The production

decline rate also depends upon agro-climatic region, variety, management practices etc,” Malakar added.

The input cost is higher in inorganic tea cultivation because of high volume and use of costly agro-chemicals. Organic tea cultivation on the other hand may have lesser yield but it has lesser input expenses. It is also priced nearly 30 to 40 per cent more than inorganic tea.

“Darjeeling tea is much in demand in foreign countries especially in Russia, Iran and Germany and switching to organic has been getting producers much higher prices,” Malakar said.

“If the government supports the cultivation of organic tea by ensuring sectors such as the railways, government offices, the military, etc, use organic tea, it would go a long way. This would encourage more gardens to make the switch, and chemical-free tea is good for the consumers in the country too,” Malakar pointed out.

A tea estate manager, on condition of

anonymity, said that the organic pesticides and fertilisers that were approved by the tea board under Plant Protection Code (PPC) were not effective. “The plants have developed a resistance to it and something has to be done to enhance the performance of the organic alternative,” he said.

“A majority of the PPC listed insecticides are showing tolerance or are non effective against *helopeltis theivora* (a tea mosquito bug) in Upper Assam and Central Dooars tea plantation area,” said Somnath Roy, senior entomologist, Tocklai Tea Research Institute (TTRI), Jorhat, Assam.

In some places in central Dooars, pesticides such as hexaconazole showed less effectiveness. According to tea industry sources, the matter is being looked into and talks are on with researchers to come up with more effective organic pesticides.

As it is with any other cultivation, tea cultivation is not untouched by erratic weather and climate change. “We are facing severe losses due to climate change. Earlier, the months of March, April and May were dry and with no rains that was conducive to tea production, but lately, it has been raining in these months that has affected the quality and quantity of tea,” said Rajiv Gupta, a senior manager at Ambari tea estate in Alipurduar district.

Researchers say that fluctuations in climate and soil variables like temperature and precipitation have a strong effect on Dooars tea production.

“Our analysis shows that maximum and minimum increase in monthly average temperature beyond a certain threshold affects the tea,” Piyashee Mallik, former Phd scholar at School of Oceanographic

studies, Jadavpur University said.

“Greater monthly rainfall hampers rain flush in Dooars region. Increase in surface net solar radiation during summer leads to decreased dry matter production and photo-inhibition in tea plants thereby reducing yield. During monsoons, the combination of wetter and warmer conditions have a detrimental effect on Dooars tea yield,” Mallik said.

“There is a mandatory cooling off period between December and February, where no tea plucking is allowed, as per the tea board directives,” tea estate manager Gupta pointed out. The time is used for maintenance and pruning of the tea, relaying and repair of water lines and so on.

According to tea industry sources, this is called the ‘Winter Dormancy’ period. It is when the day’s length reduces to 11.5 hours which is not considered conducive to plucking of tea leaves.

“But, there is still nearly 80 kgs of tea in our garden waiting to be plucked. This was not so even a decade ago,” Gupta pointed out. He said the Tea Board of India ought to review the decision in view of the changes in the cycles due to the changing climate. “Otherwise the tea industry will face severe losses,” he warned.

Sam Varghese, chief advisory officer with Kolkata-based Tea Research Association said, “We are aware of the impact of climate change on tea. Several agro-measures are being taken to mitigate it.” He said water harvesting and conservation for better water management, weed control, addition of organic manures, etc., were being looked into. ■

This story was published on 11 April, 2023.

STORY 38

Kashmir's Strawberry Farmers in the Red

In Gaasu, Srinagar, more than 1,000 families in the village are involved in the cultivation of strawberries. But, thunderstorms and hailstorms in April and May have led to a sorry harvest.



The strawberries from Gaasu are taken to the Parimpora mandi in Srinagar, from where they are distributed to other mandis in Kashmir. PHOTOS: FAHIM MATTOO

FAHIM MATTOO

GAASU (SRINAGAR), KASHMIR

GAASU VILLAGE nestles in a valley surrounded by snow-capped peaks. Located on the outskirts of Srinagar in Jammu & Kashmir, it is known for its fruit orchards and strawberry farms.

Ali Mohammad and his wife Sara Begum

own one of those farms. Between the end of April and May, they head towards their strawberry patch of two kanals (0.25 acre) and begin the delicate task of plucking the berries.

There are 1,000 families in Gaasu involved in strawberry cultivation, and the village is also known as the 'Strawberry Village' of Kashmir.



Untimely, heavy rainfall in March and April, the spring season, have caused considerable damage to the berries, complain strawberry farmers.

But this year, untimely, heavy rainfall in March and April, when it should have been a sunny spring, has damaged the strawberries.

“We have suffered about 30 per cent losses,” complained 60-year-old Hameed Mir, a seasoned strawberry grower from Gaasu. “Just when we were anticipating a bumper crop, the rains before the harvest dashed our hopes,” he said.

“This year, we have experienced an unusual pattern with frequent western disturbances, resulting in above-normal rainfall during April and the first ten days of May,” Sonam Lotus, director of the Meteorological Department, Srinagar, said, adding, “Srinagar and Qazigund received 146 mm and 167 mm of rain in March, much more than the normal 91 mm and 116 mm respectively.”

“Due to its favourable climate, Gaasu is ideal for strawberry cultivation. Although strawberries are also harvested in Tangmarg in the north and in some regions of South Kashmir, the fruit from Gaasu is recognised for its bigger size, exquisite taste, and juiciness,” said a 27-year-old farmer from Gaasu, Aquib.

“I have been cultivating strawberries for several years now, and I have witnessed the transformation it has brought about to our village,” said Manzoor Ahmad, a prominent strawberry grower from Gaasu village.

According to him, strawberry production began in earnest in their village about fifteen years ago. Before that strawberries were grown in the Harwan and Dara areas. □

This story was published on 30 May, 2023.

STORY 39

Not-So-Sweet News for Muskmelon Fans this Summer

Uttar Pradesh grows about 40 per cent of muskmelons in the country. However, this year, heavy rainfall and hail storms in May have damaged the crop.



Agricultural scientists blame the rains and hailstorms for harvest losses. In picture, 62-year-old farmer Lakshmi Kant. PHOTOS: SUMIT YADAV

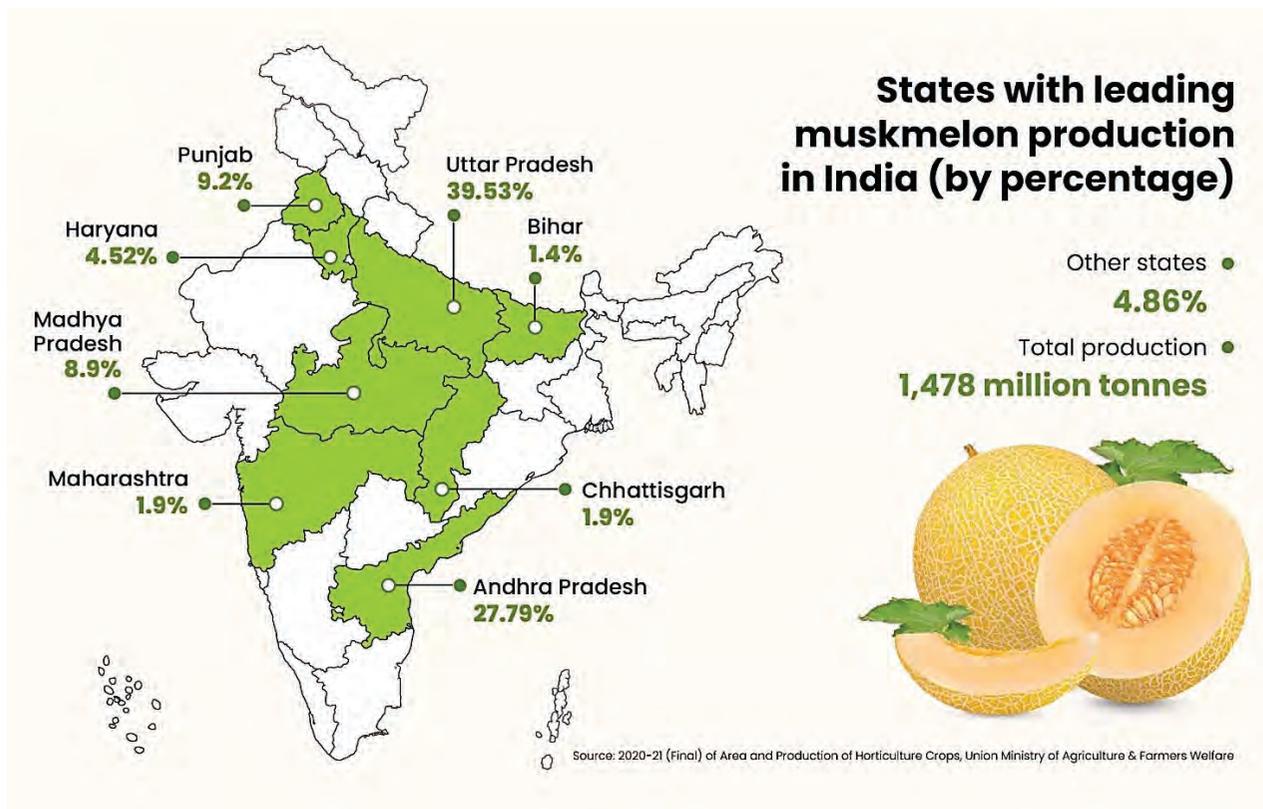
SUMIT YADAV

UNNAO, UTTAR PRADESH

A GOOD melon crop would have ensured a grand wedding for his daughter, said Lakshmi Kant. But all is not well and the 62-year-old farmer from Ramsingh Khera village in Unnao district is worried.

Heavy rainfall coupled with hailstorms in the first two weeks of May destroyed his melon orchard spread across two bighas (half a hectare) of land.

“Just when the fruits needed sunshine, we had rain and hailstorms, and now the melons are rotting in the field. They should



have been ripening and getting ready for harvest now,” Kant said despondently.

Muskmelon or kharbooza is mostly grown in the sandy soil found along the banks of the rivers. Uttar Pradesh is the largest producer of muskmelon in India, contributing to 39.53 per cent (584,330 tonnes) of the total production in India which is recorded at 1,477,970,000 tonnes according to the Union Ministry of Agriculture and Farmers Welfare in 2020-21.

Thousands of farmers in Uttar Pradesh grow it between the rabi and kharif crops. While it is not a labour intensive crop, it requires substantial capital investment and farmers like Kant usually take loans to cultivate it.

“I had borrowed Rs 25,000 from a local sahukaar [moneylender] at an interest rate of four per cent a month. There are a lot of expenses on pesticides, insecticides, fertilisers and soil treatment. I’ll have to

repay the loan from my savings. It has been an absolute loss this year,” said the farmer who supports a family of 10.

According to a research paper titled Scientific Cultivation of Muskmelon (Cucumis melo L.) published in Biotica Research Today Journal in 2020, high temperatures and low humidity at the fruit ripening stage enhance the sweetness and aroma of the fruits.

According to the report, muskmelons are susceptible to frost but tolerant to drought. They thrive best in loamy to sandy loamy texture of soil and the desired pH should be 6-7.5 only.

According to Dheeraj Tiwari, an agricultural scientist at the Krishi Vigyan Kendra in Dhaura, Unnao, the heavy rainfall and hail storms in the district in the first two weeks of May brought down the temperatures which spoiled the crop. “It is one of the few crops which grows well in the heat. Higher the



Infections and pest attacks are also on the rise as the heat is not enough to keep them in check.

temperature and hot winds, the sweeter the fruit will be. High temperatures also guard the crop against a lot of pests," he said.

Infections and pest attacks are also on the rise as the heat is not enough to keep them in check. "There are as many as 5,000 farmers cultivating muskmelons on over 2,000 hectares in the district," Tiwary said.

Taufeeq Ahmed, a 38-year-old muskmelon farmer from Hadha village said that his expenses shot up by almost 25 per cent because of an increased investment on the pesticides. "I could only produce 20 kilograms of the fruit on my four bighas. And even those that looked passable from the outside turned out to be rotten inside," Ahmed said. Usually the extreme heat of summers keep the pests at bay, but not so this year," he added.

It's not just the monetary loss which makes these farmers sad. The physical labour they invested in tilling the land, planting the seeds, irrigating the field and guarding the crop from stray animals in oppressive

heat has all been in vain.

"The muskmelon crop is a lucrative opportunity for farmers like us as it reaps fruits faster as compared to cereals and it supplements our incomes. But the heavy rainfall and hailstorms in May lowered the temperature at a crucial time. I have never seen such damage," said Kant, who has grown muskmelon for over a decade.

Salman Khan, a shopkeeper at the Lohcha market in Unnao said, "Every year, I used to procure 20 kgs of muskmelon a day at Rs 25 for three kgs. This year, I am barely getting five kilos and selling them at a rate of Rs 30 per kilo. The customers are not buying it because they have ended up with rotten fruit," Khan said.

The production of cantaloupes and melons in the world is 28 million tonnes. In India, the area under muskmelon is 74,630 hectares with a production of 1,231,000 metric tonnes on an average. ■

This story was published on 26 May, 2023.

STORY 40

No Cheer for the Cherry Farmers in Kashmir

Orchard owners in Jammu & Kashmir claim they have lost more than half their cherry harvest due to rain and hail storms in April and May.



Cherries are sensitive to extreme weather conditions, requiring a moderate temperature for optimal growth.

SADAF SHABIR

DARA VILLAGE (SRINAGAR), J&K

DARA VILLAGE that overlooks the city of Srinagar is famous for its cherry production. However, this year the cherry farmers in Jammu & Kashmir, India's topmost cherry producing province, have suffered heavy losses due to above-normal rainfall and hail storms in the past two months.

Cherry orchard owners in Dara village claim that they have lost between 50 per cent and 85 per cent of their harvest.

"This year, I managed to retrieve only ten per cent of my total cherry production," said Mohammad Maqbool, who has been cultivating cherries for the past two decades. "Never have I seen such weather in the spring and summer months," he added.

"I used to gather 200 boxes of cherries annually. But this year, the count stands at a mere 25 boxes. The untimely heavy rainfall in the past two months caused extensive damage, leaving me with piles of ruined cherries. How do I pay the four labourers I employed in my orchard," he worried.

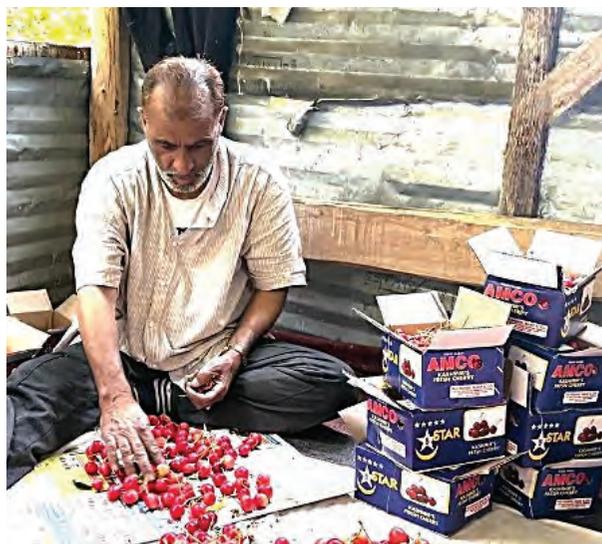
Horticulture is the mainstay of Kashmir's economy with about 3.3 million people in the Valley being directly or indirectly involved in the sector. It contributes over eight per cent to the Gross Domestic Product (GDP) of J&K.

More than 338,000 hectares of land is under fruit cultivation in the Valley. Of this, about 1,149 hectares of land is under cherry and 8,133 metric tonnes of the fruit was produced during 2021-2022. Apart from J&K, cherry is produced in the neighbouring state of Himachal Pradesh.

Cherries thrive in the Kashmir region due to its moderate temperature, and Dara village has the perfect terrain for the fruit's cultivation.

"With a four-decade-long association with cherry production, I have witnessed many seasons come and go, but this year's rainfall proved to be devastating. Despite the initial promise of a bumper season, the downpour ruined the prospect within minutes, leaving our Australian cherry variety damaged beyond rescue," said Haji Mohammad Akram Bhat from Dara Village.

Cherries are sensitive to extreme weather conditions and require a moderate temperature for optimal growth. They cannot withstand heavy rains or high temperatures, and their season commences from May 15 and lasts until June 25 making it crucial to gather the fruits before this date



Horticulture is the mainstay of Kashmir's economy with 700,000 families directly or indirectly associated with the sector.

before they rot.

"In a typical year, my orchards yield around 3,000 cherry boxes, but this season, I will barely get half the production. Now, I face the daunting task of carefully bringing the fruits down from the trees and painstakingly sorting the salvageable ones. This additional labour cost adds to our woes," said farmer Akram Bhat.

An employer at the horticulture department helped him source grafts of exquisite Australian cherries. "I take pride in being one of the few in Kashmir to possess around 15 trees of this exceptional variety. It's disheartening, though, that despite the soaring market rates, we find ourselves without any products to offer," he rued.

Maqbool had similar concerns. "Among the various cherry varieties grown here, Double and Italian cherries have always been produced in abundance. Today these cherries command high market prices, with a single box selling for 200 rupees. However, despite the soaring demand and

lucrative rates, we have no production left to sell," he lamented.

According to the Director of the Meteorological Department of Jammu and Kashmir, Sonum Lotus, "Kashmir has experienced unusual weather patterns during April and May months. Contrary to the typical transition from spring weather with decreased rainfall, this year witnessed frequent Western Disturbances, leading to above-normal precipitation."

According to Lotus, J&K and Ladakh collectively received 113 millimere (mm) of average precipitation in April against a normal of 99.5 mm – registering an increase of 13 per cent. From April 28 to May 4, J&K recorded 59 mm rainfall, some 70 per cent above normal.

On May 8, there was the highest 24-hour rainfall in over a decade in Qazigund (50 mm), Kokernag (62 mm) and Banihal (40 mm) in J&K.

Additionally, as temperatures gradually rose during this transitional period from winter to spring, localised thunderstorms and hailstorms became more prevalent, posing a threat to agriculture and horticulture including cherry production.

Mohd Amin Bhat, the Director of Horticulture Kashmir said that while cherry cultivation is widespread in various parts of Kashmir, the majority of the cherry production comes from Ganderbal district, which fortunately remained unaffected by the recent hailstorm.

However, in certain areas of Srinagar and Baramulla some cherry varieties were at the ripe stage when the hailstorm struck the crops last month, Bhat said.

But he still expected that there would be a bumper crop production this year, with an annual yield of 22,000 metric tonnes of cherry on 3,000 hectares of land.

"Due to the hailstorm, farmers cannot employ fungicides on cherries that are in the ripening stage. However, in areas where the fruit has not yet ripened, farmers can use calcium chloride spray to prevent cracks, excluding the harvest period," he said.

The horticulture department has included the cherry crop under the Revised High-Density Plantation Scheme and aims to expand the cherry cultivation area with new varieties. This scheme will facilitate the extensive promotion of cherries.

Bhat said that the government was extending transportation and marketing support to the farmers. "We are currently marketing the early season fruits and offering a 25 per cent subsidy to farmers when transported by air. We are also planning to collaborate with entrepreneurs for marketing initiatives," he said.

The department has introduced air-conditioned refrigerated vans to ensure timely transportation of fruits to the mandis (markets), and provisions have been made in this year's budget for this purpose.

In an effort to minimise waste of the fruit, the horticulture department has engaged in discussions with growers regarding the marketing of C-grade cherries, which can be utilised for juice production. "We will provide the necessary materials to ensure that these cherries are utilised effectively and not wasted," assured Bhat. ■

This story was published on 14 June, 2023.

STORY 41

Snail Invasion Destroys Soybean Farms In Maharashtra

Farmers in Latur, Dharashiv, Jalna, and Chhatrapati Sambhajinagar districts are the worst affected as snails are wiping off their soybean crops in a matter of hours.



The snails remain hidden below the ground during the day and come out after sunset. By the time the sun rises they have eaten their way through all the leaves of the soybean seedlings. PHOTOS: KOMAL JADHAV

KOMAL JADHAV

CHHATRAPATI SAMBHAJI NAGAR,
MAHARASHTRA

THOUSANDS OF snails in his 1.5 acre piece of land on which he was cultivating soybean has left farmer Vijay Ganpat Kanse, bereft. The 35-year-old farmer from Ramvadi Dhavlapur village in Maharashtra's Chhatrapati Sambhaji Nagar district is

at his wits' end wondering how he is going to recover from this blow.

"My wife and I have two daughters, and a son who all study at school. I have to look after my elderly parents. I have incurred huge losses," the farmer lamented.

"I planted soybeans in June and by July the snails had destroyed the saplings. I spent

Rs 25,000 on the crop. Had the snails not damaged my crop, I would have harvested 300 kilogrammes of soybean which would have been sold for Rs 150,000," he said.

Shridhar Gangaram Katkar, a 47-year-old farmer from the same village lost his crop not once, not twice but thrice. "I planted soybeans in June. The snails destroyed the saplings completely in July so I sowed the crop again which incurred an additional cost of Rs 4,000. That was also destroyed by snails. This is the third time I have sown soybean and it cost me another Rs 4,000. So far I have spent Rs 36,000 on the crop, and the third time too I lost it all," he said.

Thousands of farmers cultivate soybean in Latur, Dharashiv, Jalna, and Chhatrapati Sambhaji Nagar districts.

"Out of 497,232 hectares of soybean in Latur, 48,800 hectares are destroyed in the snail infestation," said Shivsamb Ladke, the district agricultural officer in Latur.

Udgir Taluka was the worst hit with 18,827 hectares destroyed. In Ahmadpur Taluka 18,300 hectares, in Renapur 1,600 hectares and in Nilanga Taluka, 1,260 hectares came under snail attack.

"After unseasonal rains, we did notice snails on the bunds in the fields, but though we took action, it was too little too late," he said.

"A total of 328,521 hectares of soybean was cultivated in Beed district, of which 476 hectares were infested. In Jalna, 203,739 hectares of soybean were planted of which 216 hectares of the crop was infested while in Chhatrapati Shivaji Nagar, of the 28,391 hectares of soybean 193 hectares were been chewed up by the snails," said RT Jadhav, joint director, agriculture depart-



Farmers in Latur, Dharashiv, Jalna, and Chhatrapati Sambhajnagar districts are the worst affected.

ment, Chatrapati Sambhaji Nagar.

According to him, Ambajogai, Kej, Patoda, Parli, Talukas in Beed were the worst hit while the Tuljapur area in Osmanabad was also bad.

"Snails remain hidden below the ground during the day and come out after sunset. By the time the sun rises they have eaten their way through all the leaves of the soybean seedlings. The fields look like they have been overrun by cattle," said Jadhav.

Continuous rainfall, high humidity (75 to 80 per cent) and temperatures that hover around 25 to 27 degrees Celsius are conditions that attract snails, said PS Neharkar, head of the department of entomology at the Parbhani-based Vasanttrao Naik Marathwada Krishi Vidyapeeth.

Though it has not rained all that much in Marathwada, the skies have been overcast, he added. "The snails have been infesting the crops for the last five years but this year has led to their population explosion. It is unprecedented the way the soybean crops have been attacked by the snails," he said.

Neharkar pointed out how Marathwada had been having good showers in the last three or four years. The moisture content in the soil and humidity is conducive to snail breeding.

In 2020-21, there were good monsoon rains followed by cold weather in December and January and then the high temperatures, and all the while the snails remained dormant in the soil. The snails proliferated in the rains before the Kharif season and attacked the crops.

“The early advent of the monsoons and prolonged rainfall proved to be ideal for the snails. The continued moisture in the soil for seven to eight months was perfect breeding conditions and their numbers went up,” Neharkar explained.

Snails live on the periphery of the land that has water accumulated on it. They are to be found in water bodies, stagnant water and moist soil. The entomologist said that snail eggs are usually present in farm equipment such as tractors, their tyres as well as the animals that work on the fields. And when it gets really humid, the snail eggs hatch and go on a rampage. They are at their most active in the four months between June and September.

“The snails should be collected and submerged in salt water. They die in saline solution and after that they should be buried. Also the periphery of the field should be kept dry with tobacco husk, dried ash, and limewater to ensure that snails from outside don’t enter the field,” Neharkar said.

There are more than 35,000 species of snails around the world while India is home to 1,450 species. The snails that have hit Maharashtra’s soybean farms

are multiplying in numbers exponentially because the species include *Lissachatina fulica* which is a hermaphrodite and every member of the species can produce eggs.

According to Nitin Patange, a Chhatrapati Sambhaji Nagar-based entomologist, each snail can produce as many as 100 eggs in moist soil in the first year.

“In the second year, they can produce 500 eggs. The snails can live up to six years and can stay in the sub-terrain for three years. When the temperature rises above 15 degrees Celsius, they come out of the ground and can start reproducing again,” Patange said.

Research is presently underway at the divisional laboratory of the institute to counter the invasion of snails in the state. “The research is analysing the effects of various organic and chemical pesticides on the snails. Since, it is a recent challenge in the state, we are trying to come up with a permanent solution at the earliest,” he said.

Meanwhile, the state government hasn’t announced any compensation for the losses suffered by farmers due to snail infestation. Last year, funds worth Rs 9.8 million were released as compensation to the farmers.

Last year, according to the state agriculture department, 72,491 hectares of soybean farms were damaged by snails. Tukaram Mote, the director of agriculture department said that in Pune, this year, the state government under its Crop Pest Surveillance and Advisory Project (CROPSAP), has announced an assistance of Rs 750 per hectare for the cultivators. ■

This story was published on 25 August, 2023.

STORY 42

The Fading Fragrance of Desi Betel Leaves in Munger

Increasing drought-like conditions are shrinking betel leaf cultivation in Munger district of Bihar and farmers fear that soon the famous paan leaves of Munger will be no more.



Can paan be a thing of the past? The erratic weather and falling incomes are definitely making its cultivation difficult. PHOTOS: RAHUL JHA

RAHUL JHA

NOT MORE than 15 years ago there were about 1,000 families engaged in cultivating or trading in paan leaves (betel leaves) in Patam village in Munger, Bihar. "Our paan travelled as far as Jharkhand and Uttar Pradesh, but now we are hard

pressed to sell them even in our own district, and there are barely 13 odd farmers who cultivate paan," said Amar Chaurasiya, a 57-year-old from Patam village in Jamalpur Block.

Patam in Munger district was famous for its Sanchi, Kapoori, Bangla and Maghai varie-



Droughts in villages of Bihar have severely impacted the paan cultivation and hence the livelihoods of the farmers.

ties. But, paan farmers fear the cultivation of the paan leaf may become a thing of the past very soon.

Shivnath Shan from Patam had a disastrous year in 2022. "I cultivated paan in two bighas of land and 40 per cent of my produce went bad because of a drought," he said.

"I had a loss of more than Rs 50,000. Farmers had to pay about Rs 150 an hour to use pumpsets. And, to water one bigha of land it takes about seven to eight hours. Which means an expense of anything between Rs 700 to Rs 900 a bigha. And, despite that, we could not save our crop," Shah said.

According to Bihar's agriculture department, in 2022, the state had declared 7,841 villages in 11 districts as drought-hit. Munger was one of those districts.

"For the paan crop to flourish, the temperature should not go beyond 40 degrees [celsius] though it routinely touches 45 degrees and more in the summers. The cycle of rain and sunshine has completely gone awry," said Kailash Chaurasiya, a 72-year-old farmer from Patam.

According to him, the westerly winds that were only occasional have increased during both summers and the winters and has adversely affected paan cultivation.

"Now there is no ideal time left to grow paan. Besides, the paan plant has to be looked after like a child and cultivating it is labour intensive. There was a time when the farmers from this village got farm labourers from other places. Now there is not enough work for the farm labourers in this very village," Kailash Chaurasiya said.

If the paan is sown in March, it is ready for harvest in August. It is a six month-

cycle, explained Vijay Chaurasiya, another Patam farmer. Adding, "Each plant yields paan leaves for five years. And the expenditure on each bigha of land is about Rs 4,000."

"There was a time when many varieties of paan grew in our village, now only the Bangla and Maghai varieties are grown to a limited extent. The demand for these varieties have also gone down," Vijay said.

That was because there was more demand for hybrid varieties, despite the fact that they were not as tasty as the indigenous varieties, he said. "It is not that less people are eating paan these days. The fact is hybrid varieties have taken over. While the local varieties of Sanchi, Kapoori and Bangla grown in Patam and Munger area are more fragrant and grow well in the hilly soil of the region, they are labour intensive," explained farmer Vikram Kumar.

They need help in the form of grants, the farmer said. If that happens, the paan cultivation may revive. But so far, farmers have received no help of any kind, he said. "Most of the farmers have given up the cultivation of paan as they have run out of money to irrigate their crops and keep them safe from pests," he added.



In 2020, the government of Bihar had started a scheme that would provide a grant of up to Rs 4 lakh each for paan farmers. In Patam, just one or two villagers have received the grant.

started a scheme that would provide a grant of up to Rs 4 lakh each for paan farmers. In Patam, just one or two villagers have received the grant.

"My father Rajkumar Chaurasia, received the grant of Rs 4 lakh in 2021," said Rahul Kumar. "But it is only a handful of farmers in Patam that have received this grant. It should be made available to more farmers," said paan farmer Bikram Kumar.

"It will take some time to make the grant available to all the farmers, but we are doing everything we can to help out the paan farmers," assured Anil

Kumar, horticulture officer, Munger district.

Shailendra Kumar, a researcher at the Pan Research Centre, Islampur in Nalanda district in Bihar, sounded a note of optimism. "Bihar has begun production of oil from the paan leaves to be used for medicinal purposes. Very soon the farmers in Munger and other districts will be included in the project, and work is underway," he said.

It takes a huge volume of paan leaves to extract the oil and as a result the oil is very expensive. According to him, the oil sells at approximately Rs 50,000 a litre, depending on the quality. □

In 2020, the government of Bihar had

This story was published on 14 March, 2023.

STORY 43

In Poll-Bound Madhya Pradesh, Sugarcane Farmers are Angry

Madhya Pradesh received so much rainfall in September that sugarcane fields were flattened and farmers have reportedly lost half their crop.



PHOTOS: POOJA YADAV

Acres and acres of sugarcane fields in Madhya Pradesh look battle ravaged.

POOJA YADAV

BHOPAL, MADHYA PRADESH

MADHYA PRADESH readies itself for the assembly polls on November 17. And, the government should be worried as they have to contend with disgruntled sugar-

cane farmers in the state.

A large number of them have lost their standing crops and suffered heavy losses. Acres and acres of sugarcane fields in Madhya Pradesh look battle ravaged. They lie on their sides, uprooted and rotting

slowly. Rats make short work of those that are still standing.

Hariom Agarwal, a farmer from Teentgaon in Neapanagar tehsil in Burhanpur district, is distraught as of the 15 acres of sugarcane he cultivated 12 are gone. "The intense rainfall in September caused some damage but it was the strong winds following the rains that completely destroyed the standing crop," he said.

"I have spent Rs 25,000 per acre of my sugarcane and what should have been a 400-quintal output will be no more than 200 quintals, that is if I am lucky," he added (1 quintal = 100 kilogram). The farmer complained that so far no one from the administration had come to assess the loss, nor was there any talk of compensation.

"Compensation should have been declared before the code of conduct came into effect. Farmers had hoped that the government would at least make an announcement about compensation, but unfortunately this has not happened. This will have repercussions in the elections and the farmers will not forget," said Surendra Rajput, member of Bharatiya Kisan Union, Narmadapuram.

On September 22, farmers from Khargone staged a protest demanding compensation for the damaged sugarcane crop. Kamal Patel, the state agriculture minister, advised them to put in an application for compensation and assured them that the needful would be done. But so far there has been no progress on the matter, the farmers said.

This year has been a difficult one. Things have been dodgy since June, when the



Farmers from Khargone staged a protest demanding compensation for the damaged sugarcane crop.

southwest monsoon arrived late and the expected rain did not fall. The following month in July there was a little rainfall that brought some relief. But August was hot and recorded one of the lowest rainfall ever.

In the drought-like conditions, the sugarcane, which is a highly water intensive cash crop, began to wilt and dry. Farmers had to irrigate their lands with the help of water pumps to keep their crops alive.

The unkindest cut were the torrential rains in September, followed by high speed winds, that laid low the crops in several districts including Narsinghpur, Chhindwara, Burhanpur, Betul, and Datia.

According to India Meteorological Department (IMD), Madhya Pradesh received a 'large excess' rainfall of 70 per cent in the month of September, the only state in the country to receive such heavy rainfall. As against its normal rainfall of 166.9 millimetre, it received 284.2 mm rainfall

between September 1 and September 30.

“This is the first time rains have damaged the sugarcane crop like this,” Mukesh Patel, a farmer from Imaliya village in Narsinghpur, said. His district received 46 per cent excess rainfall in September. Patel lost three out of his five acres of sugarcane. It is the same story with the neighbouring farmers too, he said.

“It rained so hard that for nearly eight days there was waterlogging that turned the fields into a quagmire. The strong winds made the damage worse. Had there been a pest infestation, I could have saved my crops by using pesticides and medicines, but I can’t make my fallen crops stand upright again,” the farmer lamented.

“The uprooted and broken sugarcane stalks are rotting and that is attracting wild boars that are then eating up the few intact sugarcane there is on the field,” said Shiva Rajput from Kareli village in Narsinghpur.

Mahesh Yadav of Barsali village in Betul district has similar complaints. His district received 102 per cent excess rainfall last month. “I planted sugarcane in five acres and more than half of it has gone. It is time to irrigate my land and it is going to be very difficult with the fallen sugarcane covering it,” the farmer said.

He was hoping to get about 350 quintals from his crop but now despairs if he will even get half of that. There are also fears of the smut disease in the sugarcane crop, which causes growth of fungus on the stalks. “There is also a caterpillar infestation that is eating up the leaves and stalks,” Yadav said.

The area under sugarcane cultivation

in Madhya Pradesh has been steadily increasing. In 2007–08, there were 77,730 hectares of sugarcane fields in the state. By 2013–14, the area rose to 144,000 hectares. At present, nearly 200,000 hectares of land in the central Indian state is under cane cultivation.

Sugarcane is considered to be a resilient crop that can withstand considerable vagaries of weather and is less prone to disease. It is a lot more profitable than maize, soybean, pulses, paddy, wheat, claim farmers.

But this year seems to be a bad year for the sugarcane farmers in Madhya Pradesh. BK Sharma, the senior scientist and in charge of the sugarcane research centre in Bihoni, Narasinghpur district, admitted there had been considerable damage to the sugarcane crops in the state.

“The farmers must drain their fields of water in time. Their plants should be in neat rows allowing the wind to flow through the rows without obstruction. They should also tie the sugarcane stalks firmly together and ensure they have sowed the seeds deep,” Sharma said.

“There is news of the crops also being affected by smut disease and red root disease, and using pesticides is the only option now,” the senior scientist added.

While farmers complained that they had heard nothing about compensation, Dayaram Avasya, the tehsildar of Nepanagar tehsil in Burhanpur district, said, “The damage incurred by sugarcane farmers in this district will be assessed and they will be compensated accordingly”. ■

This story was published on 10 October, 2023.

STORY 44

Fresh Trouble For Paddy Farmers in UP As Rain Damages Ripened Crop

First it was insufficient rainfall that hampered the sowing of paddy and in October when it was ready to be harvested, heavy rainfall damaged the standing crops.



Farmers who were able to sow their crops on time in July have suffered the heaviest losses because their crop had ripened. VIRENDRA SINGH

**VIRENDRA SINGH &
RAMJI MISHRA**

BARABANKI & SITAPUR, UTTAR PRADESH

THOUSANDS OF farmers in Uttar Pradesh did not get a wink of sleep on the night of 16 October. They stayed awake but were

helpless as they waited for daybreak to assess the damage to their paddy crop in the unexpected and torrential rains that lashed their villages.

When Janardan Verma, a 50-year-old farmer from Barabanki district, went to



“I shouldn’t have cultivated paddy at all. My only hope now is to recover the money I spent on it. There’s no possibility of profits,” says Janardan Verma, a 50-year-old farmer from Barabanki district.

inspect his 10 bighas (2.5 hectare) of land the morning after the storm, he found one third of his standing crop gone.

“First there was inadequate rainfall when I sowed paddy in July–August. I spent twice the amount of what I should have on irrigating my lands. I spent Rs 20,000 on the diesel pumps. My expenses on pesticides increased because infestations increase if there is insufficient rain and the temperatures are high. And now, this,” he said.

Heavy rainfall damaged ready-to-harvest paddy crops across the state. According to the Economic Survey Report 2022–23, Uttar Pradesh produced 15.27 million tonnes of rice and was only behind West Bengal which recorded a production of 16.76 million tonnes of rice.

“I shouldn’t have cultivated paddy at all.

My only hope now is that I can recover the money I spent on it, there’s no question of profits at all,” Verma added.

According to the India Meteorological Department (IMD), Barabanki recorded a rainfall of 13.5 millimetres (mm) from 8:30 am on October 16 to 8:30 am on October 17. This precipitation is 3,281 per cent more than the normal rainfall (0.4 mm) for the district. The Lucknow centre of IMD had issued alerts for thunderstorm, rainfall and squalls for October 16 and October 17. Some farmers said they had received message alerts on their mobile phones but could do little about it.

“We do not have the technology to forecast weather but once we receive such alerts from IMD, we pass it on to the farmers as much as we can. We get the announcements broadcast on radio stations or try



Uttar Pradesh is the second largest producer of rice in India.

to send announcers to the villages who use loudspeakers to alert the farmers,” said Rajit Verma, the agricultural officer in Barabanki.

Meanwhile, in Ayodhya district, Anil Verma, a farmer and district leader of Bhartiya Kisan Union Tikait, feared the heavy rainfall would hamper the sowing of the winter crops as well.

“There is too much moisture in the soil now. There are fields which are submerged in water. It will take a long while to drain the fields and make them ready for the rabi [winter] crops like maize and wheat. The late sowing of these crops will also affect their productivity,” Anil Verma said.

Some farmers had already harvested their crop but those are in danger of rotting if they are not dried properly before being transported to the nearest crop procurement centre.

Mohanlal, a farmer from Bahraich’s Barvaliya Bibipur village was at his wits end. “How do I dry it? There is no facility

to dry the produce. The paddy seeds will start germinating soon and the grain will be ruined. I had harvested half of my crop spread over six bighas of land,” he worried. “Not only is my standing crop destroyed but also the crop which was harvested and was lying out to dry is about to rot,” he said.

“The paddy crop has flattened and if the weather doesn’t improve in the next few days, my entire crop of five bighas will be ruined. I am praying for sunlight in the next few days for my paddy to dry,” said Shiv Prakash Singh, a resident of Chaandpur village in Sitapur district. “The storm was so great that three trees on my field fell in the rain,” he said.

Hail storms have devastated the farm of Rahul Mishra, a paddy farmer from Kullahi village in Hardoi district. “The grains have fallen from the standing stalks, and those who were able to sow their crops on time in July have suffered the heaviest losses because their crop had ripened,” he said. ■

This story was published on 17 October, 2023.

SOLUTIONS STORIES



THERE IS no sweeping climate change under the carpet. It is in our face, a thorn on our side and a cause of much despair the world over. However, where the vagaries of climate change are most felt, people have taken it upon themselves to deal with it as best as they can, and with surprisingly gratifying results.

Many times it is time tested, ancient practices that farmers have resorted to. Whether it is in Karnataka or Kashmir, ancestral wisdom has proved to be the best way forward. These are simple, inexpensive, environmentally friendly and easy to implement measures that have worked wonders.

So, in Rajasthan, centuries-old beris or humanmade tanks are taking care of water needs in the scorching desert state, while humble grass-huts keep the inhabitants there safe and cool; in Karnataka claypots have come to the rescue of farmers who struggled with enough water for irrigation.

People are looking back in time for solutions. Where concrete has failed, the humble clay has brought relief, where

electricity is insufficient, the energy from the sun is being harnessed...

Necessity is the mother of invention and miraculous things are happening in the land. Where there is drought, roses and strawberries are being coaxed to grow; apples, once considered the preserve of Himachal Pradesh and Kashmir, are now flourishing in the hot plains of Varanasi; millets that were disdained as rough peasant fare, is now being promoted and grown again as a nutritious food grain.

At the grassroots level, scientists and farmers are putting their heads together to come up with resilient solutions to problems created by climate change. There is a priceless cache of ancient knowledge in the land that is offering up sensible, cost effective and sustainable measures to adopt.

This, when married with the strides made by science and technology is having positive repercussions. There are solutions to all problems, they just need to be sussed out and that is what people who have been driven to the wall by climate change, are doing.





A solar revolution is underway in Bundelkhand, where farmers are switching from traditional irrigation pumping sets to solar-powered pumps and improving their livelihoods and crop health. PHOTOS: GAON CONNECTION

STORY 45

A Solar Buzz is Taking Bundelkhand by Storm

Farmers are switching from traditional diesel pumpsets to solar-powered ones that irrigate their fields at the press of a button and save thousands of rupees in diesel costs.

AISWARYA TRIPATHI

MAHOBA, UTTAR PRADESH

AT 6 AM every day, Laxmi Devi hurries to her field of jowar (a millet) to irrigate it. All she needs to do is press a button on her recently installed solar irrigation pumpset, and a gush of water flows through her farm. Tindaoli village in Bundelkhand, Uttar Pradesh where Laxmi lives is notorious for recurring droughts, but since February this year, after she got her solar pump, the 45-year-old

farmer has breathed a little easier.

A solar revolution is underway in Bundelkhand, a region spread across Uttar Pradesh and the neighbouring Madhya Pradesh. Irrigation pumps that run on solar energy are penetrating deeper into rain-deficient villages, helping farmers like Laxmi even grow an extra crop and irrigate their fields on time.

Abhay Singh Yadav, Deputy Director Agri-

culture, nodal head of Department of Agriculture in Mahoba said that solar pumps have a lot of scope in Mahoba district. “On my field visits, I met farmers who said if the solar pump was not there, they would have sold off their land,” he said.



Indresh Rajput was just a step away from selling his five bighas (0.7 hectares) of land

in Chandpura village of Mahoba, in frustration. “This land was lying unused. I borrowed water from another farmer, and invested in diesel to irrigate the land. I had to share half of my produce and was left with nothing. I was left with about Rs 25,000 in a year. How would that suffice for anything,” he asked.

Indresh said he spent about Rs 10,000 on irrigation to grow 20 quintals of wheat, and his crops usually remained under-irrigated, resulting in low productivity. But the three-horsepower solar pump has changed things dramatically. Thanks to his investment of Rs 68,400 on the solar irrigation pump (SIP) in 2019, he is not only able to irrigate his field but also provide irrigation water to neighbouring farmers at the rate of Rs 600 per bigha. His yearly profits are expected to now cross a lakh of rupees.

In March 2019, the Union government launched PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) in order to do away with diesel in the farm sector, provide water and energy security to farmers, increase their income and curb environmental pollution.

Laxmi Devi sits on a charpoy while her fields get irrigated using a solar pump, in Tindouli village, Mahoba, Uttar Pradesh.

Under the central scheme, the beneficiary gets a 60 per cent subsidy (30 per cent each by the Centre and the state). The farmer has to bear the borewell cost, over and above the remaining 40 per cent share.

In Uttar Pradesh, the government has focussed on seven districts that fall in the Bundelkhand region – Chitrakoot, Banda, Jhansi, Jalaun, Hamirpur, Mahoba, and Lalitpur. These districts have acute water shortages and residents have been known to migrate from there in search of livelihood.

Since the launch of the PM-KUSUM, 219,674 solar irrigation pumps have been installed in India till April 30, 2023. In Uttar Pradesh, 20,683 SIPs have been installed of which 5,589 are in the seven districts of the state that fall in the Bundelkhand region. Mahoba district has 1,304 solar irrigation pumps. Rajasthan has the highest number of SIPs (59,161) followed by Maharashtra (51,905).

In the month of May, when post the harvesting of winter crops most fields lie dry and brown. They have been left fallow to recover for the next crop cycle. But Indresh



Parmeshwari Dayal, a farmer in Chandpura, Mahoba demonstrates how the water gushes through the pipes, with just a press of a button.

Rajput of Chandpura village is growing vegetables on his land and crimson tomatoes peep through green foliage.

For Swami Prasad Rajput his five horsepower solar motor pump that he installed in March this year has yielded marigolds and roses in his 15 bighas of land in Chandpura village.

“I used to spend Rs 50,000 on diesel in the summer months. The solar pump has eased the burden,” said 72-year-old Swami, who borrowed money to get the solar pump installed in his field.

Lamora village in Jaitpur Block, which lies about 48 kilometres from the Mahoba district headquarters, has 88 sanctioned solar irrigation pumps, the highest in the district.

One reason for this is the proactiveness of Swami Prasad who handles the Jan Suvidha Kendra in the village. Documentation work to avail a solar irrigation pump through PM-KUSUM is elaborate, and Swami is quick to generate the maximum number of tokens

under the government’s Pehle Aao, Pehle Pao (first come, first serve) model.

Khoobchand Raikuar, a 32-year-old farmer who owns 10 bighas in Lamora village, already has a three-horsepower solar powered pump. He wants to apply for another five-horsepower one. “I have already saved the money. I am just waiting for the slots to open up,” he said, adding how he was saving up to Rs

25,000 a year he otherwise spent on diesel.

Dheeraj Yadav too is looking forward to making a switch to solar-powered pumps to help him irrigate his 20 bighas of land. “Electricity supply is erratic. My 68-year-old father and I have to take turns to irrigate the land through the night. Solar can solve this for us,” he said.

But there is a downside to the proliferation of solar pumps, said Shilp Verma, a Senior Researcher, Water-Energy-Food Policy at International Water Management Institute. “If a large number of solar pumps are installed then it might lead to groundwater exploitation,” he worried.

There has to be a groundwater source in order to avail the KUSUM scheme. In 2022, the Central Groundwater Board (CGWB) categorised the Kabrai block in Mahoba district, where Indresh lives and farms, as ‘semi-critical’ in terms of subterranean water reserves. A region is ‘semi-critical’ if the annually extracted groundwater is more than 70 per cent, and less than 90 per

cent of its total extractable groundwater annually.

As recorded in 2022, out of 0.28 billion cubic metres of annually extractable groundwater, Mahoba extracts 0.26 billion cubic metres (BCM). That's 91.91 per cent of groundwater extraction out of the total extractable groundwater. An NOC to certify the presence of groundwater is required from the district-level groundwater department to apply for the SIP, but it doesn't have any depth limitation.

"We survey the land for which the farmer needs the certificate. If the water is present, the NOC will be made available, no matter the depth of water," said Akshay Kumar, Hydrologist, Groundwater Department, Jhansi, Uttar Pradesh.

According to Abhay Singh Yadav, Deputy Director Agriculture, nodal-head of Department of Agriculture in Mahoba. "A major challenge is the absence of maintenance at the local level and lack of insurance of solar panels against natural calamities."

Bhagat Singh Rajput from Chhikahra village in Kabrai block owns two hectares of land and is reaping the benefits of owning four solar pumps. But he faced a serious problem when a storm blew down three of his solar panels. "I tried the toll-free number (for maintenance) and registered the incident but they said they don't warranty the panels against any natural calamity."

Bhagat Singh complained that he suffered a loss of Rs 50,000 because the panels

were destroyed, and spent an additional Rs 10,000 in running around to find a solution. In Supa village of Charkhari block, Badri Prasad Tiwari, who owns eight bighas, was none too happy either.

"I was the first one to get it installed in 2018. It worked well for two years. Suddenly, one of the plates caught fire at night. I was promised a replacement if anything went wrong within five years," he said. But nothing has happened and the 72-year-old farmer is frustrated. His crops were not irrigated on time in 2021, which meant a loss of more than a lakh.

"I am dissuading anyone who wants to register for a solar pump in the village from doing so. I plan to sell off my plates and recover some money," the farmer said.

Yadav from the agriculture department said the firm responsible for setting up SIP in Mahoba on July 11, 2022 was apprised of the situation. He complained again on August 31 last year. There was no response.

On September 14, Yadav wrote to Ramesh Chauhan, in-charge of the Solar Cell in the Department of Agriculture, about the inconvenience caused to farmers and non-responsive behaviour of the private solar installation company Premier Energies Limited. Eight months later, there still has been no response. Mails have been sent out to Premier Energies Ltd but there hasn't been a response yet. ■

A major challenge is the absence of maintenance at the local level and lack of insurance of solar panels against natural calamities.

This story was published on 26 May, 2023.

STORY 46

Growing Ber in Barabanki

Farmers in Barabanki district, Uttar Pradesh are delighted to grow varieties of ber (jujube) on land that was considered unfit for cultivation.



Abhishesk Dheeraj Singh has been cultivating the ber for a year now. PHOTOS: VIRENDRA SINGH

VIRENDRA SINGH

BARABANKI, UTTAR PRADESH

BEFORE 2021, Abhishesk Dheeraj Singh, a 40-year-old farmer in Baisan Purwa village in Barabanki, Uttar Pradesh left his 30 hectares of land untended after he paddy harvest in May–June. “After the harvest, my land was fallow and nothing else would grow on it,” Singh said.

But when he was on a visit to Rajasthan in 2021, he saw how a variety of ber (jujube)

fruit grew well in what looked like land similar to his back home. He also found out that the soil there had the same pH balance as the soil on his land.

“This was good news. I consulted some agriculture scientists and decided to cultivate ber,” he said. It has been a year and Singh is a happy man. “Each plant is producing 10 kgs to 15 kgs of fruit. And, I learnt that each plant, once it assumes its full size in 15 years, can yield up to 150 kgs. Bers continue to fruit for 35 years,” Singh



The total cost of cultivation is around Rs 1,000,000 while the makes an annual profit of Rs 2,000,000 to Rs 2,500,000.

explained.

The farmer had ordered the ber saplings from Kolkata at Rs 50 per plant. The total cost of cultivation is around Rs 1,000,000 while he makes an annual profit of Rs 2,000,000 to Rs 2,500,000, he said.

“If more farmers cultivate fruits like Thai apple ber, apple ber, and sundari apple ber, we will plan out a programme to support them financially,” said Ganesh Chandra Mishra, the district horticulture officer in Barabanki.

According to him, some state governments provide financial support to farmers growing crops like jujube, but not so in Uttar Pradesh.

Meanwhile, many farmers in Barabanki are keen to experiment with cultivating the jujube fruit. Abhishek Singh’s success inspired Mukul Gupta, to begin ber cultivation too. “I am arranging for funds to buy these plants and will soon start on a small

scale,” said Gupta from Shyampur village.

There are many reasons why a land becomes barren, said Sanjay Arora, chief scientist at the Hardoi-based Krishi Vigyan Kendra. “Some lands are barren by nature. Their mineral composition makes them unfit for cultivation. Excessive sodium content in the rocks in the area can make the soil infertile. Excessive irrigation also makes the soil infertile. When the water evaporates, it leaves behind a concentration of minerals in the soil that also renders the soil unsuitable for cultivation,” he explained.

The solution to this is to use gypsum in the soil. There is the Gypcal mobile app that the farmers can use to find out about how much gypsum their lands require. The farmers can get a pH test of their soils and enter the figure on the application. They will get information on how much gypsum that particular land needs. ■

This story was published on 6 February, 2023.

STORY 47

A Bed of Roses in Drought-Prone Solapur

Khandoba Farmer Producer Company has empowered farmers to grow roses in the semi-arid Solapur district of Maharashtra, and offers a minimum support price to buy roses.



385 farmers who are members of Khandoba Farmer Producer Company (KFPC), run by Agricultural Technology Management Agency (ATMA), have taken up rose cultivation in addition to traditional farming. PHOTOS: GAON CONNECTION

SHRINIVAS DESHPANDE

WADJI (SOLAPUR), MAHARASHTRA

MARUTIKAMBLE was cultivating soybean and jowar (sorghum) in his four-acre land. But in 2019, the farmer from Wadji village in Solapur district of Maharashtra decided to try something different and on half an acre of his land, he began to cultivate desi roses.

Ever since, the happy farmer has been

earning Rs 1.5 lakh profit annually. Now Kamble plans to bring the rest of his land under rose cultivation too and says that might help him earn as much as Rs 5 lakh as profit every year.

Soybean and jowar were not particularly profitable, Maruti said. "But now in rose farming we have a harvest every day and with it is the chance to earn money on a daily basis".



Ramesh Mhatre, a farmer from Wadji village, has taken up rose cultivation and found it to be better alternative to cattle farming.

Maruti is a member of the Khandoba Farmer Producer Company (KFPC), and one of the 385 other member farmers. The company was formed as a part of Maharashtra Agricultural Competitiveness Project (MACP) run by Agricultural Technology Management Agency (ATMA) in 2014.

The desi rose cultivation has led to another initiative by KFPC that set up a gulab jal project in Wadji village of Solapur.

Launched in 2016, the initiative provides Minimum Support Price (MSP) assurance to the rose growers in the village. The World Bank provided financial assistance of Rs 13.5 lakh. KFPC has capacity to daily produce 1,000 litres of gulab jal [rose water] through this project.

According to Vikram Phutane, assistant technology manager at Solapur's ATMA, "The Gulab Jal Project has provided some protection to the farmers, especially when

the markets are down. We provide technical support required for KFPC, and are confident this will double the income of the Wadji farmers." KFPC has also decided to make value-added products like gulkand.

"If the rose prices drop drastically to below twenty rupees a kilogram, the company purchases all produce at a fixed rate of Rs 20 per kilo to make gulab jal and gulkand," said Parmeshwar Kumbhar, chairperson of KFPC. This would not only save farmers during market crashes but also give them an opportunity to focus on value added products, he said. Kumbhar added that there are plans to manufacture incense sticks too.

Maharashtra Agricultural Competitiveness Project (MCAP) is a World Bank assisted project designed to increase productivity, profitability, and market access through agro related infrastructure and post harvest management techniques. MACP along with ATMA helped farmers like Maruti



A gulab jal project has been set up in Wadji village of Solapur producing 1,000 litres of rose water daily.

Kamble from Wadji village streamline rose cultivation strategies and establish backward and forward market linkages.

Maruti, and other farmers like him, attended several sessions facilitated by ATMA on modern agro-practices. During the lockdown there were video lecture sessions, provided by ATMA on the adoption of best practices of plant diseases and pest control. According to Ramesh Mhatre, another farmer from Wadji village, rose cultivation was a much better alternative to cattle farming.

“Farmers can easily earn a lot more with a lot less effort,” he said. According to him there is no other crop that gives the farmer an opportunity to earn for at least 320 days a year. “For many of us, growing roses has ensured an earning of anything from Rs 500 to Rs 2,000 per day,” Mhatre added. Roses bloom almost throughout the year, except during the pruning season.

Farmers such as Maruti and Mhatre claim that each acre yields anything between 50 kg to 100 kg of roses per day depending upon the number of bushes. Every day over 10 tonnes of roses valued at Rs 10 lakh are sold in Solapur market, the rates ranging from Rs 50-100 per kg.

The roses can be put to good use in Solapur that is home to many iconic temples like Swami Samarth Temple in Akkalkot, Lord Vitthal temple in Pandharpur, Shri Siddheshwar Temple in Solapur, Mata Tuljabhavani Temple in Tuljapur, Gurudev Datta Temple Gangapur Karnataka, besides several holy mosques, dargahs and revered tombs. This creates a huge daily demand for rose flowers.

KFPC has also taken upon itself to create awareness amongst people to stop wasting rice during wedding ceremonies. It has come up with an eco-friendly option of using rose petals instead. As part of its drive, KFPC provided free flower petals at several wedding venues for people to shower them on the newlyweds.

Chairperson Kumbhar is confident that this initiative too will help the cause of roses in the district. Ultimately, Kumbhar said, the intention was to convert Wadji into an agro-tourism spot. In the past year and a half, 250 school children have visited Wadji to see the roses grow in a drought-prone region. □

This story has been done as part of a partnership with NABARD.

This story was published on 4 February, 2023.

STORY 48

A Polyhouse Farmer is Making a Profit of Rs 5 Lakh per Acre

Anil Kamboj, an organic farmer in Karnal, Haryana, cultivates flowers, bell-pepper and cauliflower in his hi-tech polyhouse that is earning him considerable profits.



Anil Kamboj, a Haryana farmer, shifted from traditional open-field to polyhouse farming, now earning considerable profit. PHOTOS: GAON CONNECTION

SARAH KHAN

KARNAL, HARYANA

ANIL KAMBOJ was among the five farmers who were selected by Indian Council of Agricultural Research – Indian Institute of Wheat and Barley Research (ICAR-IIWBR) to go to Australia as a part of the collaboration with wheat farmers of the island continent.

While there, Kamboj was struck by poly-house farming widely practised there.

“When I first saw a polyhouse, I thought that only a rich farmer could afford to start something like this, and it was like a dream,” Kamboj, who visited Australia in 2010, said.

In 2011, Kamboj had a chance to turn that

dream into reality. “When the Haryana government came up with a scheme to provide a 65 per cent subsidy to farmers for setting up a polyhouse, I jumped at the opportunity,” Kamboj recalled.

Today, he cultivates flowers, bell-pepper and cauliflower in his hi-tech polyhouse and earns great profits. “Polyhouse farming changed the face of agriculture for me,” he said.

“Ever since I began working at the polyhouse, if I don’t make at least five lakh rupees from one acre, after paying for all the expenditure, I feel I haven’t earned anything,” he said. “Ten years ago, even if one saved Rs 10,000 it was quite an achievement. Traditional open field farming doesn’t really get us anything,” he declared.

Polyhouse farming involves building a covered structure of either glass or plastic. The translucent structure allows the farmer to grow plants in controlled environmental conditions. The polyhouse also shields the crops from a variety of external conditions that might cause significant damage to the crops.

“Under the Mission for Integrated Development of Horticulture, the farmers are provided with a 65 per cent subsidy for setting up a polyhouse,” said Manoj Kundu, joint secretary at Haryana’s Horticulture Department.

“To set up a polyhouse, a farmer is paid Rs 844 per square kilometre and the total ceiling is Rs 4,000 per square kilometre. There are close to 2,500 farmers who have benefitted from the subsidy ever since its inception in 2011-12,” the official added.

In 2011, The Centre of Excellence for



Polyhouse farming involves building a covered structure of either glass or plastic which allows the farmer to grow plants in controlled environmental conditions.

Vegetables in Gharaunda in Haryana’s Karnal district was established under the Indo-Israel agricultural project. The institute provides training to farmers, holds horticulture programmes, and distributes materials to them. Kamboj learnt about polyhouse farming here and subsequently switched from traditional cultivation of mustard, sunflower, cauliflower, bell-pepper etc, to polyhouse farming.

Along with two other farmers, Kamboj initially leased some land in Karnal’s Ladwa village, and experimented with growing various flowers and vegetables at the polyhouse. He later shifted his base to Kulri Khalsa village in 2020, and planted gerberas flowers in his polyhouse and then added cucumber and bell-pepper as well.

“I first ventured into horticulture and grew gerbera sticks which I would sell in the mandis of Delhi and Chandigarh,” Kamboj said. Kamboj, who practises soil-less farming, said that he set up his own firm under the name of Shiv Biotech and has transformed his polyhouse into a hi-tech nursery.

"I get orders from multiple farmers and companies that work with FPOs," the proud farmer said. The seeds that the farmers give him are sown in coco pith. "We maintain a conducive environment in our polyhouse for the seed to grow into a sapling and within three to four weeks, it's good to be harvested by the farmers," the 38-year-old farmer added.

"Crop diversification is important. Growing a single crop repeatedly can lead to the death of nematodes that play a beneficial role in soil," Kamboj added.

Kamboj's success has also helped him to expand his business and generate employment opportunities for people in the village. He employs seven people in his farm, two men and five women. The men are in charge of taking care of the infrastructure of the polyhouse and the women prepare the coco pith, transfer it into trays and carefully sow seeds in each cube, which is then placed in the polyhouse until the seed sprouts.

"I used to work as a labourer in other people's farms and didn't really have a decent source of income. My sister-in-law introduced me and I started working at the farm a few weeks back," said Manjeet Kaur. "There's a stable income and we are treated with respect which is usually not the case. I am also able to contribute to running the family which means a lot to me, especially now when the inflation is so high," she said.

According to Manoj Kundu, joint secretary at the Horticulture Department, "Availability of funds, involvement of all stakeholders, technology transfer to the farmers, setting up of adequate demonstration centres and development of design spec-

ification are the primary factors that have ensured the success of the scheme."

The farmers in Haryana have better access to resources and Haryana's government policies in this area are proactive and beneficial, said Anuj Kumar, the principal scientist at ICAR-IWBR, the main funding agency and promoter of wheat research in India.

While Kamboj is happy with his success, he shared that his transition from a traditional farmer to a polyhouse farmer wasn't very easy. The MIDH scheme of the government allowed him to avail subsidy but he had to rely on his family and friends to arrange for the initial investment of Rs 1,200,000.

"I was able to pay off the entire sum of money within a few years from my earning from the polyhouse. However, one thing which I really struggled with was the sale of my produce. I struggled for a year because of lack of awareness about where I could sell my produce," he recalled. Selling the produce is still a challenge, he added.

"To sell any product, one must have aggregation and quantity. Once the farmers organised themselves, they benefited as they started sending their produce together to Delhi and mandis of other states which fetched them good profits," he said.

"As suggested by our prime minister, if the farmers become part of FPOs and work together, it's an effective step which can also reduce transportation cost, especially when they are willing to sell their produce in a different state," Kamboj said. □

This story has been done as part of a partnership with NABARD.

This story was published on 2 February, 2023.

STORY 49

Sweet Tidings for the Strawberry Farmers of Bundelkhand

A number of farmers in drought-prone Bundelkhand region have switched from their traditional crops of wheat and oilseeds to strawberries and are earning profits.



Farmers in Bundelkhand, a region fraught with problems as chronic drought, are giving a chance to strawberry cultivation for additional income. PHOTOS: GAON CONNECTION

SHIVANI GUPTA

JHANSI, UTTAR PRADESH

FARMING IN Bundelkhand is fraught with problems such as chronic drought, delayed monsoons and depleting groundwater. Oilseeds, vegetables, and wheat are traditionally cultivated here, but in the recent past the strawberry is reigning big.

A number of farmers have switched from their traditional crops to strawberries. This is the outcome of a pilot project in collaboration with the district administration.

In November 2021, 25 farmers in Babina and Moth blocks of Jhansi district began to cultivate strawberries in 12.5 acres of land, with each farmer working on 0.5 acre.



The strawberry project had technical support from ICAR–Central Agroforestry Research Institute (CAFRI), drip irrigation support from the horticulture department, and financial grant NABARD.

And there has been no looking back with farmers growing the berries even in the peak heat of April in the drought-prone Bundelkhand.

“The soil here is not very fertile and water resources are also a problem. In spite of that we found strawberry farming offering farmers a potential boost to their income,” said Shailesh Kumar, Chief Development Officer, Jhansi.

The strawberry project had technical support from ICAR–Central Agroforestry Research Institute (CAFRI), drip irrigation support from the horticulture department, and a grant of five million rupees from National Bank for Agriculture and Rural Development (NABARD).

It was a leap of faith for many of the farmers. “Passersby are surprised to find strawberries growing in this infertile and arid area,” said Deepti Rai, a farmer from Babina block. She admitted that initially they were sceptical as well. “But we worked

hard, and got a bountiful produce,” smiled the 45-year-old.

“Even though we began sowing a little late, we have managed to earn two hundred and fifty rupees per kilo for our strawberries,” she added.

Rai, who traditionally grew wheat on her 4.5 acres of land, set aside half an acre to cultivate strawberries and plans to increase the area of cultivation next winter.

Strawberry is a winter crop traditionally grown between September and February when temperatures remain below 36 degrees Celsius. But these farmers in Jhansi have been able to grow them even in the scorching 45 degrees C temperatures in April.

According to the 2011 population census, Bundelkhand is home to around 18.3 million people, of which nearly 80 per cent reside in rural areas. Agriculture is the fundamental occupation of Bundelkhand that

covers a geographical area of around 70,000 square kilometres across Uttar Pradesh and Madhya Pradesh. It includes 13 districts including Jhansi, Lalitpur, Jalaun, Hamirpur, Mahoba, Banda and Chitrakoot in Uttar Pradesh; and Datia, Tikamgarh, Chhatarpur, Panna, Sagar, and Damoh in Madhya Pradesh.

According to Bhupesh Pal, district development manager, Jhansi, the maths has proven that strawberry farming is far more profitable than anything else the farmers have ever grown in the region. “While wheat earns them up to Rs 60,000 an acre, they have the potential to earn Rs 600,000 an acre from strawberries. This makes strawberry cultivation 10 times profitable,” he pointed out.

“Climate change is real. Heatwaves have increased food and nutrition insecurity, we have to think outside the conventional farming box of wheat and paddy cultivation to increase farmer income,” Pal said.

There is optimism at the outcome of the strawberry cultivation project. According to Ashok Yadav, scientist, fruit science, ICAR-CAFRI, “Generally, strawberry crops last till the end of February, but we have been successful in growing it till end April, despite the rising temperature in the region.”

Two varieties of strawberries – Camarosa and Winter Dow, have both done well, with good flavour, he said. “People are preferring this variety over what is available in the market, even though these are a little more sour. We want to study varieties that are sweet in taste,” he added.

So far, over 10,000 kilos of strawberries have been produced per acre in Jhansi. These strawberries were sold in local markets,



In the absence of cold storage units in Jhansi, farmers have to either sell the strawberries as soon as possible or process them into strawberry products.

krishi melas, and state programmes. The officials and farmers expect better sales in the region as people get more aware about the health benefits of the Vitamin C-loaded strawberries.

Bundelkhand is hot and semi-humid and instead of the 52 days of rain it should receive a year, it has rained only for 24 days a year according to a 2016 research paper titled Agro-climatic Region Centered Research and Development Planning. A little over 60 per cent of the area is cultivated, but compared to other parts of Uttar Pradesh, the sub-zone has less developed irrigation facilities.

Only about 25 per cent of the cultivated area is irrigated as against a state average of nearly 60 per cent. Soil erosion is high and land productivity is low. So growing strawberries here presented a challenge as they usually grow in hilly regions or where rainfall is more and the soil holds moisture. Bundelkhand fulfilled none of the above criteria.

“But we were successful in growing strawberries here, and it has proved to be a raam-

baan (profitable) for Bundelkhand farmers,” said A Arunachalam, director, ICAR-CAFRI, based in Jhansi. That is why we wish to get a GI tag for the Bundeli strawberries, so that the farmers too will benefit, he added.

Drip irrigation facility support from the government has helped farmers in the region save water for crops. Mulching helps save water from evaporation. Other plants, especially vegetables, were planted close to them to protect them from harsh sunlight. “Earlier, I would require gallons of water for wheat and vegetables and yet would not get good produce. With drip irrigation, I require less water and my farm is hara bhara even in this heat,” Shantilal Kevat, a farmer from Babina said. “Now I have enough water till June and July, and then monsoons will come,” he added.

Last year, Kevat said, his farmland was dry, scorched and bare after the wheat harvest. But, today it is lush with the growing strawberries. “I will forget about any other crop if I continue to get such good results from strawberries,” smiled the 62-year-old.

“The strawberry crops have the potential to boost farmer income. This would also have a long term impact in reducing migration in the region. Farmers can earn better and there would be no need for them to leave home,” said Shailesh Kumar Kumar, chief development project officer of Jhansi.

“We started with twenty five farmers last year, we will try to increase that number to five hundred farmers who will cultivate strawberries this year,” he added.

Bhupesh Pal, NABARD official from Jhansi, claimed that migration is already showing signs of coming down in the two blocks of Babina and Moth where farmers are

cultivating strawberries. “Farmers would only cultivate two crops, rabi and kharif, as they were dependent on rains. In this project, with drip irrigation farmers are cultivating three crops. This will keep them from migrating,” Pal said.

However, there are challenges, said Arunachalam, director of ICAR-CAFRI. “There are no cold storage units in Jhansi. Farmers will have to either sell the strawberries as soon as possible or process them into squashes, juice, jam, powder, etc. If we set up such units locally then a sustainable chain can be formed,” he said.

Arunachalam also said incentivising the farmers would go a long way in making strawberry cultivation sustainable. “Perhaps, the subsidy for drip irrigation can be increased, and inputs like saplings can be given for free to farmers,” he suggested.

The short shelf life of strawberries that can last for not more than three days without a cold storage is a challenge too. “There is no processing centre nor tissue culture labs here where saplings could be grown. These are necessary as buying saplings locally would be easier. We also need to set up cool chambers or vans to transport the berries to distant markets of Lucknow, Delhi, Kanpur,” scientist Ashok Yadav said.

“Villagers are selling strawberries through vegetable vendors locally. We are tying up with big companies who make processed foods. We are also trying to set up processing plants since it is a perishable commodity,” said chief development officer Shailesh Kumar, who hopes to scale up the strawberry cultivation in the district and benefit as many farmers as possible. ■

This story was published on 17 February, 2023.

STORY 50

Millet Cultivation in Vizianagaram, Andhra Pradesh, Gets a Boost

As many as 300 women from over 35 villages formed an FPO, and it plays an important role as an aggregator of millets and primary processor, and markets the products under the Brand name AROGYA Millets.



The millet movement gathered momentum through the collective effort of farmers, various government agencies and banks.

UDAYA KUMAR

VIZIANAGARAM, ANDHRA PRADESH

BOBBILI JANAKI from Veerabhadrapuram village in Vizianagaram district of Andhra Pradesh cultivates finger millet and foxtail millets on an acre of land. In another five cents of land (0.05 acre) she grows vege-

tables and some fodder. "I earn up to Rs 10,500 in a season. And, as I do not use chemical fertilisers, I save up to Rs 5,000," said the 29-year-old farmer.

Bobbili Janaki is part of a movement in the district to revive millet cultivation to help farmers achieve, among other things, food

security, fodder security, better health and nutrition, increased biodiversity, and soil fertility.

The movement gathered momentum through the collective effort of farmers, various government agencies and banks. However, the most important outcome of the movement was the formation of a women's Farmers Producer Organisation (FPO), in 2016. As many as 300 women from over 35 villages formed the FPO, and it plays an important role as an aggregator of millets, and primary processor and markets the products under the Brand name "AROGYA Millets".

The groundwork to set up the Arogya Millets Producer Company Limited (an FPO) was initiated in 2014-15, when a baseline data of 500 farmers was collected, along with details of their landholdings, the crops grown and their income.

The same year, the National Bank for Agriculture and Rural Development (NABARD) supported setting up 35 five millet farmer clubs, in as many villages. Community grain banks and seed banks came up and this enabled millet cultivation to gather momentum.

NABARD sanctioned Rs 2,000 annually to each of the farmer clubs for three years to help them organise biodiversity festivals at the village level, where farmers and government officials could meet and share knowledge of cultivation and ways of promoting the consumption of millets, attend training programmes, etc.

Thirty-year-old farmer, Vanumu Kanaka Maha Lakshmi from Chinnapalem Village said she has been cultivating millets on one acre of her three-acre land, since 2016.

"Our grandparents grew and consumed millets, but the next generation took to paddy. But, I re-learnt about the goodness of millets and how they were suitable for rainfed areas, and began to cultivate them again," she said.

The millets mission has also got support from Sabala, a local community-based organisation, which works for the empowerment of deprived women. The non-profit was working in Kothavalasa, L.Kota, and Vepada mandals of Vizianagaram district at that time.

Before the advent of the FPO, many farmers had migrated from the villages to look for better jobs, said Medapureddi Ramulamma, director, Arogya (FPO) from Cheedivalasa village. Those who stayed back switched from traditional food crops to growing casuarina and eucalyptus trees, she said.

"Real estate was booming and many agricultural lands were being converted into housing layouts. Added to that was shortage of rainfall and families were just giving up agriculture and looking for sundry jobs in towns and cities," Kommojula Saraswathi, executive secretary of Sabala said.

"People in the rural areas were dependent on markets for even leafy vegetables that were once grown in abundance," she added. But things changed for good.

"The volunteers of Sabala organisation convinced us that these trees were not good for the environment and asked us to cultivate millets. They took us to Pastapur village in Medak district for a field visit where the farmers were cultivating millets. Sabala also provided us with the seeds,"



The Andhra Pradesh government implements the Comprehensive Revival of Millets Programme to boost millet production and consumption. This approach can be replicated in water-scarce drylands to generate rural employment.

61-year-old Ramulamma said.

After several discussions with the farmers, Sabala initiated the cultivation of millets. Sabala's mission is to promote local production, local consumption and local procurement of millets to improve livelihoods of farmers.

Deccan Development Society, a non profit based in Hyderabad, that promotes millet cultivation, distributed millet seeds to farmers in the area and provided loans of Rs 5,200 per acre. Initially, 250 farmers from five villages in Vizianagaram came forward to grow millets in 200 acres of land.

Singampalli Vijaya Lakshmi, a 40-year-old farmer from Uttarapalli village, once grew only groundnut on her one and a half acres of land. But, associating with Arogya has changed all that.

"Now I grow as many as eighteen varieties of crops in our land. There are five kinds of

vegetables, five different millets, five varieties of pulses, mustard, coriander and other spices. What I grow supports our daily needs, and provides fodder for our cattle," Lakshmi said.

She said her input cost on farming had definitely gone down, and that the family was eating better. According to her, many of the farmers she knows not just cultivate millets to sell, but they also regularly include it in their diets.

"In a year, from two acres of land, a farmer can get about fifteen thousand rupees by selling millets, five thousand rupees from vegetables and five thousand rupees from flowers that are grown on bunds," she explained. Earlier, the income was inconsistent and insufficient, she added.

When the revival began, there was no marketing infrastructure nor processing facilities for the millets. Sabala purchased the finger millet and pearl millet the farmers



The millets project in Vizianagaram has also led to health benefits as these farmers have started consuming millets on a daily basis.

had grown, at Rs 5 per kilogram, in order to distribute some of the grains to poor families that were in need of help, and stored the rest in seed banks and grain banks, Saraswathi explained.

With the support of the Millet Network of India (MINI) formed by the non-profit Deccan Development Society, training programmes were organised for the farmers. They were made aware of how to add value to the millets and given technical support for organic solutions for fertilisers and pesticides. Through MINI, financial support was given to encourage more farmers to grow millets. NABARD also supported the project in a big way through the formation of the Joint Liability Groups (JLG).

According to P Harish, assistant general manager, NABARD, Vizianagaram, "Our initiatives are aimed at building an empowered and financially inclusive rural India through specific goal oriented departments." He said that the Joint Liability Groups (JLG) formed by the farmers had helped them become more productive.

Explaining what JLG was, the NABARD official said, "Five farmers from each village

form one JLG and together they get Rs 50,000 as a loan. This money is disbursed as loans of Rs 10,000 to each farmer in the group who can repay it in twenty instalments. There are 250 JLGs formed under Arogya that have received loans from three different banks."

Under the JLG, credit linkage facility was arranged with three banks – the State Bank of India, The District Cooperative Bank Limited, and Andhra Pradesh Grameena Vikas Bank. "This helps farmers procure seeds and other inputs from the market instead of depending on traders and money lenders," Harish pointed out.

NABARD also supports the JLGs by sanctioning agricultural loans, he said. NABARD supports 26 FPOs in Vizianagaram district and about 20 FPOs of them are involved in millet cultivation.

Usha Rani Ganthakuri, chairperson of Arogya FPO, said, "In 2016, Arogya FPO procured about five tonnes of foxtail millet and ten tonnes of finger millet. The following year, with the support of NABARD, links with self help groups were established for value addition of millets," Ganthakuri said.

This led to the making of finger millet biscuits and finger millet flour (made with 30 tonnes of finger millets procured from the farmers) that were supplied to tribal welfare hostel students to address malnutrition.

Before the FPO was formed, millet farmers had limited opportunities to market their produce. Traders and middlemen would come to villages and decide what price to pay the farmers, which was usually very low, and they purchased a very limited quantity of grain.

“Now, a procurement committee discusses the price and quantity of grains with farmers and mutually they decide and procure all the grain. The FPO is ready to procure all the millets produced,” Saraswathi said.

According to NABKISAN Finance Limited, a subsidiary of NABARD, the FPO has a share capital of Rs 959,000 and in 2019–2020, the revenue of the FPO was Rs 5.77 million. In 2020–2021 it reached Rs 5.5 million. NABKISAN has in addition, sanctioned Rs 7 million for strengthening the activities of the FPO.

The Arogya FPO has established an outlet for millet-marketing at Kothavalasa near Visakhapatnam. Up to 20 varieties of millet value-added products are now made available to the customers at this store. Millet Research Station in Vizianagaram, which is part of The All India Coordinated Research Project on Small Millets under Acharya NG Ranga Agriculture University, Andhra Pradesh certifies the nutritional values for the FPO’s millet products.

The District Co operative Central Bank, State Bank of India, and Andhra Pradesh

Grameen Vikasa Bank are lending money to millet entrepreneur groups for starting their units. The Girijan Cooperative Corporation, came forward to order millet biscuits and millet powder to supply their tribal welfare hostel students.

“The Andhra Pradesh Food Processing Society agreed to establish a millet processing unit with a project cost of Rs 4.06 crores at Rega village with the help of Arogya FPO. The project aims at strengthening the infrastructure for processing millets in the district and developing the millets value chain,” Saraswathi explained. The unit that is under construction should begin production in a few months. It will be operated by the Arogya Millets Processing Society and will provide employment opportunities to 240 people. “This initiative hopes to encourage more small and marginal farmers to take to millet cultivation for sustainable livelihood and earning enhanced incomes,” she added.

Last but not the least, the millets project in Vizianagaram has also led to health benefits. Vanumu Kanaka Maha Lakshmi, a millet farmer, said that she and her family have begun to include more millets in their diet and have never felt healthier. “Even during the pandemic time, we kept well. That’s so much better than making more money,” she smiled.

Meanwhile, the Andhra Pradesh government is also implementing the Comprehensive Revival of Millets Programme. This will lead to increased production and consumption of millets. So this concept can be replicated in water-scarce drylands of the state so as to create employment for the rural people. □

This story was published on 1 March, 2023.

STORY 51

Baniyatata Village in Bundelkhand Learns to Become Water-sufficient

Farmers built bunds in their fields to harvest rainwater, and this has seen an improvement in their groundwater reserves.



Three years ago, in 2020 a non-profit called Gramonnati, based in Mahoba launched water harvesting programmes in the village.

AISHWARYA TRIPATHI

IT IS unusual for Prem Vishwakarma to find time to sit peacefully in her verandah in Baniyatata village. The 35-year-old couldn't have imagined sitting down and doing nothing a few months ago. Back then, she had to make long treks to find a hand pump in the village, wait in long lines before she could fill a pot of water

and bring it home. She did this at least six or seven times a day.

"All I did all day was fetch water," Prem recalled. Her village is located in Uttar Pradesh's Mahoba district, which is a part of the notorious drought-prone Bundelkhand region in central India.

This summer, though, is different. The



Raju Yadav, a farmer who owns four bighas of land, has recorded a hike in yield.

handpump that is barely a stone's throw away from her home is still pumping out water. "Normally, it would dry up by the end of March. It is May and we still get water from it," Prem said.

Baniyatata has four wells and nine hand-pumps from where the villagers get their potable water. This year, all these 13 sources still have water even in the peak summer heat, something unheard of before. "Ever since we started medh bandi in our agricultural fields, water has been plentiful," said Prem.

Medh bandi refers to bunds in farmlands built to capture rainwater, raise groundwater level and increase soil moisture.

Three years ago, in 2020 a non-profit called Gramonnati, based in Mahoba launched water harvesting programmes in the village, which is located 235 kilometres from the state capital Lucknow. The project was funded by the Uttar Pradesh government under its initiative for 'Doubling Farmers Income in Bundelkhand region'. Gramonnati encouraged the villagers to adopt medh-bandhi, to retain rainwater in their fields.

"Building the medh prevents runoff and the

rainwater gets absorbed into the ground. This recharges the groundwater and also prevents the loss of the fertile topsoil from the fields," RP Mishra, a functionary of the non-profit, explained.

According to the Central Ground Water Board (CGWB), in 2022, the Kabrai block of Mahoba district, under which Baniyatata village falls, was categorised as 'semi-critical' in terms of subterranean water reserves in 2022.

Under the Jal Jeevan Mission, drought-prone regions of Bundelkhand and Vindhya-achal, spread across Uttar Pradesh and Madhya Pradesh, were identified as 'priority' and, an official announcement was made saying the villages in these areas were to get their tap connections by the end of 2022. But, Prem, and many others like her, still don't have a water pipeline connection in her house, making the functional handpump in the vicinity a boon.

Rajesh Tiwari, a 33-year-old farmer is pleased about the water situation too. "For a decade this handpump near my home had water only till around Holi (March). After that it reluctantly pumped no more than a bucket or two of water. How will two

buckets of water suffice a family of six? But, it's May and the water is still available," he said happily.

Tiwari used to carry his clothes to the fields to wash them using borewell water. "Then, I would fill water in cans and carry it in my trolley back home," he recalled.

Gramonnati identified five active farmers of the village to form a water committee that would educate fellow farmers of Baniyatala about the impact of medh-bandi on their agricultural produce as well as groundwater reserves.

"We held weekly meetings in the village and tried to convince farmers to adopt the bunds in their fields. The meetings went on for four hours sometimes. Many were reluctant at first," said Krishna Kumar, a member of the water committee.

But, with repeated awareness efforts, Baniyatala had 293 acres of land that now has medh-bandi. After the farmers came on board, the water committee ensured that the bunds were built. "The bunds were built keeping the tilt of the land in mind. The mud from the fields of the farmers were used to build a periphery which retained the rainwater and also prevented mitti ka katav (top soil run off)," Krishna Kumar, the water committee member said.

The bunds were constructed between April and June, in 2020 and 2021. The medh-bandi has led to a significant improvement in groundwater recharging. According to Manoj Mishra, in March, 2020 and March, 2021, on an average, there was an increase of 0.16 metres in the water level in the wells. The water level (measurement from the rim of the well to the point where water is available) decreased from 6.35 metres to

6.19 metres.

Three of the wells which were recorded as 'dry' in March 2020, had water in the same month of 2021. According to the post monsoon data, the wells on an average registered an increase of 1.17 metres of water. This was in September of 2020 and 2021.

In order to further enhance water conservation and prevent runoffs, the non-profit has planted tree saplings along the bunds, planted grass to be used as cattle fodder and built khet talaab (farm ponds) to store rainwater for irrigation purposes.

Another official of Gramonnati, Manoj Mishra, held regular kisaan goshti or farmer meetings in the village to discuss the problem. "Because of medh bandi work in my field, my production increased from three quintals of wheat per bigha [0.16 hectare] to eight quintals per bigha," said Chiddu Vishwakarma. The 45-year-old farmer who owns four bighas [0.64 hectare] of land, grows wheat as the rabi (winter) crop and, till last year produced three quintals of wheat per bigha.

While his earlier yield was enough to feed his family, this year Vishwakarma sold the extra five quintals of wheat for Rs 2,000 per quintal. The income of Rs 10,000 holds a substantial value for the marginal farmer who holds less than one hectare of land. "I am saving this money to build a home," he said.

Raju Yadav, a farmer who owns four bighas of land [0.64 hectare] has also recorded a hike in yield. "I used to get only five quintals of wheat per bigha, but now I get eight quintals, from the same land," he said. ■

This story was published on 4 May, 2023.

STORY 52

Harvesting Rainwater Saves the Day for a Tribal Village in Jharkhand

Water-strapped residents of Bara Gobindpur in Jharkhand turned to rainwater harvesting a decade ago and today, their village has water even through the gruelling summers.



The wells and hand pumps no longer run dry in summers because of the rainwater harvesting. PHOTOS: MANOJ CHOUDHARY

MANOJ CHOUDHARY

EAST SINGHBHUM, JHARKHAND

HARVESTING EVERY drop of rainwater that falls on their village has brought relief to the inhabitants of Bara Gobindpur.

Residents from the three wards of the tribal village in Khakdipara panchayat of East

Singhbhum district do not have to worry about water shortage as they have been harvesting the runoff for about a decade now. Even in the peak summer season, the village's drinking water sources do not go dry.

"It was not always like this," Devki Murmu, resident of ward number 7 of Bara



The water-strapped inhabitants of Bara Gobindpur approached the non-profit Tata Steel Rural Development Society (TSRDS) for help, and TSRDS set up the village's first water harvesting mechanism.

Gobindpur village, remembered.

"Our village had a couple of hand-pumps and the wells were the primary source of water in the village. Summers brought huge water scarcity for us. Two rivulets, Mahadev Nala and Lovbhanga Nala, were the other source of water, but they were highly polluted due to the release of industrial effluents into them," Devki said.

The inhabitants of Bara Gobindpur approached the non-profit Tata Steel Rural Development Society (TSRDS) for help, and it set up the village's first water harvesting mechanism. "TSRDS showed us how to harvest and store the runoff rainwater from the roofs of our homes," said Ram Chandra Soren of ward No 6.

Villagers were shown how the rain water from their roofs could be released through a pipe called dongi, into a small pit dug

beside the house. These pits were then interconnected through an underground pipe that eventually released the water into a nearby well that was anything up to 50 feet in depth, Soren explained.

Just by harvesting rainwater from the runoff from the roofs, the water situation in the village has improved with an increase in groundwater levels. "The wells and hand pumps no longer run dry in summers because of the rainwater harvesting we do. We get water from them throughout the year, and we do not have to look elsewhere," Soren said.

Hand-pumps and wells, situated up to a radius of 200 feet of the water recharge well (where rainwater is stored) have water all year through.

"TSRDS installed the rain water harvesting mechanism in 75 houses in three wards

of Ward No 5, 6 and 7 in Bara Gobindpur in 2013-14, and thanks to that nearly 150 households are benefiting,” said Devki Murmu. Those homes having old wells nearby were chosen for the water-harvesting project.

“Before rainwater harvesting, the water would just drain away into the open fields or roads and be of no use to us,” she said. The local residents, the gram pradhan and panchayat representatives contributed to maintain the rain water harvesting systems.

“There are altogether eight wards under Khakripada panchayat and residents of the other five wards should also have this facility. Industries should come forward like TSRDS did and help the villagers. The government should implement this throughout Jharkhand to maintain soil water level and preserve rain water from getting wasted,” Murmu said.

Krishna Hembrom, the pradhan of Khakripada panchayat, said that altogether eight wards come under his panchayat with about 400 families. Five of these wards come under Bara Govindpur village, and three in Khakripada village.

“Five years ago, the state government constructed three solar based water tanks called Jal Minar in the other two wards of Bara Gobindpur, to help them overcome water problems,” the pradhan said.

“In 2016, the Jharkhand government started a rain water harvesting project. Dobha or ponds were dug across the state. These did preserve rainwater and villagers used it for domestic and agriculture purposes. But lack of proper maintenance led to them becoming useless,” said Krishna Hembrom.



Though there are two rivers that flow near Bara Gobindpur, Gadhdha and adjacent villages, the waters of Mahadev Nala and Lovbhanga Nala rivers are not fit to use.

“But the residents of Bara Gobindpur have shown how it can improve the water situation and all other villages should follow rainwater harvesting.”

“There was a time when children would bathe at the confluence of the Mahadev Nala and Lovbhanga Nala rivers, and their water was potable. People could use it for irrigation and for their cattle,” said Rakesh Hembrom, a resident of Gadhdha village.

“Not any more. The water can’t be used to even irrigate our fields. The polluted river water damages the land’s productivity and kills the minerals in the soil that are needed for a healthy crop,” he added.

Rainwater harvesting has stopped dependency on using the polluted waters of the rivers. People now get clean water from wells and hand-pumps, and rainwater harvesting is the best way to recharge the groundwater, said Rakesh Hembrom. □

This story was published on 31 May, 2023.

STORY 53

Ancient Water Harvesting Systems Thrive in Desert Villages of Jaisalmer

In the inhospitable Thar Desert in Rajasthan, centuries-old water conservation methods meet the drinking water needs of villagers and their cattle.



Beria is an underground tank that collects every drop of rainwater which falls in its catchment and stores it for future use. PHOTOS: KULDEEP CHHANGANI

KULDEEP CHHANGANI
POKHRAN (JAISALMER), RAJASTHAN

FARMER DHANNARAM grows bajra, moong and cluster beans on his 50 bighas of land in Abasar, a desert village in Jaisalmer, Rajasthan. For the 38-year-old farmer and his 12 family members, their most precious possession is the beri on

their agricultural land, which meets their drinking water needs throughout the year, including the scorching summer heat of the Thar Desert.

Beri is an underground tank that collects every drop of rainwater which falls in its catchment and stores it for future use. It is a part of the ancient water harvesting



Villagers dig 60 to 70 feet into the sand, layer it with cement and ashes to make beria, ensuring a year’s worth of drinking water for themselves and their cattle.

systems that have evolved over centuries in Rajasthan where rainfall is scanty and water is a priceless resource.

“I have two beris that we call paar, and they provide us and our cattle with enough drinking water for an entire year,” said Dhannaram, whose village is located in Phalsund in Pokhran tehsil.

These ancient water harvesting systems, some of which were built 100 years ago, have stood the test of time and still work.

“A GLR (Ground Level Reservoir) was built by the water department near my home but the last time we saw water there was in 2015, after which it ran dry,” said the farmer, unlike the beri that always has water.

Hot and arid Jaisalmer district receives the least rainfall in the country, and summer temperatures in the desert district cross 47–49 degree Celsius. Therefore, it is not uncommon to see beris in and around agricultural lands in Phalsund.

Rajasthan is known for preserving its ancient wisdom of harvesting rainwater, and water conservation efforts of the communities who live in the water-strapped region. Rainwater harvesting has been a way of life for centuries and in many of the villages in Jaisalmer district, beris that were constructed more than 60 years old still function.

There are 400 homes in Prabhupura village in Phalsund tehsil. Each one of them has a beri to collect rainwater. “It is constructed over one bigha of land. We dig about 60 to 70 feet into the sand and layer the base with cement and ashes. We ensure the land slopes towards the beri so that any runoff rainwater collects in it and not even a drop goes waste,” explained Ashok Chaudhary of Prabhupura village.

“These days the beri is covered with a cement lid, but earlier branches of trees, dried grass, etc., were used to do so,” he added. “Four of the seven beris in my land were built before I was born.

We constructed the other three more recently,” said Chaudhary, who is 30 years old.

“The entire drinking water needs of my family is comfortably met by the water in these beri and in the case of a wedding or some function in any household in the village, we also share water with them,” said the farmer who farms on 500 bighas of land.



These days the beri is covered with a cement lid, but earlier branches of trees, dried grass were also used.

While the beri provide potable water for Dhanaram’s family members and their cattle, water for other uses in his house in Abasar village is brought by tankers from the Indira Gandhi Canal, Phalsund.

“We get water from there twice a month. Each tanker with about 4,236 litres costs us Rs 1,000,” the farmer said.

As per the rain gauge register maintained by the tahsildar in Pokhran, the beri ran dry between 2004 and 2006, because of severe drought in the area. As against the annual rainfall of over 200 mm (millimetre) in Jaisalmer district, in the drought year of 2004, the region received 80 mm of rainfall only. But, things improved and water began collecting again in the beri. In 2022, the rainfall was 354 mm, note the records.

As part of the Jal Jeevan Mission of the Ministry of Jal Shakti, pipelines were laid in all the villages in Phalsund. However, the water supply has reached only part of the way till Jeevrajagarh village. Villages beyond that such as Dhanaram’s village, Abasar, Bhurjgarh, Padampura and Prab-

hupura are yet to get piped water.

According to Radheyram Rewar, official from the Rural Development and Panchayati Raj Department, Pokhran Sub-division, currently, there are no government-backed water-harvesting programmes in the area. “Most of the beris made in Prabhupura village have been constructed by the villagers themselves. The community tanks and wells were constructed by gram panchayats and schemes such as the Jal Jeevan Mission.”

For the communities that make their home in the inhospitable Thar desert, water is life. Centuries old techniques of rainwater harvesting have been creating oases in the desert. Therefore, every generation passes on valuable information and knowledge on water conservation, to the younger generation. “We do not bat an eyelid if we spill ghee, but wasting even one drop of water is a horror unimaginable for us” is what people there say. □

This story was published on 5 July, 2023.

STORY 54

Bite into Crisp Apples Grown in Varanasi

Two farmer brothers in Varanasi district, Uttar Pradesh successfully cultivate sweet and crunchy apples that usually grow in much higher altitudes of Kashmir and Himachal.



The Patel brothers have successfully demonstrated how to grow apples in 40°C.

DEWESH PANDEY

VARANASI, UTTAR PRADESH

THE CRISP apples of Kashmir and Himachal Pradesh are now also grown in the hot plains of Uttar Pradesh. Brothers Radheyshyam Patel and Dashrath Patel who live in Bhatpurwa village in Sevapuri Block in Varanasi district, watched videos on YouTube put up by apple farmers in Kashmir and Himachal Pradesh, and decided to try growing the fruit in their village.

In 2019, they actively began to plan cultivation of apples on their three acres land.

“Until recently, we cultivated wheat and paddy. But with unpredictable weather patterns, we had considerable losses, and our expenses increased while profits plummeted,” said Radheyshyam.

So when he and his brother decided to try growing apples on their land, he procured 500 HRMN-99 variety of apple saplings from apple farmers in Himachal Pradesh,

and planted them on one acre, and in two years, they saw the fruits of their labour.

“Each tree yielded about 15 to 20 kgs of apples. And, we were now confident enough to continue with this,” said a jubilant Radheyshyam. They asked for another 500 apple saplings, this time from Kashmir. “We planted them too and just like our earlier batch of trees, this lot also gave us about 15-20 kgs of apples each,” said a jubilant Dashrath, adding that they had managed to grow apples in 40 degrees celsius.

The apples gained fame and this year, they sent nearly three quintals of apples to the Rajatalab fruit mandi in Varanasi. “We got about Rs 150 per kg for the apples, and even small store owners nearby began to buy from us directly to sell in their shops,” said Dashrath.

“Any farmer in Varanasi, Gazipur, Azamgarh, Baliya, etc, can grow apples,” said Awadhesh Narayan Singh, professor of Horticulture at Udai Pratap College, Varanasi. He reiterated that if the farmers kept a few things in mind, they too could grow apples successfully.

He said:

- The soil should be kept moist at all times
- The trees start flowering in January, and by February they begin to germinate
- In April the fruits are sprayed with calcium twice in order to make the fruits redder and sweeter
- The apples begin to ripen in May and by June 15, they are ready to be picked, sorted and sent to the markets to sell

“The apple farmers in Himachal Pradesh and Jammu & Kashmir told us that the trees would begin to bear more fruits in the next couple of years,” said Dashrath. For now,

each tree yields up to 45 apples. According to the brothers, the Varanasi apples are sweet and their peel is thinner than their counterparts from the mountain states.

Because the fruits are so sweet, they attract a lot of birds, and protecting the apples from the birds who peck at them is a challenge, said Dashrath. “We have to cover them with nets to save them from the birds and from people who help themselves to the fruits,” he smiled.

“Keeping the soil moist in the hot climate of Varanasi is the other challenge. Every third day we have to irrigate the land,” said Radheyshyam. Also, because theirs is the only farm where apples are grown in the region, the requisite pesticides and fertilisers are not easily available. “We have to order them from elsewhere or if anyone we know is travelling to Himachal or J&K, we ask them to bring them for us,” he said.

A team of horticulture scientists visited the farm of the Patels.

“What the brothers are doing is praise worthy. Our team of scientists have also been guiding them in their mission,” said Jyoti Kumar Singh, district horticulture officer. He added that in case any other farmers showed interest in starting apple cultivation, all help would be extended to them from the horticulture department.

“We are writing to the administration to see if the apple farmers can get financial support. We also plan to get in touch with agencies in Himachal Pradesh, and J & K to help us set up stores in Varanasi district, where fertilisers etc., for cultivating apples will be made available,” said Jyoti Kumar Singh. □

This story was published on 3 July, 2023.

STORY 55

Farmers in Jaisalmer on a Date with Israel

A Rajasthan government initiative led by the horticulture department has farmers in the Thar Desert cultivating dates.



It all started in 2008 when the horticulture department of Rajasthan government decided to set up a plantation spread across 100 hectares of land in order to cultivate date palms. PHOTOS: KULDEEP CHHANGANI

KULDEEP CHHANGANI

JAISALMER, RAJASTHAN

THE SEVERELY high temperatures and paucity of water do not allow farmers in Jaisalmer, Rajasthan to experiment too much with agriculture. But change is afoot. While the pearl millet has been the crop of choice and also the staple diet of the inhabitants of the arid Thar region, since 2008, date cultivation has brought much sweetness into their lives.

It all started in 2008 when the horticulture department of the Rajasthan government decided to set up a date plantation spread across 100 hectares.

“The saplings were imported from Israel which has a similar desert-like climate.

The climatic conditions of Jaisalmer, Barmer, and Bikaner have proven to be suitable for date production, The varieties that were brought here included Khalas,

Khadrawi, Khuneji, Barhi, Medjool, Sagai, and Ghanami,” said Mohit Kumar, agriculture officer of the Centre of Excellence for Date Palm.

“In 2022-23, there were 5,441 saplings of the date palms that were distributed amongst the farmers in Jaisalmer. A single sapling of date palm costs Rs 1,500 but the state government is providing 75 per cent subsidy, and each sapling of date is available to the farmers at Rs 375,” Kumar said.

Iqbal Khan, a 48-year-old farmer from Jaisalmer’s Pokhran procured the date saplings from the horticulture department’s orchard in 2016.

“I planted 1,092 date palms on seven hectares of land. I am earning Rs 500,000 a year from selling dates in the wholesale market. Such an income was simply not possible from growing staple crops like millets. I grow millets but only for household usage, my earnings are mainly from date cultivation. A kilogramme of dates is sold for Rs 60,” Khan said.

Bhagirath Joshi, a farmer from Kanodiya Rajpurohitan village in Jaisalmer district, attended a workshop conducted by the horticulture department and received a subsidy for buying saplings.

“I planted 156 saplings of date palms over almost half a hectare of land earlier this year. These will fruit after five years, and they are growing well. I have already seen farmers who have earned as much as Rs 100,000 from a plot of land of the same size. The good thing is that date fruit is produced throughout the year,” said the 36-year-old farmer, who also cultivates millets, peanuts, cotton, wheat and seasonal vegetables on his 24 hectares of land.



The dates produced in Rajasthan are supplied to states like Gujarat, Delhi and Uttar Pradesh.

The dates produced in Rajasthan are supplied to Gujarat, Delhi and Uttar Pradesh where the demand is high.

In the water-strapped Thar region, irrigation is a major challenge. “We advise farmers to use drip irrigation and the state government also provides a subsidy of 70 per cent to set up the drip irrigation system in the orchards,” agriculture officer Kumar said.

Once they are harvested, the dates are dehydrated before being marketed. This drying process requires electricity which is often not available. “To solve this problem, we have installed solar dryers to dehydrate the fruits. The dates require a temperature of almost 50 degrees celsius to be dehydrated. Although the temperatures here are hot enough to dry them under the sun, the sand and strong winds can damage the dates,” Kumar added. ■

This story was published on 12 July, 2023.

STORY 56

Kheep Cool in the Desert

Huts built using kheep grass have kept communities cool and protected in the harsh environments of the Rajasthan desert.



For centuries, communities have been living in the inhospitable terrain of the vast desert in Rajasthan and have evolved their lives and lifestyle, including construction of their huts, around it. **TWARITA CHOUHAN**

TWARITA CHOUHAN

BIKANER, RAJASTHAN

IT IS barely dawn and Mahaveer Singh is already at work on his farm where he grows vegetables, fodder and lemons in four and half acres. “I always start early and try to finish my work by eleven in the morning after which I go indoors,” said the 55-year-old farmer in Bajju, Bikaner district of Rajasthan. That is to escape the blistering heat of the Thar desert where summer temperatures often cross 47-48 degree Celsius.

Undeterred, there are communities that have been living in the inhospitable terrain of the vast desert in Rajasthan for centu-

ries, and have devised ways to keep cool.

Mahaveer’s home, where he lives by himself, is thatched with kheep, a locally grown grass variety. It is a cool haven where he stays until the evening when the sun goes down. This is how, the farmer said, his ancestors have survived in the registaan (desert). While the traditional huts have no electricity, Mahaveer’s hut that was provided to him by a non-profit has solar panels that allow him to use one fan and one bulb.

Kheep (*Leptadenia pyrotechnica*) is used widely by communities for whom the desert is home. The plant has the ability to withstand rising temperatures, changing

climates, and the intensifying frequency of droughts. With its long roots it can thrive in extreme conditions and stabilises the fragile desert ecosystem.

The walls of Mahaveer's hut are made up of intricately woven slender branches, bound together by ropes. The thatch, the walls and the ropes are all made of kheep grass that grows in the desert. "The walls of my hut are plastered with a paste of cow dung, and the temperature indoors remains surprisingly and refreshingly cool, even during the scorching noon hours," explained Mahaveer.

In Bikaner, Rajasthan, in the village of Bursalpur, close to the Indo-Pakistan border, lives Kasturi Devi. "When the temperatures soar and it gets impossibly hot, I seek refuge in a kheep hut that still stands just outside my concrete home" the 65-year-old said.

Kasturi has lived in a kheep hut all her life until about eight years ago her children decided that a concrete structure was more 'prestigious' to live in. Thatched kheep huts are still visible in the hamlets that dot the desert terrain for their endurance as well as the protection they offer from the heat. But, clearly, their numbers are dwindling as concrete structures take over.

It is a pity that this traditional building practice is disappearing, said Manu Sharma, director (Innovations), Desert Resource Centre, Bikaner. "Kheep is a breathable fibre and it dilutes and can potentially eliminate toxic compounds. It can contribute to a healthier environment. It allows airflow and circulation and delivers cleaner and breathable air to the environment," he explained. It also removes airborne pollutants, unpleasant odours, and other volatile

organic compounds within indoor spaces, he added.

"A few years ago the village had almost all kheep-thatched homes. The men had the skill and knowledge about constructing these huts. The women gathered the kheep, and even the children would participate in the building activity, and learn the art of thatch making along the way," Kasturi Devi reminisced.

The kheep roof was overhauled every two years. Old and weak grass was removed and replaced with fresh kheep. This process was performed before the onset of rains. The roofs were constructed in such a way that it ensured that no water entered even when it rained. The kheep also regulated moisture levels within the huts. "Not too many people want these roofs nowadays," Palaram, an artisan from Alsu in Churu district of Rajasthan, rued. Palaram comes from many generations of kheep-thatch-makers.

"The changing lifestyle of people and the scarcity of kheep are responsible for this. More and more land is being acquired as real estate. Concrete homes are becoming the norm, he said. "My son is not following in my footsteps. He does not want to pursue the traditional family occupation and has instead chosen to become a mason," Palaram said.

It is getting increasingly difficult to find kheep now. This is worrying to many of the desert inhabitants. "I own 400 camels and a big part of their fodder is kheep," said Gaina Ram, a pastoralist, from Grandi, in Bikaner district. "Acquisition of land for agriculture, industrialisation, and mining has left no space for fodder to grow. I grew up under a thatched kheep roof," said the 50-year-old. ■

This story was published on 17 July, 2023.

STORY 57

Farm Mechanisation Boosts Millets Cultivation By Women Farmers

The introduction of modern machines for weeding and husking of millets in Koraput has increased productivity, earning, and improved the health of tribal farmers.



Tribal women farmers of Koraput to enhance millet cultivation. PHOTOS: PRAGATI PRAVA

PRAGATI PRAVA KORAPUT, ODISHA

IN THE remote tribal villages of Koraput in Odisha, components of a bicycle are helping further a health movement — millet cultivation. Women farmers, who used to toil in farms for weeks together, bent double to weed millet fields, are now using cycle-weeders to quickly finish the task in a couple of hours.

The cycle-weeder was developed by using inexpensive bicycle components. And 55-year-old Kamala Khara swears by it. All she needs to do is to walk in the field with the one-wheel hand-held weeding machine that removes the unwanted plants.

“Weeding an acre of land used to take me nearly forty days. I spent hours bent from my waist weeding. And, I suffered



Women follow line transplantation and systematic millet intensification for better harvest.

from neck, back and knee pain for months together. However, with a cycle-weeder, I can do it in a mere four hours,” said Khara from Kandha Podapadar village in Koraput.

The Centre for Youth and Social Development (CYSD), a non-profit that works for the promotion of millet farming in south Odisha, has provided cycle-weeders to tribal women farmers of Koraput to help them in millet cultivation. Since mechanisation has made the labour intensive crop less cumbersome, more and more farmers are coming forward to take it up.

“Millet farming is hard work,” said Ramesh Chandra Swain, from CYSD. But organisations such as the MS Swaminathan Research Foundation (MSSRF), the Odisha Millet Mission, and the CYSD, have helped reduce the toil of millet cultivation for the women by mechanising a lot of the process. Women farmers have also been provided with 26 pulverizers and 10 thresher-winnowers in the Boipariguda block that covers 20 gram panchayats in Koraput.

Traditionally, women used a heavy manual thresher or mushala. “It took an hour to de-husk a kilo of millet. However, now with the

electric winnower and pulverizer machines, two to three quintals of millets are dehusked in an hour,” Prashant Kumar Parida, development coordinator of MSSRF, said.

‘A woman’s crop’ is how Parida describes millets. “Women are at the helm of millet farming and perform almost all the activities starting from cultivation to post production. Men only prepare the land and take the millets to mandis for sale,” said Parida.

Alladin Khila from Kandha Podapadar has grown finger millet (mandia), foxtail millet (kangu), barnyard millet (khira), kodo millet, little millet (suan), sorghum (khedjana/jahna), and bajra (pearl millet) on her three acres of land this year.

“My father and grandfather grew millets on eight to nine acres of land every year, but the harvest used to be insufficient to meet the family requirements,” Aladdin said. But the recent interventions have changed that. “I harvested 24 quintals of finger millets. After keeping four quintals for my family, I sold the remaining 20 quintals at the mandi and earned over Rs 71,000,” she said happily. Aladdin also intercropped the millets with pigeon pea, horse gram and black gram, besides vegetables.

The boost in production, mechanisation of the processing, etc, has led to an increase in the Minimum Support Price (MSP) of the millets.

Odisha Millets Mission launched in 2017 is further helping millet farmers in the state. "Earlier, we earned a meagre twelve to fifteen rupees per kilogram of finger millets. However, its MSP has gone up. It was Rs 2,800 per quintal in 2019, and now it is Rs 3,578 per quintal," said Hiramani Khara, millet farmer from Kandha Podapadar.

"Besides, we get the payment as soon as we sell our produce in the mandi," he added.

Pitabas Barik has been promoting millet cultivation in Boipariguda block under the Odisha Millet Mission since 2017, and has witnessed the increase in farmer's incomes. According to Barik, an average family harvests eight to nine quintals of finger millet from an acre of land. They keep part of it for their own consumption and the remaining is sold.

"Thus, the average earning of a family from millets per annum is around Rs 21,000 at Rs 3,578 per quintal," said Barik. "Women deposit the surplus money in their self help groups (SHGs), which in turn provide them financial security by giving them loans at a very nominal rate of interest."

Tula Khila from Kandha Podapadar said the money they are earning is keeping them out of debt and improving the quality of their lives. "We can now buy bullocks, pump sets and use the money for our children's education, constructing houses, meeting health expenses and celebrating festivals."

A direct impact has also been the improve-

ment of the health of the tribal women. "Millets have enhanced the income of women and now they can afford to add eggs, meat and more vegetables to their family diet. This has led to improved nutrition in the tribal families," Palanga Santa, an anganwadi worker at Kandha Podapadar, pointed out.

For instance, every morning, Radha Kila helps herself to some mandia jau (a gruel made of finger millet). The staple breakfast keeps her fueled for her long day of work ahead in the millet fields surrounding her remote Kandha Podapadar village in Boipariguda block.

"Earlier, the harvest was not enough. Besides, we only made gruel and ragi balls (locally called mandia anda). Now, we have learnt a number of tasty millet recipes and we never get bored of millets," said Manika Khila of Padiaguda.

Women have set up millet kiosks in almost every village.

In our kiosk, we make a profit of around Rs 200 everyday. We set up millet stalls in weekly markets and in different fairs at block, district and state levels. We get more profit there," Daita Pujari of Padiaguda village, said.

Meanwhile, plans are afoot to further promote millets in the state. "Each village needs at least one integrated processing unit — all processing facilities (de-husking, threshing, winnowing, grading, de-stoning, pulverising and packaging) at one place," said Parida. There are plans to set up at least two to three integrated units in each panchayat of the block in the next couple of years, he added. ■

This story was published on 8 August, 2023.

STORY 58

Farmers In Odisha & Assam Benefit From Micro Irrigation Systems

The Resilience Project is popularising micro-drip irrigation and sprinkler systems to enhance the yield of smallholder farmers and build climate resilience.



The project aims to improve agricultural productivity, adaptive capacity and livelihoods of smallholder farmers to climate and economic changes.

LARAIB FATIMA WARSI

JADUMANI GOGOI has saved enough money to buy some tools he has been wanting to for sometime now. He said he could do this thanks to the sprinkler technique of irrigation he adopted in 2021, which cut his expenses and allowed him to save money.

Twenty-seven-year-old Gogoi, is a farmer from Chawdang Pothar village in Assam's Golaghat who owns 12 acres (about five hectares) of land on which he grows bananas, lemons and betel nuts.

Gogoi irrigates his farmland using a sprinkler system in which water is delivered to his fields through a network of pipes or

hoses. This reduces water wastage.

“Earlier we were dependent entirely on the rainfall, but ever since we adopted the sprinkler technique we get enough water for the crops,” he said.

“We fetch water from the pond near the house and then draw water from there to our field through the sprinkler system. Earlier when I used the diesel-operated pumps to draw water from the canal then the cost on fuel would come to Rs 10,000 per acre of land. With the sprinklers, it is half the cost. Now it costs me Rs 4,000–5,000 for one acre land,” he said.

Gogoi is one of several farmers in Assam’s Golaghat and Sivasagar districts who have benefitted from the micro irrigation systems, such as sprinklers and drip irrigation, provided under the ‘Resilience’ project.

The project launched in 2018 and funded by Norway’s Ministry of Foreign Affairs aims to improve agricultural productivity, adaptive capacity and livelihoods of smallholder farmers to climate and economic changes, by building resilience and strengthening the agri-product market value chains.

Due to climate change, rainfall patterns are changing and adoption of micro irrigation systems, which help grow crops using limited water resources, can help build climate resilience.

Apart from Assam, the project is also being implemented in Odisha. International Water Management Institute (IWMI) is one of the partners of the Resilience project and is working closely with the state governments to install micro irrigation systems in Assam’s Golaghat and Sivasagar and Odisha’s Cuttack and Ganjam districts.



The micro-irrigation systems are provided to the farmers under the Pradhan Mantri Krishi Sinchayee Yojana which is a welfare scheme funded by the Central government.

Surendra Sethi, a farmer from Odisha’s Ganjam district said how he uses drip irrigation system for his two acres of land. The 52-year-old cultivates cowpea and kidney beans.

Drip Irrigation is an efficient and economical way to water your land. Used commonly in drier areas of the country, it is becoming more popular in the Northeast. Unlike other forms of irrigation, such as sprinklers that are only 65 per cent – 75 per cent efficient, drip irrigation is 90 per cent efficient at allowing plants to use the water applied.

“Since we started using the drip irrigation system for our land nearly one fourth of the water has been saved. Earlier when we used a traditional system of irrigation, the cost of electricity was Rs 1,100– Rs 1,500 per year. It has decreased to Rs 350– Rs 400,” said Sethi.

Susri Barnana Behera, a consultant at IWMI said that the installation of a drip irrigation system in an acre of land is around

Rs 70,000. Installing sprinklers is about Rs 40,000 for an acre.

The micro-irrigation systems are provided to the farmers under the Pradhan Mantri Krishi Sinchayee Yojana which is a welfare scheme funded by the Central government and provides 60 per cent of the assistance in the ratio of 90:10 (Central:State) and the rest 40 per cent has to be contributed by the farmers.

Initially, between 2020 and 2022, the farmers' share of investment for the installation of the micro-irrigation techniques was supported by IWMI. But presently, with the frequent awareness and training programmes by IWMI, at least 35 more farmers are paying the 40 per cent themselves. They have applied for the scheme to avail the subsidies for the micro irrigation systems.

A policy brief titled Upscaling micro-irrigation in the Indian states of Odisha and Assam, April, 2023, published by IWMI explains how the challenges to the project were the lack of technical knowledge to operate and maintain MIS [micro irrigation system], financial capacity and low awareness about the benefits of MIS.

To address these issues and increase adoption, the Resilience project conducted field demonstrations of MIS among other water saving irrigation practices, and capacity building and training programs in Cuttack and Ganjam in Odisha and Golaghat and Sivasagar in Assam. Adopting the water management practices like the micro irrigation system, farmers in Assam and Odisha can reduce agricultural risks and increase the production of crops, the report noted.

However, the adoption of micro irrigation systems has been low in both the states.

As per the latest data shared by IWMI, the adoption in Odisha is 2.46 per cent and in Assam it is 0.72 per cent of the net sown area.

Smaranika Mahapatra, a researcher at IWMI said, "The farmers were hesitant to adopt the technologies and the associated risks to crop yield as they were habituated to traditional irrigation practices. Also, they did not have the knowledge on the technologies, benefits, and the schemes the government is providing. Lack of finances was the other hurdle," she said. But, once the farmers were given multiple demonstrations on how the irrigation systems worked and were beneficial, they were convinced.

"We organised field visits and training sessions where we showed them micro irrigation is giving them three to four times profit, while saving them from labour charges and also reducing their electricity bill," Mahapatra said.

The fact that a majority of the farmers particularly in eastern India have small/fragmented plots or they are sharecroppers. And, this came in the way of them easily adopting the new irrigation practices.

But, under the Resilience project, six micro-irrigation systems have been installed in Assam and five in Odisha.

IWMI has installed these micro irrigation systems along with the state governments of Assam and Odisha and project partners – Assam Agricultural University (Jorhat), Odisha University of Agriculture and Technology (Bhubaneswar), National Rice Research Institute (Cuttack) and the M. S. Swaminathan Research Foundation (Chennai). □

This story was published on 14 August, 2023.

STORY 59

Solar Power Brings Windfall to Flour Mills & Rural Shopkeepers

Power outages no longer bother small business owners in villages of Uttar Pradesh as solar panels ensure uninterrupted power supply for them and reduce their electricity bills.



The number of livelihoods that can be impacted in the entire country through decentralised renewable technologies is over 37 million. Of these, the highest potential is in the state of Uttar Pradesh with 5.5 million.

LARAIB FATIMA WARSI

SANDEEP VERMA who has an electronic store in Maruadih village in Varanasi, is tinkering with a table fan that has come to him for repairs. "I can work uninterrupted now and do not have to pull down the shutters of my shop everytime the electricity goes

off, which is often," said the 24-year-old.

Earlier this year, Verma installed solar panels in his shop, which has not only boosted his business but also increased his monthly savings on electricity bill. "Now I can work all day. I have been saving up to Rs 2,000 a month," he said.



Setting up 32 Loom Solar panels for the flour mill cost Kumar Rs 7,75,000. His mill only uses solar for its functioning.

Power cuts in his village sometimes go up to several hours at a stretch. But such outages no longer affect his work of fixing electronic items that require continuous power supply. Like Verma, a number of shopkeepers and small business owners in rural India are turning to solar energy to meet their power demand and cut down on their expenditure on grid-supplied electricity.

Over 60 kilometres east of Verma's village in Varanasi, in the neighbouring district of Mirzapur, Gopal Singh has an ice cream factory in Niyamatpur Kalan village. Singh has solar panels in his factory since 2021 and now wants additional panels.

"Setting up solar panels at my ice cream

factory has been beneficial. It cost me Rs 3,20,000 to get those panels but now I pay far less for electricity bills," he said.

According to him, his factory's electricity bills were anything up to Rs 20,000 a month before the solar panels. But now, he saves Rs 14,000 per month, and pays only Rs 6,000 as electricity bill. This way he has already recovered the cost of installing the panels and is ready to add on more solar panels to bring down his monthly bill to zero.

Setting up solar panels at my ice cream factory has been beneficial. It cost me Rs 3,20,000 to get those panels but now I pay far less for electricity bills

GOPAL SINGH ,
ICE CREAM FACTORY OWNER,
NIYAMATPUR KALAN VILLAGE

Loom Solar Pvt Ltd, a start-up in Faridabad, Haryana, that manu-

factures solar panels and lithium batteries has been instrumental in many young and small businesses in Uttar Pradesh

becoming self-reliant and steady. The ISO-certified company is a recognised startup by the Government of India.

“Since 2018 Loom Solar has generated around 50,000 consumers across India and now we are happy to reach the small business owners of Uttar Pradesh,” said Nishi Chandra, head of marketing in Loom Solar.

Chandra said that so far the company has installed 8227 solar panels in Uttar Pradesh.

The solar panels are normally set up on the roofs of buildings. Sometimes, if there is no space they are installed near the buildings in an empty space. The panels are positioned side by side so that the energy generated through the sun is stored efficiently in the battery.

Deepak Kumar in Akhtyarpur Dhaukal village in Shahjahanpur district in Uttar Pradesh also uses the Loom Solar panels in his flour mill. He has been doing so since 2022 and his mill runs entirely on solar energy.

“Since I started using solar for the work in my flour mill it has become easy on my pocket,” the 40-year-old said. Setting up 32 Loom Solar panels for the flour mill cost Kumar Rs 7,75,000.

“I am saving around Rs 1,000 a day as I do not have to buy diesel, and I am seeing considerable profit in my mill too,” said the happy miller. Kumar said that it may take him another three to four years to recover

the money he invested on his panels, but he is confident it will happen. And after that it will only be profits.

Miller Meghraj Saini from Shukrullah Pur village in Budaun district of Uttar Pradesh is a flour miller too. “Earlier, I spent Rs 800-1,000 per day. I am saving that money now that I have the solar panels,” he said. Saini spent Rs 8,00,000 to install the solar panels in 2022. There are 28 panels installed in his mill.

For Vinay Gangwar, the fact that he does not have to spend every day on diesel to run his flour mill in Kaimganj, Farrukhabad is a windfall. Gangwar installed the Loom solar in August, 2021. Ever since, he has been saving up to Rs 1,000 a day, he said.

“Electricity supply in our state is poor and I spent Rs 7,20,000 on the installation of solar panels. But I save Rs 30,000 every month,” Gangwar reiterated.

According to a May 2023 report by New Delhi-based CEEW (Council of Energy, Environment and Water), the number of livelihoods that can be impacted in the country through decentralised renewable technologies is over 37 million. Of these, the highest potential is in the state of Uttar Pradesh with its 5.5 million. The report also highlighted that solar-powered grain milling machines can impact 1.9 million livelihoods in the country. ■

The solar panels are normally set up on the roofs of buildings. Sometimes, if there is no space they are installed near the buildings in an empty space. The panels are positioned side by side so that the energy generated through the sun is stored efficiently in the battery.

This story was published on 21 August, 2023

STORY 60

Silk Reelers in Odisha Bask in the Sunshine of Enhanced Livelihoods

Solar-run portable reeling machines called Unnati, introduced by the social enterprise Resham Sutra, increase incomes of silk reelers and weavers from tribal communities.



Decentralised renewable energy livelihood technologies have already impacted more than 566,000 livelihoods across India, with silk reeling machines accounting for 14,000 of them.

AISHWARYA TRIPATHI

KUNI DEHURI has been a silk reeler and weaver for over 19 years. Her days are spent taking out threads from cocoons that she weaves into fabrics and then sells.

Four years ago, her fortunes changed when

she switched to a solar-run portable reeling machine. Power outages in her remote tribal village Bhagamunda in Odisha no longer affect her work, and her earnings have jumped up to seven times — from Rs 1,200 per month to Rs 8,000, she said.

Like Kuni, a number of rural women who

work as silk reelers have adopted portable reeling machines, which run on solar energy. This allows them to finish reeling at a much faster pace.

Resham Sutra, a Delhi-based social enterprise, has been providing solar-based portable reeling machines to these women. Called 'Unnati' the machine is compact and costs Rs 35,000.

The organisation provides these machines at 90 per cent subsidy to communities belonging to Scheduled Tribes and Scheduled Caste. Almost 70 per cent of its beneficiaries are tribal women. Resham Sutra is working across 350 villages in 16 states, out of which 20 villages are in Odisha, including Kuni's village in Kendujhar district.

Before adopting a solar-run portable reeling machine, 35-year-old Kuni laboured for hours boiling the cocoons of silk that then were reeled the very day so that they did not discolour before she converted them into bales of Tussar silk.

When there was no electricity for weeks on end and Kuni's motorised silk reeling machine just sat there idle. No electricity meant a tremendous livelihood loss for Kuni. On a good day, she could reel 350 grams of silk in eight hours, but on an average, despite the exhausting labour, she could never make more than Rs 1,200 per month.

"Many times the cocoons wouldn't get reeled on time and looking at the quality, the traders wouldn't even believe that it's silk," Kuni recalled. "But now, I am able to earn up to Rs 8,000 in a month," she added.

Resham Sutra, with the vision of enabling underprivileged rural artisan communities towards financial independence through



Four years ago, Kuni's fortunes changed when she switched to a solar-run portable reeling machine. AISHWARYA TRIPATHI

sustainable innovations, has provided a 40-watt capacity solar photovoltaic system to the silk reeler.

Kuni's reeling machines require 15 watts to run and the remaining power can be stored and used even in the absence of sun. It is because of this, that she is able to work even past sunset, increasing her work hours. She works from 6.30 am to 10.30 pm sometimes. Kuni also trains other women in using these new portable machines.

"I have trained about 500 women to use these machines and adopt the new technology," she said. Rebati Dehuri is one of them. Earlier Dehuri, along with two other women ran the charkha (spinning wheel) to collectively make Rs 5,000 on a monthly basis. Her share used to be roughly Rs 1,800. With Kuni's training, Rebati has learnt the art of producing twisted thread, and is able to work for longer hours due to the solar machine, which helps her earn up to Rs 8,000 per month.

The 30-year-old had been reeling silk for the past seven years but it was only in 2022 that she undertook a six months

training led by Kuni. It has spiked her income and increased her confidence. “With my savings, I bought myself a gold nath [nosepin],” said a proud Rebati.

Rebati’s coworker, Madhumati Dehuri has been reeling tussar since 2014. Joining Kuni’s training centre was a turning point in her life. With an increased income, she bought a pedestal fan – the first one in her house in Hundatangiri village, 22 kilometres from the training centre in Bagamunda village.

“People in my village sit outside their huts, on the roadside to combat the heat. The electricity is erratic and many don’t have a fan in their house,” Madhumati said. “I have got a solar system installed at my house to power the fan,” she added. All this has been possible due to her increased income. Madhumati now plans to invest in a tailoring business as soon as she saves up enough. She said that she was making Rs 8,000 per month, as compared to a meagre Rs 1,500 earlier.

Traditionally, the rural women used thigh reeling technique, passed down the generations to make yarn out of the cocoon. The technique took a toll on their health, causing back and thigh pain. Though Kuni didn’t depend on this traditional technique, the motorised silk reeling machine she used was bulky and needed at least three women to run it. Resham Sutra’s ‘Unnati’ machine is compact and user-friendly.

In Odisha, a large part of the machine’s Rs 35,000 cost is borne by the state government’s Directorate of Textile as subsidy to the poor tribal women. Kuni only had to pay Rs 3,500 upfront cost to make Unnati part of her livelihood.

“Seventy per cent of our beneficiaries are tribal women who had no fixed source

of income except for what they earned by foraging for forest produce. Earning a constant income improves their social status allowing them to make decisions like providing better education to their children,” said Kunal Vaid, CEO, Resham Sutra.

A report titled Decentralised Renewable Energy Technologies for Sustainable Livelihoods was recently released by the New Delhi-based Council on Energy, Environment and Water (CEEW). According to the study, decentralised renewable energy livelihood technologies have already impacted more than 566,000 livelihoods across India, with silk reeling machines accounting for 14,000 of them.

Energy-efficient technologies powered by decentralised renewables can help enhance the incomes and resilience of many of India’s more than 60 million micro-enterprises while fostering climate action, the report stated. Under its Powering Livelihoods programme, CEEW is supporting small solar refrigerators, solar-powered small horticulture processors, solar-powered silk reeling machines, solar-powered cold storage, solar dryers.

Meanwhile, recognising the impact of decentralised rural energy-based livelihood technologies, the Ministry of New and Renewable Energy, Government of India, released a dedicated policy framework titled Framework for Promotion of Decentralised Renewable Energy Livelihood Applications.

In it, the ministry observed that decentralised rural energy-powered livelihood solutions have the potential to reduce and eventually eliminate the reliance of livelihood on diesel, particularly in rural settings, and can supplement the grid supply. □

This story was published on 30 August, 2023

STORY 61

A Solar Irrigation Pumpset that fits into a Jhola is Helping Farmers

Easy to carry and operate, a solar powered pump set is having a positive impact on their crop yield, say small-holding farmers in Jharkhand.



Single-switch, automatic operation and no installation cost of the portable pumpsets means anyone can easily use them.

AISHWARYA TRIPATHI

AKLI TUDU picks up her jhola, balances the shiny black solar panels on her head and walks across to her one-acre mustard field. Her jhola holds a portable solar-powered irrigation pump that will help the marginal farmer from Surgi village in Gurabandha, Jharkhand, irrigate her crop.

The portable solar-powered irrigation pump, introduced by Pune-based startup Khethworks, is as big as a mixer jar, and it is helping small and marginal farmers meet their irrigation needs.

These farmers, with land holdings of up to 2 hectares or 5 acres, are unable to afford large-sized solar irrigation pumps



The farmers can transport the Khethworks solar pumps to work and bring them back home at night for safe storage.

that cost up to Rs 100,000. And these easy-to-operate portable irrigation pumps are coming to their rescue. Single-switch, automatic operation and no installation cost of the portable pumpsets mean anyone can use them.

The farmers can transport the Khethworks solar pumps to work and bring them back home at night for safe storage. They can also rent them out for additional income.

Khethworks targeted shallow water and surface water areas in the east where rechargeable water continues as a sustainable resource.

Tudu, who belongs to the Mahli tribe in East Singhbhum district, swears by her portable pump. She submerges the portable solar pump in a pond on her field, attaches a pipe that comes along with the pump and presses a button – and the water gushes out.

According to her, adoption of solar-powered irrigation pumpset has increased her earnings due the yield of her crops has improved. It has also saved money

on diesel, which she had to buy earlier to run conventional pumpset. “This year, my land yielded 1.5 quintals [150 kilograms] of mustard, which has never happened before. Last year, we had only 30 kilograms of mustard,” said a happy Tudu. She said timely and sufficient irrigation was responsible for the bumper yield this year. She gets the mustard pressed and stores it as oil.

“My niece got married this year and we had enough mustard oil to be used for cooking in the wedding. Otherwise, we would have to buy it at Rs 235 per litre. We are also planning to sell the extra oil,” she added.

The central government, under its PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) scheme, has been popularising the use of solar irrigation pumps (SIP) to replace the diesel pumpsets in the agriculture sector. The intention is to aid India transition to a clean-energy based economy that will help achieve the net zero target by 2070.

However, the capacity of the pumps provided under KUSUM scheme range



Durga Dayal Patra's producer company works with 5,000 farmers in the block and has 2,095 women shareholders, out of which 33 have invested in the pumpset.

between 2 horsepower (hp) to 10 horsepower. But these are too big and expensive for the small and marginal farmers.

The mobile micro-SIP by Khethworks has two solar panels of 168 Watt each, which Tudu transports on her husband's motor-bike to irrigate another patch of land in a different location. Like Tudu, 32 other farmers in Gurabandha block are utilising these micro SIPs.

Tudu is a member of a Farmer Producer Company called Gharoni Lahanti Mahila Utpadak Producer Company Limited, and last September she bought the portable pump of 0.48 hp. She paid Rs 6,000 up front and the balance has to be paid in instalments for the portable solar pump, which costs Rs 26,000 at a subsidised rate.

She has already made enough profits and will soon finish paying all instalments. "I will be clearing my last instalment in the coming week," the tribal farmer said with pride.

Until August last year, Tudu depended

on diesel-powered irrigation pumpset to irrigate her land. Though she owned the pumpset, the fuel cost her Rs 100 per litre. The nearest petrol pump is 25 kilometres away in Dumariya.

According to her, the pump used five litres of fuel in a day to run. "It cost me nearly Rs 16,000 to run the pump to irrigate my mustard crop last season," she said. Furthermore, to operate the bulky diesel pump, Tudu had to hire a labourer who charged Rs 200 per day for the job.

Bulky pumpsets that are difficult to move are liable to be stolen and that is an added worry for farmers like Tudu. There were so many nights she was sleepless wondering if her pumpset would still be there the following morning where she had left it in her field.

Portable solar pumpsets are addressing these problems to a large extent. "These pumps cost Rs 52,000, out of which the farmers need to pay only Rs 26,000 — the remaining is being paid by Tata Trust under its Collectives for Integrated Liveli-

hood Initiatives,” said Durga Dayal Patra, CEO of Gharoni Lahanti Mahila Utpadak Producer Company Limited.

“Out of Rs 26,000, the upfront cost is only Rs 6,000 and the remaining can be paid by accessing loans through our company,” Patra added. Patra’s producer company works with 5,000 farmers in the block and has 2,095 women shareholders, out of which 33 have invested in the pumpset.

“In this region, you will see more didis [women] on field as compared to dadas [men], which is why we are focused on having women as members of our company,” he added.

Like Tudu, 29-year-old Sunita Murmu from Gura village in East Singhbhum turned to the micro-SIP by Khethworks in November 2022. Murmu learnt how to use the portable pump at a demo session organised in her Farmers’ Producer Company. She in turn taught her husband and other family members to run the pumpset. And her irrigation woes are now over, she said.

The pumps run on five speeds, and Murmu can control the flow of water according to her need. She submerges it in an open well or pond. The pump automatically switches off if the water level is below 12 feet. Adoption of a solar-based irrigation pumpset has also brought down her electricity bills. And irrigating fields is no more linked to the erratic power supply in her village.

“In summers, we get electricity for roughly five hours. God forbid if it rains, then we might not get it at all. We could never get water when we wanted to irrigate,” Murmu recalled.

Victor Lesniewski, Chief Executive Officer, Khetworks pointed out how overdepend-

ence on inconsistent monsoon rains and fuel-based pumps by 86 per cent of small and marginal farmers affects their productivity and income, particularly in eastern India where electricity does not reach the fields.

“In these areas, water is available, but lifting it is expensive. Diesel prices are increasing and kerosene availability is decreasing. With irrigation energy costs estimated to be 20-40 per cent of production costs (up to Rs. 10,000 per acre per season), small-holder farmers are choosing to abandon farming outside of the monsoon and migrate for labour,” he said.

“On average we have around two small-holder farming users per pump and about 2000 direct beneficiaries across 14 Indian states, with about a quarter of those in Jharkhand specifically,” he added.

Patra of the Farmers’ Producer Company said they were in talks with Khethworks officials to further bring down the price to make the micro pumps more accessible.

Citing the challenges, Lesniewski pointed at the supply chain disruptions and the rising costs of raw materials over the last few years. On the demand side, he said there was relatively low awareness of solar pumps in remote communities despite years of capital subsidies.

“The biggest challenge is the upfront cost of the solar pump to the end customer. We are hoping to roll out end-user financing next month with partners in both Jharkhand and Odisha,” he said, adding that the company was working towards benefiting the end-user financing ecosystem. ■

This story was published on 8 September, 2023.

STORY 62

An Ancient Pot-Irrigation System Is Revived In North Karnataka

In drought prone Raichur district in Karnataka, farmers adopt an ancient technique in which porous clay pots filled with water are buried in the field and are a source of irrigation water to the farmers.



The buried clay pot or pitcher method is one of the oldest and the most efficient traditional systems of irrigation known.

LARAIB FATIMA WARSI

CLAY POTS usually used to fetch water are now coming to the aid of farmers in drought-prone north Karnataka who are adopting a 2000 year old irrigation system using cheap and locally available clay pots to irrigate their farmlands and fruit orchards.

Like it is across the land, erratic rainfall, climate irregularities and other vagaries of climate change have become a challenge to the farmers in North Karnataka who are struggling with paucity of water.

In July this year, a Bengaluru-based non-profit called Parambha introduced pot irrigation to farmers in Raichur. The

buried clay pot or pitcher method is one of the oldest and the most efficient traditional systems of irrigation known. It has been used successfully for more than 2,000 years, notes a scientific research paper. It is well suited for small farmers who cannot invest large sums of money in irrigating their fields.

Porous clay pots with water are buried underground and these slowly release water to the plants. An acre of land, requires about 140 such clay pots in order to be irrigated. The pots are refilled once a week, depending on the crops being cultivated, and they can be used for three years. The cost of one clay pot is about Rs 100.

Koteppa, a 45-year-old farmer from Huligudda village in Raichur, is one of 20 beneficiaries of the project in the district, who switched to pot irrigation. He said that earlier he used drip irrigation techniques to supply water to his two hectares of land on which he cultivates mango, pomegranate, lime, berry and figs. Though there were savings in water, installing drip irrigation was expensive.

“Earlier, the cost of growing horticultural crops on my land used to be around one-and-a-half-lakh rupees [Rs 150,000] but since I have started using the pot irrigation system it costs me Rs 30,000. It is a very cost effective method and they are also less likely to be damaged by stray animals,” Koteppa said.

“The unglazed, porous clay pots filled with water provide controlled irrigation to plants. The water seeps out through the clay wall of the pot at a rate that is influenced by the plant’s water use,” explained SS Ghanti, programme coordinator at Prarambha’s office in Raichur.

Research articles point out that this tech-

nique leads to high water efficiency, even better than drip irrigation, and as much as 10 times better than conventional surface irrigation. This system can help address the increasing irrigation challenges as rainfall patterns get erratic due to climate change.

Water, Environment, Land and Livelihoods (WELL) Labs, another Bengaluru-based non-profit, has collaborated with Prarambha to educate farmers on growing horticultural crops on degraded land with the help of pot irrigation.

Karishma Shelar, senior programme manager at WELL Labs, said that this method saves up to 40 per cent of water as compared to drip irrigation.

“We run awareness campaigns that make farmers realise the efficacy of locally available pots to use for irrigation. These are inexpensive and environment-friendly,” she explained.

Reven Siddappa, a 37-year-old farmer from Huligudda village, has adopted the pot irrigation system. He owns about two hectares of land on which he grows fruits including guava, mango, black berry, and drumsticks. Siddappa felt that the drip irrigation system was expensive and also required too much upkeep. So when he was introduced to the pot irrigation system, he decided to switch.

“This traditional system of pot irrigation is pocket friendly and is also efficient because it requires less water than the drip irrigation system. It is ideal for many small and marginal farmers like me,” Sidatta said. “Earlier I had to spend around Rs 130,000 for irrigating my land but now the work is done at Rs 28,000–30,000, it is a big relief for me,” he added. ■

This story was published on 18 September, 2023.

STORY 63

Potatoes: Buried Treasure in Gurez Valley

People in the Gurez Valley of Kashmir store potatoes under the frozen ground, an age-old climate-resilient technique of safeguarding seeds and harvest in the bitter winters.



Abdul Khaliq placing potatoes in the ditches for preservation. PHOTOS: TAUSEEF AHMAD

TAUSEEF AHMAD

GUREZ VALLEY, JAMMU & KASHMIR

AS WINTER sets in, Gurez Valley in Bandipora district, prepares for months of isolation from the rest of the world for about six months. Heavy snowfall in the north Kashmir region will keep them homebound.

The inhabitants of this region still depend on centuries-old practices to survive. These include farming techniques that are suited to the inhospitable environment.

“One of the things we do is bury our potatoes deep in the ground after they are harvested. This is exactly what our ancestors did and we do the same,” said Abdul Khaliq, a 48-year-old farmer from Bagtore village. Khaliq said the potatoes remained fresh and continued to be nutritious even after months of being buried.

There are hundreds of farmers like him who in order to be self-sufficient and well stocked with food during the long winter months, rely on ancestral wisdom and

traditions to farm and store produce.

Farmers dig deep and store the potatoes in the pits layered with hay or straw that maintains a conducive temperature and humidity.

Explaining how the ancient practice works, Dr Bilal, senior scientist with Krishi Vigyan Kendra, Gurez, explained: “Farmers go down deep in the ground depending on how much produce they need to store. The cavernous underground storage space can sometimes hold up to five thousand kilograms of potatoes.”

This is a climate resilient practice which helps people in Gurez to survive in extreme climatic conditions in the region. The people also bury potatoes under the earth for seed purposes, as the temperature under soil remains high as compared to outside, the senior scientist pointed out. Once the snowfall stops, the planting of potatoes begins again.

Gurez valley is known for its high quality of potatoes and produces as much as 15,000 tonnes of potatoes annually.

“The farmers here use decomposed farm yard manure, forest litter and plant residues to enrich the soil, and this provides essential nutrients to the potato plants,” Bilal said.

Potatoes are an important source of nutrition for us during the cold winters. Burying potatoes under the frozen earth is not only about keeping them fresh, but it is also a way to keep the memories of our ancestors alive, and following these traditions gives us the hope and strength to survive the bitter winters,” said Mohd Niyaz, a 46-year-old farmer from Gurez valley.



It is mostly the women who are tasked with carrying harvested potatoes to the ditches.

According to Mohd Hussain, headman of Kilshay village in Tulail valley of Gurez around 40,000 people of Gurez valley depended on the stored vegetables to last the winters.

“Every household stores potatoes. It is their lifeline,” the 49-year-old. “These techniques naturally preserve potatoes, maintain their freshness and nutritional value and are cost-effective. They utilise locally available materials and minimise energy consumption,” he added.

“Temperatures in Gurez sometimes drop below minus 20 degrees celsius and storing vegetables underground is an effective way of keeping them fresh in the winters. Our ancestors did it successfully and we do the same,” said Shahmeema Begum of Bagtore village.

PepsiCo, the global F&B giant, has plans to buy potatoes directly from Gurez farmers for its brand of Lay’s chips, said Dr Bilal. ▣

This story was published on 25 October, 2023

STORY 64

Using Nanotechnology to Enhance Agriculture

Tamil Nadu Agriculture University has researched, developed and come up with nano-technology solutions to minimise pollution, increase yield of crops and extend the shelf-life of fruits and vegetables.



A TNAU project has developed a series of nano-products to preserve fruits, increase their shelf life and reduce waste. The experiments are on across Tamil Nadu in mango and banana cultivation.

PANKAJA SRINIVASAN
COIMBATORE, TAMIL NADU

IN THE hallowed premises of the Tamil Nadu Agriculture University (TNAU) in Coimbatore, that is more than a 100 years old, the relatively new department of nano science and technology is working on nano-solutions to enhance the quality of agriculture in the country.

“Agriculture uses a lot of inputs, such as fertilisers, pesticides, weedicides and fungicides. The crops use just about 20

to 30 per cent of the conventional inputs, and the rest of it remains as residue in the soil or permeates into the groundwater or the atmosphere,” said KS Subramanian, director of research.

Subramanian is one of the pioneers in the country who has years of research and experience behind him in the field of nano-technology agro support. In 2017 NABARD set up a NABARD Professor Chair at the department of Nano Science and Technology at TNAU. The chair was awarded to Subramaniam for three years with a finan-

cial support of Rs One Crore over three years (September 2017–August 2020).

TNAU has researched, developed and come up with nano-technology solutions to minimise pollution, increase yield of crops and improve the shelf-life of fruits and vegetables.

“Nano technology improves the efficiency of agricultural inputs. These products can be used in precise amounts, to their optimal level, and they are cost effective,” the director said. “More than one lakh crore rupees worth of fertilisers are imported into the country. And nano-products can bring about huge savings to the exchequer,” he pointed out.

“One 500 ml bottle of urea is equivalent to one 50-kg bag of urea. The 500 ml of urea costs Rs 240 as of now and is sufficient for an acre of land,” he explained.

One of the immediate benefits of using a nano-product was reducing colossal wastage. India is the second largest producer in the world with 330 million tonnes of fruits and vegetables per annum. But, for every three fruits one fruit is lost (35 per cent).

A TNAU project has enabled Subramanian to develop a series of nano-products to preserve fruits, increase their shelf life and reduce waste. The experiments are on

across Tamil Nadu in mango and banana cultivation. “If we can minimise even 10 per cent of the losses, it means a huge saving for the country,” he said.

Some of the nano-products developed by TNAU include a formulation that keeps fruits and vegetables fresh, extends their shelf life

and protects them from post harvest diseases. This has been developed by TNAU in collaboration with University of Guelph, Canada.

“More than 5,000 farmers growing mangoes and bananas used the formulation over five years with significant success. These were farmers from Krishnagiri, Theni, Dharmapuri, Dindigul and Kanyakumari districts. Eighty per cent of the farmers reported less incidence of disease and therefore better profits,” he added.

Special stickers and pellets have also been developed (they are registered for patenting). The stickers/pellets can be put into the packing boxes containing the fruits and this helps keep the contents fresh during storage or transportation.

Machineries hum in the processing lab at the Nano Science and Technology department. Pointing to a glass enclosed apparatus, Subramaniam said it was coating seeds. “Seeds of cotton, green moong, okra and paddy among others are coated fine nano-fibres that contain all the nourish-



Some of the nano-products developed by TNAU include a formulation that keeps fruits and vegetables fresh, extends their shelf life and protects them from post harvest diseases.

ment, protection from pests, growth regulators, etc,” the scientist explained.

According to him, these already prepped and primed seeds are of great help to the farmer who does not then have to worry about treating seeds and handling fungicides, pesticides, etc.

Nano-urea, one of the products developed at TNAU, has already been used with considerable success on ten acres each of rice and maize in the Bhavani Sagar area in Tamil Nadu. The yield has increased by 10 to 15 per cent, Subramaniam said. The Indian Council of Agricultural Research then conducted observation trials across 11,000 locations in the country, where the nano-urea was distributed to farmers through 650 Krishi Vigyan Kendras.

In May 2022, Prime Minister Narendra Modi inaugurated the world’s first Nano Urea Liquid plant by IFFCO at Kalol, Gujarat. This was to boost productivity and help increase their income.

“IFFCO developed a nano-urea. And, it was scientifically validated and bio-safety-tested by TNAU. This helped in notification of the first nano-fertiliser in the country by the Fertiliser Control Order in February 2021,” Subramaniam said.

While some of the nano product technology has already been forwarded to Agri Business Directorate-TNAU, others are ready for pilot trials. TNAU is also coordi-

nating pilot testing along with pesticide companies and agro-related industries.

Nano-technology is being enlisted to detect diseases in crops, measure the nitrogen and moisture content in the soil, ensure the products are not harmful to humans and farm animals, etc.

“We are currently working on linking nano-devices to the farmers in such a way that the farmers will be alerted through SMS if their crops are found to have any deficiencies,” Subramaniam said.

Nano-technology is being enlisted to detect diseases in crops, measure the nitrogen and moisture content in the soil, ensure the products are not harmful to humans and farm animals, etc.

But there are challenges too. According to him, the foremost challenge was financial support to keep the research and development going. The second was to have policies that were in alignment with scientific research. In addition, there has to be awareness about what is happening in the labs amongst different levels of people ranging from the user, the farmer to the policy makers, the government.

He also said research and development could benefit if red tapism were curtailed. It took an inordinately long time for government funds to actually materialise. “If processes continue to be complicated and cumbersome, innovation, experiments and discoveries will dry up,” he warned. □

This story has been done as part of a partnership with NABARD.

This story was published on 24 February, 2023.

STORY 65

Soilless Farming is Picking up in Kashmir Valley

People are adopting hydroponics and growing spinach, collard greens, coriander, and other vegetables, in their courtyards in limited space.



The new technique of farming, in which vegetables can be grown without soil, and vertically in nutrient-rich water is fast picking up in the Valley. PHOTOS: MUDASSIR KULOO

MUDASSIR KULOO

SRINAGAR, JAMMU & KASHMIR

ASHIQ HUSSAIN is an electrician by profession, but he loves gardening. The resident of Kander Mohalla Saidakadal in Hazratbal, Srinagar, has always been frustrated that he could not pursue his passion, just because he did not have enough land to grow vegetables.

But three months ago, the 27-year-old learnt from a friend how vegetables can be grown without soil, and vertically in nutrient-rich water. This new technique of farming, which is fast picking up in the Valley, is known as hydroponics, or soilless farming.

Hussain is now growing spinach, collard greens, coriander, mint, and other vegetables, most of which are ready for harvest



Hydroponics enables year-round cultivation, independent of seasonal changes, which can lead to a more consistent and reliable food supply.

in 45 days. The electrician now grows food for his family in PVC plastic pipes at home!

“I learnt that in hydroponics I did not need a lot of space and all that I required were ten PVC pipes, a stand, and a motor for circulating the nutrient-rich water,” Hussain said.

He immediately converted a part of his courtyard into a hydroponic farm and has been growing vegetables. “The farm, which is no more than 3x6 feet in area, yields spinach, collard greens, coriander, mint, all in 45 days,” he said.

Hussain had to spend only Rs 25,000 to set up the hydroponic farm. “I have already harvested collard greens four times and our family has enjoyed eating them. We can pluck their leaves for several weeks,” said Hussain, who has a father, brother and

a sister in the family. “In the coming days, we will harvest spinach, and then mint and coriander,” he added.

Hussain said he got a lot of guidance from the agriculture department of the Jammu & Kashmir government. Iqbal Chowdhary, director of the agriculture department, Kashmir, was all for the hydroponics technique.

“Plants receive essential nutrients from a water-based solution. It contains nitrogen, potassium, calcium, and mixed with water to provide essential nutrients to plants. A motor-driven system circulates the nutrient solution through pipes, making it accessible to those lacking land for conventional farming,” he explained.

Although he does not have exact figures,

he claimed that many people who did not have land were approaching the department to learn about soilless farming and adopt it.

Elaborating on the advantages of hydroponics, Hussain said that it was not labour intensive. "It requires minimal labour, eliminates the need for weeding, and can be set up anywhere. Even those with a limited knowledge of farming, such as me, can easily grow things," he said, adding that it was an ideal technique for the harsh winters of Kashmir, as the crops can be kept safe from snowfall and removed easily.

In soilless farming, the seeds of plants to be grown are germinated for over a week and then shifted to PVC pipes, where a circulation of nutrient rich water keeps them healthy.

"All that we have to be mindful of is water, the specific nutrients for it, and the electricity to circulate the water periodically. Water circulation provides plants with nutrients and oxygen. Few hours of electricity in a day is enough to do the job," Hussain explained.

Hussain's friends and neighbours shared the fruits of his labour on social media and that is inspiring others in the Valley to take up soilless farming. Mehraj ud Din from Ganderbal district in Central Kashmir is one of them. He saw the images of vegetables growing in PVC pipes and was intrigued. He decided to learn more online, and has invested in PVC pipes, iron stands and a motor to embark on his hydroponic

farming journey.

"This method appealed to me because unlike traditional farming which requires a lot of physical labour, this technique is beneficial especially for those who do other things for a living," said Mehraj, who is a government employee. "Just 20-30 minutes a day is enough to tend to the vegetables, and produce grown this way is less susceptible to disease," he added.

Bilal Ahmad, a research scholar at Shar-e-Kashmir University of Agriculture Sciences and Technology Kashmir said hydroponics used significantly less water than traditional soil-based farming. "In hydroponic

farming we recirculate water. Excess water not taken up by plants is reused and thus minimising water loss. Besides, nutrients are dissolved in water and delivered directly to the plant roots. Plants receive what they need, reducing overuse of water," he said.

In soilless farming, the seeds of plants to be grown are germinated for over a week and then shifted to PVC pipes, where a circulation of nutrient rich water keeps them healthy.

"It is therefore a sustainable alternative, especially in water-scarce regions," he reiterated. He also pointed out that growing plants hydroponically can reduce the risk of soil-borne pests and diseases.

"Hydroponics enables year-round cultivation, independent of seasonal changes, which can lead to a more consistent and reliable food supply. Hydroponic systems are an option even in urban areas and can be practised indoors or as vertical farming," Ahmad concluded. ■

The story was published on 21 October, 2023.

STORY 66

Bangladesh's Coastal Farmers Transform Saline Lands into Arable Fields

Farmers in coastal Bangladesh have freed freshwater canals from encroachment and are cultivating three crops a year. They no longer migrate to cities in search of work.



The collective initiative of the farmers has changed the agricultural picture of the area. PHOTOS: RAFIQU L ISLAM MONTU

RAFIQU L ISLAM MONTU
KALAPARA (PATUAKHALI), BANGLADESH

ON A hot and humid afternoon, with pre-monsoon clouds hovering in the horizon, a group of farmers walked back home carrying baskets full of ripe papaya. Not too far away, other farmers were furiously harvesting papaya, bitter gourd, cucumber, pepper, gourd, and pumpkin

so that their produce would be ready to reach the market the next morning.

Five years ago, these fields in the coastal village of Kumirmara in Bangladesh, presented a very different picture. Where now there are lush fertile fields, there was once just lands rendered barren from sea water.

But the grit and determination of farmers in



This floating bridge has been built on the initiative of the farmers to ensure the facility of marketing the crops produced on the land.

Nilganj Union Council of Kalapara Upazila (Sub-District) of Patuakhali district, have turned these lands around and now they have become a source of livelihood for the local people.

Coastal farmers in Bangladesh bear the brunt of climate change. There was a time these farmers could cultivate only paddy during the monsoon season, but now they are growing crops through the year.

Not only have they freed the freshwater canals from encroachment and taken charge of sluice gates to control water flow, they have also formed local farmer organisations to put pressure on the authorities to address their woes. Some of them have also adopted the floating method of vegetable cultivation in ponds for a higher produce. They no longer migrate to cities in search of work.

“We have done agricultural work for generations. But at one time, due to salinity and lack of fresh water, cultivation in the land stopped. I was forced to migrate to the city and work as a daily wager,” said

37-year-old farmer Hemayet Uddin from Kumirmora village. “But now my land is green once again as we have fresh water to irrigate our fields and I have started to cultivate vegetables,” he added.

The same transformation is visible in Saudagar Para village of Taltoli Upazila (Sub-District) of Barguna District near Kalapara Upazila (Sub-District). Farmers of Padma village in Patharghata upazila (sub-district) of Barguna district have also adopted different farming techniques to combat salinity.

All these coastal villages were affected by salinity ingress and increasing number of cyclones due to climate change and warming of the oceans. Kumirmara village is only 15 kilometres (kms) from the sea, Sawdagarpara village is 10 kms from the sea, whereas Padma village is barely 8 kms from the seashore.

Farmers realised that they need to adopt multiple techniques to address the growing salinity in their areas. And the first thing they decided to do was to get control



Farmer Abdur Rahim has cultivated floating vegetables in the pond for recuperation.

over the freshwater canal, 10 kms long and 1200 feet (0.36 kms) wide, which was either encroached upon or was under the control of influential locals.

This was the state of affairs in Kumirmora village, where a freshwater canal which was dug and constructed by the government, was in the possession of influential people. Local farmers could not use its water to irrigate their fields. With the help of the administration, the farmers freed the canal from encroachment and now use it to irrigate and cultivate crops.

They have also taken control of the sluice gates fixed in the canal to control the flow of saline sea water.

Farmer Zakir Hossain of Kirmara village has cultivated vegetables and fruits on his 200 dismil land which was once affected by salinity ingress. Availability of freshwater has changed his fortunes. And seeing him, a number of other farmers have also gone back to farming.

In 2018, some people of Kumirmora decided to form a farmers' association and named

it 'Nilganj Adarsh Krishak Samiti'. The main aim of this association was to hold regular meetings and approach the government as a group to address their woes.

Today the organisation has 162 members. And, nearly 8,000 farmers in the union are positively impacted by this initiative.

"We are looking for a way out of a multifaceted crisis. The farmers of the area have come together to revive agriculture. The collective power of farmers has brought us back to the field. We have converted the land, which was not used for cultivation, into yielding three crops a year. Our area is now full of greenery almost throughout the year," Zakir Hossain, president of Nilganj Adarsh Krishak Samiti, said.

Abdur Rahim, a 48-year-old fisherman from Patharghata upazila (sub-district), was finding it difficult to continue fishing in the wake of frequent cyclones. So he started to farm his land. But, salinity came in the way of any earning he could make from his land.

The fisherman learnt about an alterna-

tive method of farming to avoid salinity. He adopted the floating and scaffolding methods. The floating method of vegetable cultivation is done in ponds where bamboo and wooden floating structures are built over the water body. Vegetables are grown on top of it to get a loft. This keeps the crops free of salt and yields better produce.

“There have been many changes in our lives as a result of changing climate and increasing natural disasters. Fish are not available in the sea and river like it used to be earlier. Cyclones hit us every now and then. We have to adapt to disasters and find alternative ways of livelihood. Floating method of farming has offered us hope,” said Abdur Rahim.

Noore Alam had moved to Dhaka, to make both the ends meet and feed his family of six. He did odd jobs there and returned home to his native Kumirmora village only during the monsoon season to cultivate paddy. But thanks to the efforts of Nilganj Adarsh Krishak Samiti, the 35-year-old farmer has now returned to his village for good and is cultivating his land all through the year. Several other villagers, who used to migrate, have returned to the village and are back to farming.

In Sawdagarpara village, 34-year-old Noor Daraj has come home too. “I went to Chittagong city to earn a living. But now I am back home and cultivating my land,” said Noor Daraj.

According to the Global Climate Risk Index, Bangladesh ranks seventh among the countries most affected by extreme weather in the last two decades. Rising sea levels, frequent cyclones and other natural hazards threaten the lives of millions of people in the country. Agriculture is also



The collective initiative of the farmers has changed the agricultural picture of the area.

under threat due to increased salinity and lack of irrigation water. Millions have already been displaced into urban slums or abroad.

“This initiative of coastal farmers in climate-prone areas shows us the solution. The collective initiative of the farmers has changed the agricultural picture of the area. Many farmers depend on agriculture for livelihood. Government and private institutions should stand by the farmers to advance this type of initiative,” said Rabiul Alam, an agricultural researcher.

Saiful Islam, climate expert at Bangladesh University of Engineering and Technology, also suggested that embankments along the long coastline of Bangladesh should be increased and strengthened.

“Mangrove forests should be created in the coastal belt to combat the effects of cyclones and sea level rise. Bangladesh has received “nothing” from the proposed \$100 billion allocated by developed countries for climate change adaptation and mitigation,” he complained. ■

This story was published on 16 June, 2023.

POINT OF VIEW





Livestock, which is a major contributor to methane emissions in India, is also a source of income among the rural poor, contributing to 31 per cent of the gross value added in agriculture and allied sectors including livestock, poultry and fisheries.

STORY 67

Farming in The Times of Climate Change

Indian agriculture accounts for 14 per cent of the total greenhouse gas emissions. It is crucial for the country to balance strategies and approaches to decarbonising agriculture.



**MADHU
VERMA**



**PARUL
SHARMA**

TRADITIONALLY, THE collective measures to ensure that India attains its objective of becoming a low-carbon economy has focused on cutting emissions in the energy and power sectors. However, the

net zero target cannot be achieved without addressing emissions in other vital sectors such as agriculture which continues to involve the biggest share of the Indian population – around 60 per cent.

Indian agriculture accounts for 14 per cent of the total greenhouse gas (GHG) emissions.

Farming, a source of livelihood for a significant population of India's rural poor, is extremely vulnerable to the impacts of climate change. More than 80 per cent of farmers fall in the small and marginal cate-

gory, owning less than two hectares of land. For them, the impacts are exacerbated.

Hence, it is crucial for a country to balance strategies and approaches to decarbonising agriculture in a country like India, where farming can do more harm than good.

Agricultural practices in India need to be more aligned with the nationally determined contributions (NDCs) under the Paris Climate Agreement, which focus on reducing emissions intensity of the gross domestic product or the GDP (greenhouse gas emissions emitted for every unit of GDP) by 45 per cent, in order to achieve the net zero target by 2070.

To achieve this, we need to move away from conventional approaches, which view agricultural land in terms of per-hectare yield, to a more systems-based approach that considers ecosystem benefits derived from the land and the principles of a circular economy.

Agriculture should be viewed both as a source and sink for carbon emissions, as it has the capacity to both emit and sequester carbon. Livestock, which is a major contributor to methane emissions in India, is also a source of income among the rural poor, contributing to 31 per cent of the gross value added in agriculture and allied sectors including livestock, poultry and fisheries.

Agri-food systems cover complex systems across the value chain covering crop production, harvesting, fishing, live-stock-rearing, storing, transporting, selling, consuming and disposing of food.

In the Indian agriculture scenario, livestock is an integral part of the social and cultural fabric, with multiple uses for food, farm

inputs, transport, etc. As emissions estimates are based mostly on industrial livestock, we need to also consider scenarios that reflect the small farm holdings and the complex role of livestock in developing economies. The data generated from such scenarios will help to better assess emissions situations in India and similar geographies.

The 2022-23 Budget has called for a shift from chemical farming to nature-positive farming, which relies on organic and locally available inputs. Nature-based solutions that protect, sustainably manage, and restore ecosystems can help effectively and adaptively address the challenges of this shift, benefiting people and nature simultaneously.

Agro-ecological practices that recognise the true value of the ecosystem and work in alignment with the ecology, economy and society are the way forward. Practices such as mulching, intercropping, and preparing fertilisers from cow dung enrich the quality and carbon content of soil.

Healthy soils help mitigate climate change by storing carbon and decreasing greenhouse gas emissions. Climate-smart practices create important synergies for agricultural production, climate adaptation and mitigation, and livelihood and environmental objectives, through coordinated action at the level of the farm as well as the landscape.

An important feature of climate-smart agriculture is that it takes into consideration the local agro-ecology. India has several agro-ecological zones, so a one-size-fits-all solution could lead to ecological harm. Rather, unique solutions that are best suited to the region should be adopted. Technological innovation

is a key factor in making a food system sustainable. Techniques such as precision agriculture can help achieve efficiency in resource use, and can help farmers practise agriculture efficiently and sustainably.

Diversifying from traditional monoculture can improve nutrition among farming communities and help the country become more self-reliant in crop production.

Agroforestry, or planting trees at the perimeter of a field as a form of crop diversification, can not only enhance carbon sequestration potential but also help farmers generate additional income from the wood economy through farm forestry, bamboo cultivation etc.

Other new modes of crop diversification are emerging too, such as millet production and food forestry. Millets are climate-resilient and well suited to the agro-ecology of many Indian states, as they grow best in semi-arid regions. Millets were a major crop on the Indian subcontinent until the Green Revolution, after which they were replaced with paddy.

Moving away from rice and wheat to millets can save the country 50 million tonnes of GHG emissions and 300 billion cubic metres of water annually by 2050, as per a report from Centre for Study of Science, Technology and Policy, Bengaluru.

Nature-positive and regenerative agriculture practices are important in reducing fertiliser dependency. Excessive use of chemical fertiliser over the last few decades has resulted in the depletion of important soil nutrients, leading to ecological imbalance. If farmers use natural alternatives, it will help reduce not only the ecosystem imbalance but also input costs. Alternatives include

organic, natural, and pesticide-free farming.

There are several initiatives of organic and natural farming across the country where farms are being managed as sustainable landscapes reaping environmental benefits through the ecosystem services, such as soil improvement, biological pest control, pollination, and water flow.

The pathway to low-carbon agriculture is through identifying opportunities across the value chain and ensuring fair distribution of benefits and costs among the stakeholders. Providing a green premium to farmers and exploring other incentive-based mechanisms will help bridge the gap between chemical and nature-based farming. Consumer perception increasingly favours chemical-free farming, and good marketing helps farmers get a better return on organic produce.

Further, effective crop residue management mitigates emissions from burning of crop residue and creates additional revenue for farmers. With the Indian government promoting biomass fuel through schemes such as the Sustainable Alternative Towards Affordable Transportation (SATAT), farmers could gain an additional revenue stream.

Thus, a systems-based approach that follows the principles of a circular economy could go a long way in decarbonising agriculture in India. ■

Dr. Madhu Verma is Ex-Chief Economist and Parul Sharma is Ex-Lead Researcher at the Economics Center, WRI India. Consultant Gayatri Pande and intern Kaira Kuhu Naidu also contributed to this piece. Views are personal.

This story was published on 28th Mar, 2023.

STORY 68

Rain-battered North India is on its Knees. But, no Lessons Will be Learnt

Climate change is the whipping post for any disaster with authorities pinning the blame squarely on it. However, they remain tightlipped about executing projects that completely disregard the fragile Himalayan ecosystem.



**NIDHI
JAMWAL**

Extreme heavy rainfall causes flash floods and destruction; and the world is increasingly facing these disasters.

THE TWITTER timeline is like a Hollywood horror-story — hills breaking apart; rivers of mud engulfing everything in their way; concrete buildings crumbling like cake; bridges collapsing, and all-weather high-

ways being swept away ... all in a matter of minutes.

But these are real-time visuals of the monsoon mayhem in north India where extremely heavy rainfall has brought state after state to its knees.

Unconfirmed news reports say about 100 people are said to have been killed in rain-related disasters, and losses worth several crores are expected due to the torrential rains.

In Himachal Pradesh, incessant rainfall has led to all the major rivers in spate and several feet above the danger level.

Sitting at home in Mumbai, over 1,800 kilometres away, it is horrifying to watch a Facebook LIVE by Gurudwara Sahib Manikaran in Kullu, Himachal Pradesh, which I have visited in the past. Flood waters from the swollen Beas River entered the holy site, causing huge damage. Several parts of Himachal Pradesh are completely cut off as roads have caved in and bridges washed away. Reports of landslides and casualties have come from Uttarkashi in Uttarakhand too.

In Punjab and Haryana, parked SUVs in plush societies are submerged in the flood waters. Ambala in Haryana is marooned. And in Delhi, the Yamuna river is in full spate and above the danger mark. People living in low-lying areas are being evacuated to safer locations. Heavy rainfall in Rajasthan has reportedly killed seven people.

Meanwhile, the Amarnath Yatra in J&K has also been suspended temporarily due to inclement weather. And the Jammu-Srinagar national highway is closed as a part of the 'all-weather' road has caved in.

The disaster is still unfolding. North India is at the receiving end of not just nature's fury but official apathy too.

To blame the present crisis entirely on climate change is unfair. The government authorities, our elected represent-

atives, and bureaucrats must shoulder the responsibility for the destruction that is unleashed in the Himalayas – year after year, monsoon after monsoon. Ministries and departments plan multi-crore infrastructure projects in the fragile mountains as if they were a glitzy Gurgaon or an SEZ (special economic zone) where regular rules do not apply.

It won't be surprising if this time too, like before, the central and state governments and the local bodies blame the present crisis on God's wrath or climate change. Climate change is turning out to be the convenient scapegoat for inaction, for not fixing responsibility and for the continued plunder of the Himalayas.

Climate change is also a whitewash that the authorities often use to hide their own inefficiencies and their zero will towards environmental protection. The rainfall received in several parts of north India is way beyond normal.

For instance, the India Meteorological Department's (IMD) past 24 hours (from 0830 hrs of 09-07-2023 to 0830 hrs of 10-07-2023) district-wise rainfall data shows the wide extent of large excess rainfall received in north India. Between July 9 and July 10, Lahaul Spiti received 1,778 % beyond normal rainfall. Other districts of Himachal have had similarly large excess rainfall – Kullu 1,524 %, Kinnaur 1,024 %, Shimla 1,269 %, Solan 1,147 %, Chamba 1,167 %, Mandi 487 %, and so on.

Meanwhile, in the same time period, New Delhi had 1,532 % excess rainfall. Several districts of Punjab too bore the brunt of heavy 24 hours rainfall – Hoshiarpur 668 % excess rainfall and Jalandhar 541 %. In neighbouring Haryana, Kurukshetra

recorded a rainfall departure of 2,423 % in 24 hours, Panipat 495 %, Sonipat 649 %, and the list goes on.

But these rainfall figures and extreme weather events should no longer surprise us. Time and again, climate researchers and scientists have pointed out the changing rainfall patterns due to climate change. And how global warming is likely to worsen the situation and make weather-related disasters a common occurrence.

They have been warning that we need to put in extra efforts to address the challenges thrown by extreme weather events, build climate-resilient infrastructure, and invest in ecological conservation, including creating room for the rivers.

But what do we do? In the name of all-weather four-way highways, comfort of the tourists, and ease for the pilgrims, we have ripped apart the Himalayas. Despite a series of similar disasters – 2013 Uttarakhand floods and Chamoli disaster of 2021, to name a few – we have continued with the suicidal business-as-usual approach of plundering the hills.

The situation is no different in the plains where high-end townships and mini-cities have come up on the floodplains of rivers, and local water bodies (ponds, tanks, lakes, natural drains) have given way to multi-storey buildings (some of which house government departments).

Little or no attention has been paid to the natural drainage system of the area. Rivers and rivulets, if they have not already gone dry or been encroached upon, have turned into nullahs. No wonder then that cities and towns get marooned in no

time and every monsoon our financial losses mount, while more and more of taxpayers money is pumped into ecologically damaging projects. Extreme heavy rainfall causes flash floods and destruction; and the world is increasingly facing these disasters.

Recently, flash floods battered Spain and we watched on social media, as cars were washed away in the floodwaters. Heavy rain flooded New York's Hudson Valley on July 9 that killed at least one person, swamped roadways and forced road closures. As per the analysis by CEEW, Preparing India for Extreme Climate Events 2020, the Indian subcontinent has witnessed more than 478 extreme events since 1970 and an acceleration in their frequency after 2005.

In the period between 1970 and 2005, there were 250 extreme events; the post-2005 period witnessed 310 extreme and associated events (which include slow onset events like heat waves and cold waves). Further, between 1970 and 2004, three extreme flood events occurred per year on average, but after 2005, the yearly average rose to 11.

All this information and scientific data should push our government and the concerned authorities to act on climate change. Responding to climate change should become a mass movement so that citizens exert pressure on the government to safeguard lives and the natural environment. Otherwise, what we watch on our Twitter feed today will be playing out right outside every home tomorrow. ■

Nidhi Jamwal is Managing Editor, Gaon Connection. Views are personal.

This story was published on 11th July, 2023.

STORY 69

The Land Beneath their Feet Slips While Authorities Sleep

The districts of Rudraprayag and Tehri in Uttarakhand have witnessed at least 3,601 major landslides since 2015.



**ANOOP
NAUTIYAL**

A bulk of Uttarakhand's mountainous terrain happens to be ecologically sensitive and prone to natural disasters.

REPRESENTATIONAL IMAGE SOURCED BY FLICKR

EARLIER IN the month of August in Chamba, a town located in the Tehri district in Uttarakhand, Suman Khanduri seated his young wife Poonam Khanduri, newborn infant Suman Singh, and his sister Saraswati Devi in a taxi at the stand telling them he would be back soon after running

some errands. Khanduri did not know then that when he returned he would find an entire section of the mountain collapsed onto the taxi stand, taking the lives of his loved ones.

Crushing stories such as this one are no longer isolated in Uttarakhand where at

least three landslides in August have left more than 30 people dead or missing.

Gaurikund serves as a basecamp for those en route to the holy shrine of Kedarnath in Rudraprayag district. On August 3, around 11.30 pm two shops and a dhaba were washed away as the Mandakini river rampaged through the town killing 23 people. Roughly a week later, four pilgrims from Gujarat on their way to Kedarnath died as their car was crushed in the debris following the collapse of a 80-metre portion of the highway, again in the Rudraprayag district.

A bulk of Uttarakhand's mountainous terrain happens to be ecologically sensitive and prone to natural disasters. A handful of devastating disasters particularly over the past decade have thrust Uttarakhand and neighbouring Himachal Pradesh into the national spotlight. This has perhaps led many to believe that rivers on rampage, flash floods or earthquakes are the preeminent danger people face.

However, those who live and travel across Uttarakhand will be quick to tell you that what they have started fearing most above all recently are landslides.

The Indian Space Research Centre, ISRO, and National Remote Sensing Centre (NRSC) published the Landslide Atlas of India in February this year. It illustrates how volatile India, and specifically the Himalayan region is when it comes to landslides.

The geospatial landslide inventory data-

base consisting of 80,000 landslides in India mapped by NRSC, ISRO under its Disaster Management Support programme was reported in the Atlas. The database covered landslide vulnerable regions in 147 districts in 17 states and two Union Territories of India in the Himalayas and Western Ghats. The database included three types of landslide inventory – seasonal, event-based, and route-wise for the 1998-2022 period.

The four types of exposure ISRO classified in the Landslide Atlas were population, number of households, livestock and road exposure. When taking each of these categories into account, the districts of

Rudraprayag and Tehri in Uttarakhand ranked first and second in the country out of the 147 districts with a substantial landslide exposure.

In fact, according to ISRO's index, six of the top 30 most landslide-prone districts like Chamoli, Uttarkashi,

Pauri and Dehardun at the 19th, 21st, 23rd and 29th spots are in Uttarakhand. Thirteen other districts from the Himalayan region from Himachal Pradesh, Jammu and Kashmir, Sikkim, Assam and Manipur figure in the top 30 list. It is no breaking news to those living in the hill districts of Uttarakhand that they dwell upon land that could quite literally slip away from under their feet.

The truth is that the numerous infrastructure, road widening and hydro power projects taking place in sensitive regions across the Himalayan belt are often hastily executed. They lack the appropriate due diligence needed to ensure that they are

According to ISRO, six of the top 30 most landslide-prone districts like Chamoli, Uttarkashi, Pauri and Dehardun, are in Uttarakhand.

built soundly and with safety as the number one priority.

The reasons behind this inept approach are multifold, but the overall sentiment boils down to a desire for short-term gains in favour of ecological planning that takes its environment in account.

For example, the construction of the Tapovan Vishnugad Hydro Power Project in Chamoli district required a massive tunnel to be bored through mountains. Landslides and shocking reports of subsidence in and around the neighbouring area of Joshimath have increased since the start of 2023.

Local residents in Joshimath are categorical in their assessment and squarely blame the above NTPC project for their woes. This is a gargantuan government project, yet it is plain to see that an undertaking of such magnitude was planned and approved with such ecological apathy.

Without trying to engage in 'blame game' finger-pointing tactics when it comes to the troika of development, disasters and climate, the government of Uttarakhand clearly seems to be one step behind. It might appear that the state government has become relatively quicker at deploying disaster management forces than it was before but it is still not tackling the issue at its forefront.

That is, when such mega projects like the Char Dham All Weather Road or others



Maybe it is easier for the politicians to rationalise the destruction caused by a flash flood because rains and cloudbursts are seen as incidents of climate change.

REPRESENTATIONAL IMAGE SOURCED BY FLICKR

are planned, announced and approved; there should be another check in place that has the wherewithal to guarantee such constructions are suitable or not for the sensitive areas.

Maybe it is easier for the politicians to rationalise the destruction caused by a flash flood because rains and cloudbursts are seen as incidents of climate change. However, with 3,601 major landslides hitting the state of Uttarakhand since 2015, the number of casualties and property damage inflicted by these events has ballooned as well.

We must therefore, at both the central government and state levels, shift our focus from getting better at picking up the pieces to assuring that the pieces don't fall to begin with. ■

Anoop Nautiyal is an Uttarakhand-based social worker. Views are personal.

This story was published on 7th September, 2023.

STORY 70

Harnessing the Sun to Power India's Agri Sector

There is a need to reinvent the PM-KUSUM scheme by bringing in equity and gender into India's ambitious plan to solarise the agriculture sector.



**NIDHI
JAMWAL**

Nearly one-fourth of the total electricity consumed in India is by the agriculture sector, mostly to power irrigation pumpsets.

PHOTOS: NIDHI JAMWAL

IT IS not uncommon in rural India to see gallons of water gushing out of a tubewell and into a field. But did you know that these tubewells are sucking out all that groundwater that has collected in aquifers over hundreds of years?

On the face of it, pumpsets are powered by electricity or diesel, and their function is to draw the water out. But, the consequences

of this are far more complex and have a direct bearing on the growth of the agriculture sector, and also climate change.

Nearly one-fourth of the total electricity consumed in India is by the agriculture sector, mostly to power irrigation pumpsets. It is estimated that the country has over 22 million wells and tubewells — 12 million electric and 10 million diesel-run — that together extract over 250 cubic

kilometres of groundwater for irrigation. This is a clear threat to the fast depleting 'invisible' groundwater resource.

Besides the worrisome issue of groundwater depletion, there is also the matter of electricity being supplied to the farming sector. Millions of agriculture pump sets run on highly subsidised power supply which is straining power distribution companies (DISCOMs).

This was discussed at great length during a recent conference, Energizing Agriculture and Enabling Just Energy Transitions in South Asia, organised by International Water Management Institute (IWMI) at IIT Gandhinagar, Gujarat.

In Maharashtra alone, which has 4.25 million electric pump sets (20 per cent of the total pump sets in India), MahaDiscom due from agriculture stands at a whopping Rs 50,000 crore. This data was shared by Hippy Salk Kristle Nath of Institute of Rural Management, Anand (IRMA). He also presented findings of IRMA's assessment of the solar feeder programme in Maharashtra.

Nath explained how power supply to the agriculture sector is cross subsidised by industrial and commercial consumers. As against an average cost of Rs 6.19 per unit to supply electricity to the agriculture sector, the average revenue is Re 1 per unit only, he said.

A June 2020 paper published in Energy Policy points out that "agricultural electricity subsidies are equivalent to about 25% of India's fiscal deficit, twice the annual public spending on health or rural development, and two and a half times the annual spending on developing surface



Tubewell sucks out all that groundwater that has collected in aquifers over hundreds of years. On the face of it, are the pumpsets that are powered by electricity or diesel, that draw the water out.

water irrigation infrastructure".

In such a scenario, 'solarisation' of the agriculture sector holds promise, which will also contribute towards India's target of achieving net zero emissions by 2070. Farmers can use solar irrigation pumps (SIPs) to extract groundwater for irrigation and also sell the extra solar power to the grid and earn revenue. Feeders can be solarised, and solar power plants can be set up.

The objective of the Indian government when it launched PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) in March 2019, was "de-dieselisation of the farm sector, providing water and energy security to farmers, increasing the income of farmers and curbing environmental pollution".

Divided into three components, PM-KUSUM has an ambitious target to achieve 10,000 MW capacity through installation of



Farmers barely use solar pump sets for 100 days in a year. For the rest of the year, the solar power generated should be fed into the grid, which will benefit both the DISCOMs and the farmers.

grid-connected solar power plants each with a capacity up to 2 MW under Component A; and solarisation of 3.5 million agriculture pumps under Component-B and Component-C.

As on October 31, 2022, an aggregate solar capacity of 73.45 MW has been installed under Component- A of the scheme against the total allocation of 4,886 MW capacity. According to an official press release, only about 152,000 agriculture pumps have been reportedly solarised (till 31.10.22) against the target of 3.35 million pumps under the scheme (some estimates claim 300,000 SIPs have been installed in India). The PM-KUSUM scheme has since been extended till March 31, 2026.

The slow pace of implementation of SIPs was also discussed at the IWMI conference. Participants from South Asia shared

their experiences and learnings that could help strengthen the scheme and obtain maximum impact. Low utilisation of SIPs was a far greater concern than the over extraction of groundwater using solar pumpsets. A couple of years ago, I met farmers in Buldhana district in the drought-prone Vidarbha region of Maharashtra where for four months of a year, these off-grid solar-powered agricultural pumps remain idle.

The conference discussed ways to relook at the PM-KUSUM scheme and here are some learnings that emerged from it. Firstly, SIPs should be grid-connected and net metered. Farmers barely use these solar pump sets for 100 days in a year. For the rest of the year, the solar power generated should be fed into the grid, which will benefit both the DISCOMs and the farmers.

Gujarat's Suryashakti Kisan Yojana (SKY) scheme, launched in 2018, is often quoted as a good example. Under SKY, farmers generate electricity using solar panels for their captive consumption (irrigation) and sell the left-over generated electricity to the government via grids. SKY farmers receive 12 hours of daytime electric supply whereas non-SKY farmers receive only eight hours.

Under the SKY scheme, the centre provides 30 per cent subsidy and 65 per cent loan to the farmer (repayable in seven years). The beneficiary farmer has to pay only five per cent upfront cost. The government will procure electricity at a rate of Rs 7 per unit for seven years and then at Rs 3.50 for the remaining 18 years. The SKY scheme is expected to cover 1.5 million farmers in 33 districts and will provide them with solar power through 7,060 feeders.

Secondly, solarisation of agriculture must keep in mind the needs of small and marginal farmers (sharecroppers and tenant farmers). This group of farmers, which owns less than two hectares of land, accounts for 86.2 per cent of all farmers in India, but owns just 47.3 per cent of the crop area, according to provisional numbers from the 10th agriculture census 2015-16.

Gender also has to be at the centerstage of our solar programme because women carry out the majority of the farming activities in India. Some organisations are working with women farmers and helping them access SIPs. Although the PM-KUSUM scheme directs the state governments to prioritise small and marginal farmers, the thrust still remains on large capacity pump sets (two horsepower, five horsepower and above). Interestingly, a number of start-ups in India are working with small

and marginal farmers and making solar technology available to them.

For instance, SwitchON Foundation is working with women farmers in West Bengal and offering them mini solar pumps that cost Rs 2 lakh only. It was noted that the lack of financial access was holding back small and marginal rural farmers in acquiring solar pumps.

Similarly, Kalinga Renewable Energy in Odisha has developed Mobile URJA model. Small and marginal farmers who have small landholdings can share the resources (solar pumpsets) on a need basis.

Post installation service and maintenance of SIPs needs to be addressed. Gujarat Energy Research and Management Institute (GERMI) is working with farmers to build their capacities and train them in using SIPs, and its recent study found that many farmers were unaware about the basic components of the scheme.

Last but not the least, in the concluding session of the IWMI conference, Tushar Shah, an economist and public policy specialist, pointed out that the main objective of the new PM-KUSUM scheme should be to metre 19 million unmetered grid-connected tubewells; create a farmer-participatory rural power grid; and enable farmers to earn by selling 60-70 per cent of their solar generation. Solarising India's agriculture sector holds great promise and it should move ahead by taking in consideration the learnings of the past years. ■

Nidhi Jamwal is Managing Editor, Gaon Connection. Views are personal.

This story was published on 17 February 2023

STORY 71

Sustainable Groundwater Development Through Solar Irrigation in India

Solar irrigation, expanding across India, may provide an opportunity to manage groundwater in both over and underexploited areas.



**ALOK
SIKKA**



**MOHAMMAD
FAIZ ALAM**

GROUNDWATER IS central to India's water and food security. Almost 50 per cent of urban and 85 per cent of rural India depend on groundwater to fulfil domestic water needs.

In agriculture, 64 per cent of irrigated areas use groundwater, abstracted by more than 20 million wells. However, this was not always the case. At the time of Independence, the contribution of groundwater to irrigation was less than 30 per cent. But in the 1960s, groundwater irrigation boomed with the advent of modern drilling and pumping technologies and enabling policies like subsidised electricity. This was instrumental in the success of the green revolution.

However, this unfettered access to groundwater had negative consequences too. The latest assessment by the Central

Ground Water Board (CGWB) shows that almost a quarter of assessed units have unsustainable groundwater development. These are predominantly located in the Northwest and Southern Peninsular regions where the boom in groundwater irrigation was concentrated. In some of the districts located in this region, such as Patiala in Punjab and Kollar in Karnataka, groundwater abstraction is almost twice the annual recharge.

On the contrary, groundwater development in eastern and central India remained limited, constrained by unsuitable terrain and limited electricity network for agriculture. This made groundwater irrigation dependent on expensive diesel.

On an average, in the North-eastern and eastern states groundwater development has only been 25 per cent. Thus, with limited irrigation in the region, agriculture is still dependent on vagaries of monsoon resulting in low cropping intensity and productivity.

Both over and under development of groundwater is limiting the adaptive capacity of Indian agriculture to climate change. Indian agriculture, almost 50 per



Solar irrigation, expanding across India, may provide an opportunity to manage groundwater in both over and underexploited areas.

cent of which is still rainfed, relies heavily on the short monsoon season thus making it highly vulnerable to climate change.

According to the Indian economic survey 2017-18, farmers' income may decrease by 15-25 per cent due to climate change impacts, much more in areas with no irrigation. Similarly, recent research shows that without any measures to limit unsustainable development, cropping intensity may reduce by 68 per cent in groundwater-depleted regions.

Groundwater being more resilient to dry spells, and more reliable and easily accessible to farmers, is central to the irrigation expansion and building agricultural resilience. Thus, a sustainable groundwater development pathway is critical.

Recently, several programmes by the government focusing on managing groundwater show that groundwater is getting the key attention it requires. Punjab and Haryana, the two most overexploited groundwater states, have offered incentives to farmers to shift away from water intensive paddy crops.

Haryana's "Mera Paani Meri Viraasat"

scheme, operational in groundwater over-exploited blocks, provides an incentive of Rs 7,000 per acre to farmers to grow less water consuming crops such as maize and pulses. Both states have also announced cash incentives (Rs 1,500 to Rs 4,000 per acre) for direct seeding of rice (DSR) which can save 15-20 per cent of irrigation water.

Punjab is also piloting "Paani Bachao, Paise Kamao" or Direct Benefit Transfer in Electricity (DBTE) scheme that provides a monetary incentive to farmers to cut down on electricity consumption to incentivise groundwater use.

Solar irrigation, expanding across India, may provide an opportunity to manage groundwater in both over and underexploited areas. In overexploited areas, grid connected solar irrigation models where farmers can sell the generated and unused power back to the grid, could pave a path for incentivizing the use of groundwater.

This could also be an opportunity to disentangle the perverse water-energy nexus under which billions are spent on energy subsidy for irrigation. Gujarat piloted this under the Suryashakti Kisan Yojana (SKY) scheme, and PM - KUSUM

(Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) scheme at a national scale to upscale the same with the target of 10 lakh grid connected pumps.

The schemes are influenced by the IWMI-Tata Water Policy Research Program where the world's first Solar Pump Irrigators' Cooperative Enterprise was set up in a small village of Dhundi in Gujarat and signed a 25-year power purchase agreement with the local power distribution committee.

On the other hand, the standalone solar pumps and solar irrigation service models present a way to develop underexploited groundwater resources in groundwater rich eastern India where development is still constrained by lack of electricity or expensive diesel. Business models such as solar irrigation service provider entrepreneurs, piloted by IWMI in Bihar, can create an equitable irrigation service market reducing reliance on expensive diesel pumps.

Multiple states have been focusing on augmenting groundwater through artificial groundwater recharge. Gujarat, Maharashtra, and Rajasthan have all initiated schemes focused on managed aquifer recharge, a range of methods to enhance recharge by harvesting rainfall.

India's ambitious recharge plan suggests envisaging a potential of > 150 billion cubic metres of water. Underground Transfer of Floods for Irrigation (UTFI) to recharge surplus wet season flows is one innovative approach to co-manage floods and groundwater depletion at the river basin scale.

Another recently launched flagship scheme – Atal Bhujal Yojana – which is operational in select water stressed areas in identified states (Gujarat, Haryana, Karnataka,

Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh) is rightly focusing on participatory groundwater development.

These initiatives present a welcoming step towards managing groundwater and making invisible groundwater visible, which was also the theme of this year's World Water Day. However, many challenges and issues remain regarding the implementation of these programmes.

For example, the uptake of crop diversification schemes under lack of market linkages remains limited. Similarly, direct benefit transfer for electricity and solar irrigation are constrained by operational issues and farmers remain unwilling to adopt DSR despite incentives. This results from a mix of farmers' scepticism, misconceptions and institutional challenges in implementation.

This reflects that there are no quick fixes. Decades old problems will require a holistic approach incorporating communication, outreach, and behaviour change with location technical solutions.

Additionally, we need scientifically robust and timely assessments to assess the effectiveness of these schemes. This will help policies and programmes incorporate learnings as we travel fast in the unprecedented era of climate change. Sustainable and resilient groundwater will be more important than ever for the food and water security of the nation. ■

Alok Sikka is Country Representative at International Water Management Institute – India; and Mohammad Faiz Alam is a Researcher – Water Resources– Agricultural Water Management at IWMI – India. Views are personal.

This story was published on 14 February, 2023.

STORY 72

Climate Change and Mental Health Burden in Uttarakhand

Nae Disha, a special youth resilience programme, has been rolled out in government schools in Dehradun and Uttarkashi as a mental health intervention across the Himalayan state.



RISHABH SRIVASTAVA

What is more worrying is that mental health impacts of climate change are unequally distributed and affect people based on factors such as socio-economic status, caste, religion, gender and age. All Photos by Burans, a community health initiative.

RAMPANT AND unplanned development continues

unabated in Uttarakhand in the Himalayas. The impact of recent extreme weather events including landslides and floods illustrate the vulnerability of mountainous regions to climate change and this has increased the risk of fear and mental

distress for local populations, especially in remote areas.

For instance, people in Joshimath report that they are staring at an uncertain future making them feel anxious and stressed out. The World Health Organization (WHO) in its recent policy brief outlines that increasing climate change poses a huge threat to

mental health and psychosocial well-being from emotional distress and anxiety to depression, grief, and suicidal behavior.

What is even more worrying is that mental health impacts of climate change are unequally distributed and affect people disproportionately based on factors such as socio-economic status, caste, religion, gender and age.

According to a 2021 report by a Dehradun-based SDC Foundation, only four psychiatrists are available for a population of more than 10 million across 13 districts in Uttarakhand.

There is an urgent need to conduct a state-wide assessment of two things: One, the prevalence of mental health problems across all 13 districts and in all the age groups, and, two, to assess the capacity of the health system to address mental health issues at the primary and community levels in both rural and urban areas of Uttarakhand.

This will generate the much-needed data to design interventions that are not only effective but also user-appropriate. Meaning, this will equip us to look at the mental health problems of women in rural areas differently when compared to children and adolescents living in urban areas. One size does not fit all.

Such a dataset will help the government plan its policy and resource allocation. It will set an example of evidence-based decision-making. Investing in mental health not only makes the lives of citizens better and uplifts society but also ensures productivity in terms of economic growth.

Just for reference, the Philippines has

become one of the first countries in the world to study the economic case for mental health investment and UN agencies say that investment in mental health interventions there could save more than 26,000 lives and return 3 million healthy life years to Filipinos over 20 years, and yield returns over 20 years as high as US \$15 for every US \$1 invested now.

Such assessments also have the potential to mitigate the mental health impacts caused due to climate change and extreme weather events that are unfolding at a rapid rate in the Himalayas of Uttarakhand. These could help launch targeted interventions for populations that are living in remote regions and stand deeply affected.

Stakeholders also need to focus on strengthening the policy framework which includes strict implementation of the Mental Healthcare Act 2017. The act remains the most important policy piece in ensuring that the rights of those affected by mental health issues are secured and adequate social security measures are provided by the state. It also provides for the establishment of a State Mental Health Authority and State Mental Health Review Board that most of the states, including Uttarakhand, have failed to constitute even after six years of this act coming into force.

The above-mentioned assessments can also be used by the government to review Uttarakhand's implementation of the District Mental Health Programme (DMHP), launched under the National Mental Health Programme (NMHP) by the Union Ministry of Health in 1996.

DMHP remains a critical policy intervention that provided for the decentralisation of

mental health services and its integration with regular medical services. It also talks about the training of medical personnel, integration at the primary health care level, identification and screening of mental health issues and focussing on community mental health.

Currently, while DMHP is being implemented in all 13 districts of Uttarakhand as per the Union Health Ministry, many people in rural and remote districts such as Uttarkashi report that there is no access to mental health care or the essential medicines mandated in DMHP.

Promoting community mental health One of the effective ways for Uttarakhand to tackle the growing burden of mental health challenges is by promoting community mental health. It is an approach where mental health issues are handled at a community level rather than in institutional settings.

Community mental health interventions have shown huge potential in addressing the treatment gap that exists due to the inadequate availability of specialist doctors and the stigma that remains deeply rooted in our society. Community mental health programmes can also be a good tool in addressing the stressors caused in the community due to climate change and disasters, which are unfortunately becoming a regular phenomenon in Uttarakhand.

Burans, a community health initiative of Herbertpur Christian Hospital and the Uttarakhand Community Health cluster in Dehradun, is a good example of this.

Started in 2014, Burans works with marginalised populations in Uttarakhand such as

the urban poor, women, victims of domestic violence, prisoners, young people and others. It works with a network of community health workers, lay workers, volunteers, and students who play a crucial role in raising awareness and educating communities on mental health and engaging in the identification and screening of mental health problems.

The initiative has also developed Nae Disha, a special youth resilience programme that has been rolled out in government schools in Dehradun and Uttarkashi. This could serve as a good template for similar interventions at scale across cities and districts. Burans has also provided evidence on how community psychosocial support groups can help improve mental health, especially amongst marginalised women, even where there is a mental health professional.

There is also a special onus on the citizenry and the larger civil society of Uttarakhand to engage in advocacy and dialogue with the government on issues of mental health. They could also play a crucial role in constructing spaces that are open and safe for people to come and share their mental health experiences, especially with a focus on young people.

The time has come for Uttarakhand to put mental health at the top of its priority list. It will further need proactive and evidence-based action from the system and a strong political will to support people in the state to be mentally healthy. □

Rishabh Shrivastava is an independent researcher and writer working on issues of law and public policy. Views are personal.

This story was published on 10th October, 2023

STORY 73

Reviving The Dying Wisdom

In a changing climate, the Bhovi community of traditional well diggers in Karnataka has many lessons to offer on water conservation.



**NIDHI
JAMWAL**

The Bhovi men, most of them unlettered and from a Schedule Caste, are helping address Bengaluru's water crisis, one well at a time. PHOTOS: NIDHI JAMWAL

BENGALURU WAS never more alluring with its sweet breeze, gentle sunshine and its flowering trees. On a February afternoon, I stood at a small, but beautifully crafted and colourful temple in the dhobi ghat of Malleshwaram, one of the city's oldest localities. As I walked its lanes and by-lanes dotted with old houses with kolam on their doorsteps and thresholds, I was transported to Malgudi Days of my childhood.

My happy nostalgia was suddenly interrupted by loud voices speaking in Kannada. The voices emerged from a wide hole in the ground — a dugwell, believed to be over 100 years old.

I had come to the dhobi ghat in Malleshwaram on the advice of my friend and guide, S Vishwanath, founder and director of Biome Environmental Solutions. He had told me about how an ancient practice was being revived in Bengaluru to rid the



According to S Vishwanath, the well diggers community could play in helping solve the growing water crisis in the southern metropolis.

Silicon City of India, of its most pressing problem – water scarcity.

I peered down and saw a bunch of water warriors – men from the ‘Bhovi’ (‘Bhavi’ means well in Kannada) or ‘Mannu Vaddar’ (also spelled as Waddar) community of traditional well-diggers. These well-warriors stood inside the 60-foot deep well, in their undergarments, removing silt and waste from the giant well, which once was the sole source of water for the washerman’s community. But with the increase of borewells and water tankers, open dug wells slowly choked to death.

Shankar, the leader of the group, informed me that the group of ten well-diggers would spend all day cleaning the well in order to bring it back to life. They used thick ropes to descend and ascend from the well, buckets and baskets to remove the silt and garbage, and a motor pump to

pump out dirty water. Of course, their most important tool was traditional wisdom about a profession that had come down to them from generations.

The Bhovi men, most of them unlettered and from a Schedule Caste, are helping address Bengaluru’s water crisis, one well at a time. They are an integral part of the ‘Million Wells for Bengaluru’ campaign started by the Biome Environmental Trust. The objective of this mass movement is to increase the groundwater table in the city while providing livelihoods to the community of well diggers.

There are at least 15 villages of the Bhovi community around Bengaluru. Shankar and his fellow diggers hailed from Bhovi Palya village, near Sarjapur, on the outskirts of Bengaluru, which had 110 Bhovi families. People of these families who once earned a comfortable living by digging

and maintaining dugwells, are now mostly daily wage labourers, often migrating in search of work.

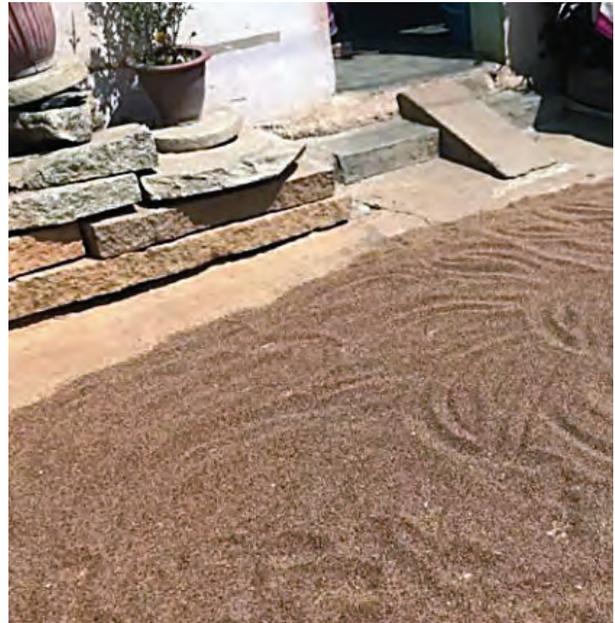
Vishwanath, who was also at the site, explained the role the well diggers community could play in helping solve the growing water crisis in the southern metropolis, and across the Indian landscape that was one dotted with open wells of different sizes, shapes and designs. These wells were once the main source of drinking water for Bengaluru, Vishwanath said. Even after piped water supply came in, wells continued to do their job. But, the arrival of borewells in the early 1980s spelt the end of the culture of wells. Dugwells, which were integral to our everyday lives, fell to disuse and slowly disappeared, were encroached upon and finally died with the start of indiscriminate groundwater extraction.

As Vishwanath spoke, I thought back to other reporting assignments in Bihar where dug wells were abandoned and the chapakal (hand pumps) were introduced by the government and international agencies to provide 'safe' drinking water.

The fact that these hand pumps soon became a source of 'poisoned' water laced with high arsenic and fluoride, which over the decades have maimed hundreds of thousand and spread cancer in far-flung villages, is another story.

Several villages in Bihar are now abandoning hand pumps and reviving their dug wells to escape disability and death.

According to Shankar, because of water shortage, washermen were forced to buy water from private tankers, or depend on borewells that were fast running dry. So, the washermen association approached



Vaddars are broadly divided into three sub-groups, out of which the ooru vaddars are ragi (finger millet) cultivators.

the long-forgotten Bhovi community to clean this 100-year-old well and revive it.

Shankar smiled. So did I. The modern world of borewells and submersible pumps had written off age-old dug wells and their caretakers, the Bhovi community. But, ancient wisdom had its way as we watched how Munikrishna, Srinivas and Pedanna skillfully removed silt and waste from the ancient well and coaxed it back to life. The exact history of the origins of the Bhovi or Vaddar community is uncertain. Some claim Vaddars came from Odisha (the community is also known as Odra), whereas others believe they are from Andhra Pradesh, as they also speak Telugu. Well-digging communities are also found in Maharashtra and Gujarat. Vaddars are broadly divided into three sub-groups, as Ramakrishna, a well digger, explained. Mati or mannu vaddar mainly deal with the soil and mud; kallu or dagad vaddar handle stones, whereas ooru vaddars are ragi (finger millet) cultivators, he said.

Apart from helping capture rainwater and reviving dugwells, the Bhovi community also cultivates ragi and consumes it regularly, I learnt. I was served a wholesome meal of ragi mudde (ragi ball) at Shankar's home.

Bengaluru has taken up revival and recharging of dug wells in a big way. The main aim is to augment groundwater levels, which are dipping, and reduce the city's dependence on the river Cauvery that flows nearly 100 kilometres away. Recharge wells, that collect rainwater from a given area and pump it into the ground, are becoming popular. And, the members of the Bhovi community are helping dig, clean and maintain these wells across the city.

Despite two monsoons every year— the southwest monsoon (June to September), and the northeast monsoon (October to December) — India struggles for water. According to an article in *Down To Earth* magazine, "It rains about 900 mm during a normal monsoon year over India and if we assume that about 80 per cent of India is covered by this rain, then the estimated volume of water is well over 200 lakh crore buckets. It comes to 2 lakh (or 200,000) buckets per person!"

According to the World Bank, India has 18 per cent of the world's population, but only four per cent of its water resources, making it amongst the most water-stressed in the world.

A June 2018 report by the NITI Aayog points out that India is undergoing the worst water crisis in its history and nearly 600 million people are facing high to extreme water stress. The country is ranked at 120th amongst 122 countries in the water quality index, with nearly 70 per cent of water being

contaminated.

Most big cities in India have made rain-water harvesting mandatory. Unfortunately, a lot of it is only on paper, and the climate change that is affecting our monsoon rainfall patterns, is worsening the situation. But there is hope.

There still exist traditional communities of water managers across the country and are known by different names in different states. They have an ancient bond with water and water-related practices, and it would do well to shine the spotlight on them and their skills.

Sadly, they live on the margins of modern life, mostly in oblivion. Their younger generation is dissociated with their centuries-old craft because barely anyone values this ancient wisdom of managing our water and water resources. Our relation with our water is now limited to turning on the tap or pressing the flush handle, or buying bottled water. This must change.

As we rush headlong into the world of artificial intelligence, that is supposed to revolutionise the way we live and function, it is time to pause, step back and take note. Never have we felt a greater need to go back to basics that has stood the test of time.

The need of the hour is to marry traditional knowledge with modern technology. It does not have to be an either-or situation. They can co-exist. And Shankar, Ramakrishna and the other Bhovi well diggers demonstrated that all too well. ■

Nidhi Jamwal is Managing Editor, Gaon Connection. Views are personal.

This story was published on 17th March, 2023.

STORY 74

Getting Hammered from Pole to Pole and Tropic to Tropic

Spring did not show up this year, but there has been snowfall in April and May in some of the Himalayan states. Heatwaves are on the rise lasting up to 36 days a year. But the monsoon rainfall over the Indo-Gangetic plains has reduced.



**NIDHI
JAMWAL**

It was several decades ago when weather still followed a familiar pattern; when winter gave way to spring, which slowly transitioned to the summer season. Now the weather is all mixed up!

AN ELEVEN-SECOND video I received on my WhatsApp was so soothing. The branches of a mango tree, laden with fruit swayed in the breeze, and the kaccha mangoes danced, occasionally bumping into each other. Watching the sheets of rain in the clip, I could almost

smell the rain-on soil fragrance.

But, something was not quite right. The video was shot three days ago, on May 1, a time when it is peak summer in north India with the mercury often crossing 40 degree Celsius. 'Never seen such a pleasant May month in Lucknow' – was the caption



Winter brings little precipitation and snowfall has shifted to April and May months.

that came with the video. I immediately recognised the mango tree which stands tall outside the Gaon Connection office in Lucknow, the capital of Uttar Pradesh.

The state is India's highest mango producer. Mango trees love hot and humid climates. I remember, as kids complaining about power cuts in the searing summer heat. But our nanis and dadis would console us saying the hotter the summer, the sweeter the mangoes.

But that was several decades ago when weather still followed a familiar pattern; when winter gave way to spring, which slowly transitioned to summer. Not any more.

Winter brings little precipitation and snowfall has shifted to April and May. States such as Uttarakhand and Jammu & Kashmir have a weather alert and are experiencing snowfall now, in May. 'Instead of a white Christmas, we have a white Holi'

has become a common refrain.

Pretty as the mango tree WhatsApp video was, it worried me. More so because I had just returned after attending a two-day national workshop on heatwaves organised by Climate Trends. The venue of the workshop was Bengaluru in Karnataka, where election fever is at an all time high.

But, unlike other journalists who have arrived in the Silicon Valley of India to report on the elections, a bunch of environment and climate journalists, like me, were there to understand heatwaves (terrestrial and marine), changing monsoon rainfall patterns, warming of the planet and its effects that are already being felt across the globe. And to learn how best we could report on these issues and press for action.

Over two days, climate scientists, academicians, researchers and field practitioners explained the nitty gritty of climate change.



Climate scientists have been showing the latest evidence and data of the impact of climate change.

There was training on how to report on erratic weather events, heatwaves, teleconnections, monsoon, El Niño - La Niña, and related issues. Slide after slide, map after map, climate scientists showed the latest evidence and data of the impact of climate change – which poses a direct threat to the livelihoods and economy, health, food basket, water systems, and our very existence.

April and May are usually associated with heatwaves. But this year, several parts of the country have observed below normal temperatures (Mumbai received pre-monsoon showers, which is almost unheard of). In sharp contrast, heatwaves arrived much earlier, in the beginning of March, damaging crops that were getting ready for harvest.

Last year, in 2022, the country faced unprecedented heatwaves, both in terms of intensity and frequency. Vimal Mishra, professor of civil engineering and earth science at Indian Institute of Technology (IIT) Gandhi Nagar, who has analysed data of heatwaves, presented the findings at the Bengaluru workshop. They were worrying revelations. The Indian region faced around five heatwaves during the pre-monsoon

season last year (February to April) that extended for 36 days.

Misra showed how both the intensity and duration of heatwaves have increased sharply. For instance, between the 1950s and 2010s, the duration of heatwaves ranged between seven days and 12-13 days in a year. But, in 2022, it jumped to 36 days. Similarly, the frequency of heatwaves ranged between one and two events per year (1950s to 2010s). But last year, there were five heatwaves in the pre-monsoon season.

“The unprecedented heatwave, like the one in 2022, is projected to become very frequent in future warming, which will pose a severe impact on the highly populated Indian subcontinent region,” warned Mishra, stressing on the need to develop and implement district-level heat action plans. The biggest impact of heatwaves, as pointed out by him, will be borne by the workers and labourers.

Heatwaves aside, rising temperatures and warming of the oceans is impacting our monsoon, which, for centuries, has irrigated our farmlands, replenished our freshwater sources and sustained all life forms, besides inspiring poets and lovers.

Roxy Mathew Koll, a climate scientist at the Indian Institute of Tropical Meteorology (IITM), Pune, presented the analysis of 152 years of all India Summer Monsoon rainfall, from 1871 to 2022. The IITM analysis shows that post 2000, there has been no 'wet' year (rainfall anomaly of more than 10 per cent of mean) in the country, whereas there have been drought years. Koll also pointed out that about 50 per cent of drought years are El Niño years.

The bad news doesn't end here. Koll pointed out how in the past 70 years (1950 onwards), there has been a significant reduction in monsoon rainfall in the Indo-Gangetic basin and central India, and a significant increase in Gujarat and Central Maharashtra. Meanwhile, extreme rainfall events have increased in parts of central India.

Rainfed agriculture occupies about 51 percent of the country's net sown area and accounts for nearly 40 per cent of the total food production, as documented by the Ministry of Agriculture & Farmers Welfare. To put it simply, erratic monsoon rainfall means our monthly grocery bills will rise and there is a likelihood of increased water stress.

Koll also talked about the Indian Ocean which is the fastest warming ocean in the world. "The observed Indian Ocean warming has been rapid and large," he said as he presented data analysis which shows that between 1901 and 2013, the sea surface temperature in the Indian Ocean has already increased by 1.2 degree C. It is likely to increase by another 3 degree C between 2020 and 2100!

This can be catastrophic as warming of the ocean is linked to both increased frequency and intensity of tropical cyclones. The Arabian Sea has been warming at a faster

pace and reporting more cyclones, as has been documented by the India Meteorological Department (IMD). In his detailed presentation, Raghu Murtugudde, an earth system scientist and visiting professor at IIT Bombay, showed how each decade has been warmer than the earlier one.

Murtugudde said that it was meaningless to talk about a normal monsoon as every monsoon was likely to be crazier. "We are getting hammered from Pole to Pole, tropic to tropic... Pre-monsoon rainfall has become erratic and is interacting with heatwaves," the earth system scientist said. He added that we needed better weather forecasts at granular level and adaptation at local level.

We don't need to wait till 2070, or even 2050 to experience the devastating impacts of climate change on the lives of common people. Luke Parsons, postdoctoral associate with Duke University, presented some disturbing numbers on annual productivity losses due to the rising heat. According to him, globally 220 billion hours in a year (in shade) are lost due to the rising heat and wet-bulb temperature. A wet bulb temperature (that takes into consideration both heat and humidity) of 32 degree C is usually the maximum that a human body can endure and carry out normal outdoor activities in.

Of the total 220 billion hours lost, almost half (46 per cent) – 101 billion hours lost – are from India. This is equivalent to about 23 million jobs lost, Parsons said. Can India afford to lose them? ■

Nidhi Jamwal is Managing Editor, Gaon Connection. Views are personal.

This story was published on 4th May, 2023

STORY 75

Flood-Resilient Toilet: An Eco Katha

What if one day you woke up to find yourself in waist-deep water, your toilet submerged in dirty floodwater? And have to live that way, not for a day or two, but for weeks together...



**NIDHI
JAMWAL**

Based on local conditions and community feedback, Megh Pyne Abhiyan designed a unique ecosan (ecological sanitation) toilet called Phaydemand Shauchalay (beneficial or productive toilet), particularly meant for the flood prone areas of north Bihar. PHOTOS: NIDHI JAMWAL.

OUR MORNING routine: wake up and head straight to the toilet, usually attached to our bedroom, relieve ourselves and freshen up. But what if one day we woke up, found ourselves in waist-deep water, and discovered our toilet was submerged too? What if we had to live that way, not for a day or two, but for weeks together...

How would we then defecate? Worse, what would we do if we were women having our periods? Where would we find the privacy to change our soiled rag/ sanitary pad?

But this is not a hypothetical matter. These are very real concerns of millions of people living in north Bihar, India's most flood-prone region.



The ecosan toilets have become a part of the daily lives of several rural women, who said they were finally able to defecate in a safe and clean space, even when the village was hit by floods.

Even as we read this, there are villages along the India–Nepal border in north Bihar which are living in these conditions. There are 66 flood events in a year (even outside of the monsoon season), as recorded by non-profit Megh Pyne Abhiyan (MPA). And each flood event can last for several days depending upon the rainfall (locally and upstream in Nepal) and other factors.

Millions of rural women in north Bihar suffer during these natural disasters, now exacerbated due to climate change and changing rainfall patterns. The women do not have access to a safe spot for ‘maidan jana’ (a local term for defecation) during the floods. Underground twin-pit toilets built under Swachh Bharat Mission are no good in floods.

The massive floods of 2008–09 in north Bihar led to a new beginning, an innovation in the sanitation sector in flood-prone areas. Based on local conditions and community feedback, Megh Pyne Abhiyan designed a unique ecosan (ecological sanitation) toilet called Phaydemand Shauchalay (beneficial or productive toilet).

In 2016, I visited villages in Pashchim Champaran district of north Bihar where I first saw the Phaydemand Shauchalay in a couple of villages in Nautan and Gaunaha blocks. Megh Pyne Abhiyan constructed them with the support of local communities and trained local masons to do the job.

As an environmental journalist, I was impressed with the design of these toilets, which require very little wash water and also produce humanure for farming. A Phaydemand Shauchalay has two specially-designed ecosan toilet pans placed above two concrete chambers, which are divided by a wall. The toilet and its chambers are constructed on a raised platform. This ensures that even during an extreme flood event, Phaydemand Shauchalay remains operational. That is its litmus test.

Each pan has a 10-inch diameter opening in the centre, which leads to the chambers below, where the faeces is collected. Sloping away from this open space are two basins at the front and back with their own drainage. These collect urine and wash

water, separately. After defecating, the user sprinkles some ash or sawdust on the faeces and closes the lid of the excreta hole.

To prevent insect attack, not even a drop of wash water or urine should get inside the excreta chambers. The family uses one chamber of the ecosan toilet for the first five to six months, and once that is full, it shifts to the second chamber.

Meanwhile, the faeces in the first chamber naturally converts into humanure over a period of time. It is then harvested and used in the fields, which also cuts down the family's expenses on fertiliser and pesticides. The urine is also put to use. It is collected in a separate container, is mixed with water and sprinkled in the fields.

After my first encounter with Phaydemand Shauchalay, I revisited these toilets in the villages of Pashchim Champaran between 2016 and 2018. I met several rural women who said they were relieved that finally they had a safe and clean place to defecate, even during the floods. Adolescent girls benefitted the most. A reason to revisit these ecosan toilets was also to check if they were "still functional" (we reporters are known to be suspicious creatures). And to my surprise, I did find them functional despite a couple of floods in the area.

Then came the pandemic and the world staggered to a halt. But were the Phaydemand Shauchalays still functioning? I found they were still being used when I visited the Naya Tola Bishambharpur village, located within the embankments of Gandak river in Pashchim Champaran, which faces recurring floods, and where eight Phaydemand Shauchalay were constructed in 2017.

It was an overwhelming feeling to again

meet villagers whom I had met in the pre-pandemic years and to see their families safe. But what cheered me the most was to find that six ecosan toilets were still functional in the village of 134 households, and women and their families, whom I had met five-six years ago, were still using them.

Geeta Devi excitedly took me to show her Phaydemand Shauchalay which had tiled walls now. "My husband added these tiles to make our toilet look even better," she said. "We have expanded our house and now the toilet is attached to our house," she added. Geeta Devi had also recently harvested humanure from her toilette use in her sugarcane fields.

Chhathi Devi, who was the first woman to undertake construction of Phaydemand Shauchalay in Naya Tola Bishambharpur village, also showed me her toilet — spic and span with no odour.

Clearly, the ecosan toilet had become a part of the daily lives of these rural women, who said they were finally able to defecate in a safe and clean space, even when the village was hit by floods, which is almost every monsoon as it is trapped inside the embankments of the Gandak river.

Eklavya Prasad, founder of Phaydemand Shauchalay, said that plans were underway to construct more flood-resilient ecosan toilets in Naya Tola Bishambharpur village. A win-win solution for ecological sanitation and chemical-free farming, isn't it? ■

Nidhi Jamwal is Managing Editor, Gaon Connection. Views are personal.

This story was published on 15 September 2023



GAON CONNECTION IS
INDIA'S BIGGEST
RURAL COMMUNICATION AND
INSIGHTS PLATFORM.



ACROSS
470
DISTRICTS

WhatsApp icon +91 95656 11118

www.gaonconnection.com



647,000
+ SUBSCRIBERS

117.8 MN
+ VIEWS

3.5 MN
WATCH HOURS

883,000
VIEWS A MONTH



SUBSCRIBE TO GAONCONNECTION TV
THE HONEST CHRONICLER OF RURAL INDIA

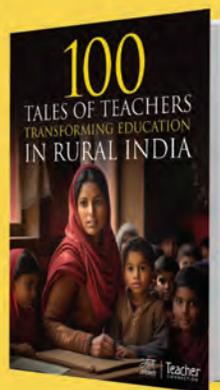
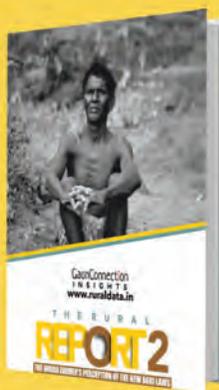
www.youtube.com/@GaonConnectionTV

LISTEN TO GAON RADIO 24X7 ON
GAON CONNECTION'S WEBSITE

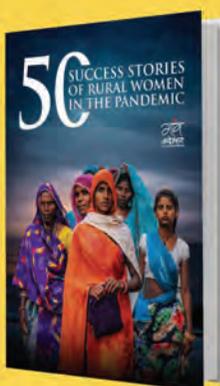
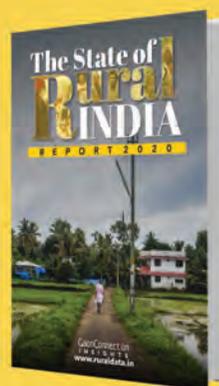
गाँव
कनेक्शन
PRESENTS
गाँव रेडियो 

www.gaonconnection.com

 +91 95656 11118



Gaon | गाँव
CONNECTION | कनेक्शन
INSIGHTS | YOUR CONNECTION WITH RURAL VOICE



www.gaonconnection.com

Gaon Connection is a unique rural communication and insights company
creating video, text and audio content, insights reports, and rural activation.

 +91 95656 11118