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8. Professional Training			
Organisation	Period		Details of Training
	From	To	
University of East Anglia, UK	February, 1995	July, 1995	Undergone six months research-based training on “ Climate Change ” at the University of East Anglia, UK under the Technical Cooperation Training Programme sponsored by the British Council Division.
Indira Gandhi Agricultural University, Raipur	14 September 1992	3October, 1992.	Attended first SERC School on Agrometeorology with the theme “ Agricultural drought, concept, assessment and management ” sponsored by the Science and Engineering Research Council (SERC) of the Department of Science and Technology (DST), Government of India at Indira Gandhi Agricultural University, Raipur
India Meteorological Department, Pune	29.January .1990	28.January. 1991	Undergone one year Training of Meteorologist Grade II with specialization in Agricultural Meteorology, India Meteorological Department, Pune.

9. Employment records (in chronological order starting with the first job)				
Name and address of employer/institution	Period		Designation	Nature of work
	From	To		
Ministry of Agriculture, Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi	01.2.1988	22.8.1989	Technical Assistant	Dealing with the different projects on soil and water conservation and also Centrally Sponsored Schemes on River Valley Projects in different states of the country
Ministry of Agriculture, Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi.	23.8.1989	28.1.1990	Senior Technical Assistant	
India Meteorological Department Ministry. of Earth Sciences	29.1.1990	28.1.1991	Trainee Meteorologist	Undergone one year Training of Meteorologist Grade II with specialization in Agricultural Meteorology, India Meteorological Department, Pune
India Meteorological Department Ministry. of Earth Sciences	29.1.1991	13.7.1997	Meteorologist Grade II	<ul style="list-style-type: none"> • Issuance of Agromet Advisory Service Bulletin twice a week to farmers & different AIR Stations of Tamil Nadu for broadcasting and telecast over Doordarshan Kendra. • Research activities on Agrometeorological aspects.
India Meteorological Department Min. of Earth Sciences	14.7.1997	10.2.2004	Meteorologist Grade I	<ul style="list-style-type: none"> • Development of weather based forewarning models for the out-break of different pests and diseases on major crops grown in India. • Research work on other Agrometeorological aspects.
India Meteorological Department Min. of Earth Sciences	11.2.2004	30.6.2011	Director	<ul style="list-style-type: none"> • Preparation of All India Agromet Advisory Service bulletins. • Infrastructure development under Integrated Agromet Advisory Services in the country. • Dissemination of Agromet Advisories through SMS and multi-channel dissemination systems. • Designing and regular updating of website of the and multi (http://www.imdagrimet.gov.in) for displaying of AAS bulletin (national, states & districts) in English and local languages.

				<ul style="list-style-type: none"> • Worked as Member Secretary of the Committee for Integration of Agromet Advisory Services of India Meteorological Department, National Centre for Medium Range Weather Forecast (NCMRWF) and Indian Council of Agricultural Research (ICAR). • Contributed generation and issue of weather forecast and agromet advisories at district level from June 2008. • Maintained organisation of 130 Agromet Field Units (AMFUs) of the country located in agroclimatic zones of different parts of the country for issue of district level agromet advisories. • Delivered lectures in different courses conducted by Agricultural Meteorology Division and also to the participants in the different course Programme of Doordarshan Kendra's, Department of Science & Technology (DST) sponsored SERC School etc. • Research & Development in Agrometeorology.
India Meteorological Department, Min. of Earth Sciences	1.7.2011	17.8.2018	Head & Deputy Director General of Meteorology , Agricultural Meteorology Division	<p>Overall functioning (Administrative & Technical) of Agricultural Meteorological Division with special emphasis on implementation of Gramin Krishi Mausam Seva Project as Project Co-ordinator and also issue of crop yield forecast under the projects Forecasting Agricultural output using Space, Agrometeorology and Land based observations (FASAL)/ Coordinated programme on Horticulture Assessment and Management using Geoinformatics (CHAMAN).</p> <ol style="list-style-type: none"> 1. Coordinated for the issuance of weather-based crop and locale-specific agro-advisories for 640 districts from field units and disseminated to farmers by deploying various modes of information dissemination channels, e.g., radio, television, print media, internet and mobile phones. Around 43 million farmers as on today receive abridged advisories through SMS on their mobile phones. 2. Efficient alert system has been established to reach the farming community at minimum possible time to take appropriate action to save their crops from any weather hazards. Warnings was disseminated to large number of farmers. 3. Agromet Advisories were disseminated in different languages through DD Kisan- 24 hours channel for the farmers in the country launched by the Honourable Prime Minister of India. 4. Farmer awareness programmes were organized across the country 5. Application of Remote Sensing in Agromet Advisories Services (crop, productivity and soil moisture status of a region under water stress, other

				<p>biotic or abiotic conditions along with the possibility of forewarning pest and disease outbreak for smaller areas) was introduced.</p> <p>6. Linkages were established with Panchayati Raj Institutions and Urban/ Rural Local Bodies to disseminate the weather forecast and agromet advisories to the farmers in the country through different stake holders in PPP mode. Mini-observatory at the Panchayat level along with Climate Managers were established for disseminating real time weather information and Agromet Advisories to the farming community</p> <p>7.. Advisories were disseminated to the farmers during extreme events like HUDHUD AND NILOFER CYCLONE and also during unusual heavy rainfall along with hailstorm</p> <p>8. Issued Agromet Advisories fortnightly based on the extended range weather forecast during monsoon season.</p> <p>9. Organised training /Capacity building programme</p> <p>10.Undertook work to upgrade district level agrometeorological advisory services to block level. Further to improve the relevance of this service, block-level ‘Gramin Krishi Mausam Seva’ has been initiated. A high-resolution weather forecast at block level was utilized to develop this service. As a part of this initiative, established District Agromet Units (DAMUs) in existing Krishi Vigyan Kendras.</p> <p>11. Issued in season yield forecast during kharif and rabi season for the crop’s jute, rice, cotton. sugarcane rapeseed- mustard, wheat, winter potato, sorghum and onion.</p> <p>12. Different collaborative projects with various organisations like Space Application Centre, Indian Space Research Organisation, Ministry of Agriculture, Prasar Bharati, M.S. Swaminathan Foundation etc. were taken up to strengthen the agromet advisory services in the country.</p> <p>13.Worked closely with the Commission of Agricultural Meteorology (CAGM), World Meteorological Organisation to strengthen operational agrometeorological services in the world.</p>
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<p>Agro-Meteorological Information Systems Development Project, Component-C of Bangladesh Weather and Climate Services Regional Project,</p> <p>Department of Agricultural Extension (DAE), Dhaka Bangladesh</p>	<p>18.10.2018</p>	<p>17.10.2020</p>	<p>Senior International Agrometeorological Technical Consultant</p>	<ul style="list-style-type: none"> a) Prepared of a comprehensive list of deliverables i.e., Final guidelines for developing agrometeorological databases for the 487 upazillas; Guidance document on agrometeorological data analysis and future scenario generation (including the use of crop models) and downscaling the scenarios to upazila level; and create and use of risk mapping of climate-vulnerable farming communities in Bangladesh; b) Supported the government in issuance of agrometeorological advisories and development of products to farming communities in different regions of Bangladesh through the web portal, BAMIS and other communication channels; c) Undertake an assessment of existing data for development of agro-advisory bulletins and for crop modeling; along with enhance monitoring; d) Visited selected upazillas and develop a comprehensive strategy, after discussions with DAE and BMD staff, for developing agrometeorological databases for the 487 upazillas; work with DAE and other institutions to help develop such databases; e) Developed a plan, in consultation with experts from BMD, DAE, BARI, Bangladesh Rice Research Institute (BRRI), Bangladesh Sugar Crop Research Institute (BSRI) and Bangladesh Jute Research Institute (BJRI) for agrometeorological data analysis and future scenario generation (including the use of crop models) and downscaling the scenarios to block level; support and provide training to the agencies on these aspects; f) Visited selected sites where automatic weather stations will be installed and prepare a plan for the integration of data from these stations with the data from the agriculture sector collected by DAE through the Agricultural Officers in the Upazillas to facilitate the development of agrometeorological advisories and products for use by the farming community; g) Visited the offices of Union Parishads and develop the sustainable plan for use of data from the automatic rain gauges and on-line reception and display of agrometeorological information through display boards in all the 4,051 Union Parishads for provision of agrometeorological information to farmers;
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The World Bank	July 30, 2020	September 15, 2020	Short Term Consultant	<ol style="list-style-type: none"> 1. Preparation of the write up on the " Road Map for Strengthening Agromet Advisory Services in Bhutan" in consultation with the other Consultants of World Bank Group and Department of Agriculture, NCHM, Bhutan and RIMES 2. Preparation of concept note on "Climate Farmer Field School" in consultation of World Bank & Department of Agriculture, Bhutan.

10. Research & Development:

Research & Development have been carried out during last 34 years in the area of Agricultural Meteorology. In the beginning, research work was done in collaboration with Bose Institute of Calcutta and Geology Department of Calcutta University on Mangrove Forest and soil. Afterwards, research work was oriented on recycling of organic waste and its use in crop production. During the assignments in UK, I had the opportunities to work in Climatic Research Unit of East Anglia, UK and worked on “Evaporation and potential evapotranspiration in India under conditions of recent and future climatic change”.and published the paper in Agricultural and Forest Meteorology journal.

After joining in Agricultural Meteorology Division, India Meteorological Department (IMD), in addition to the operational agromet advisory services, research has been carried out in different subjects of agrometeorology like pest & disease forewarning models, crop water requirements, extreme weather events, food security, climate change and crop weather relationships etc.

Besides, under Gramin Krishi Mausam Seva (GKMS) project, research initiatives were carried out with various Agricultural Institutes, ICAR Centers etc. on subjects like crop water management and its efficient use, improved and more efficient input use in agriculture, development of integrated crop / pest management and knowledge on response farming strategies, crop pest/disease/climate dynamics, animal and climate relationships, early warning and monitoring of drought, livestock, climatic extremes affecting agricultural productivity, latest improvements in information technologies to be used for better agricultural planning and management, utilisation of agro-climatic information for agromet advisories, develop and use modern tools in agrometeorology, dry farming research, microclimatic studies etc. The aim of these initiatives is to strengthen the operational activities in different parts of the country even up to block level.

11. Awards:

- 2014-Award of silver medal for the best poster presentation for the paper entitled "Variability of Food Grain Production in India" in INTROMET – 2013 held at SRM University, Kattankulathur, Tamil Nadu during 21-24 February 2014.
- 2012-Best paper Award for paper on “Evaluating the Potential of Kalpana-1 Rainfall Product for Operational Agromet Advisory Services in India” for presenting in the workshop on Meteorological Satellite Kalpana: A Decade Service to the Nation.
- 2008-Young Scientist Award for 2008 in the Field of Atmospheric Sciences by the Ministry of Earth Sciences, Government of India.
- 2008-Best Employee Award in the Department on the occasion of in the celebration of 80 Years of India Meteorological Department (IMD), Pune.
- 2002-Best paper Award in “National Symposium on 2002 at Regional Agricultural Research Station, Patambi, Kerala Agricultural University.
- 2000-ISCA best poster presentation in the 89th session of the Indian Science Congress, University of Pune, 2000.

- 1997-Noel Deerr Gold Medal' Award for best paper in the 58th Annual Convention of Sugarcane Technologists' Association of India, Goa, in 1997.

12. Work experience:

During the earlier phase of the professional carrier, I worked as Technical/ Senior Technical Assistant and was looking after various ongoing schemes of Soil and Water Conservation in the Soil and Water Conservation Division, Department of Agriculture and Co-operation, Ministry of Agriculture, Krishi Bhavan, New Delhi. After that, I joined as Meteorologist Grade II in India Meteorological Department at Regional Meteorological Centre, Madras, Tamil Nadu where I was assigned to issue Agromet Advisory Services Bulletin to the State Government and different users in Tamil Nadu twice a week. Then I was posted as Meteorologist Grade I and subsequently as Director & Deputy Director General in the Division of Agricultural Meteorology, India Meteorological Department, Pune. In Agrimet Division, IMD, Pune I worked mainly on the research activities related to pest & diseases and other aspects of agrometeorology along with the improvement in Operational Agromet Advisory Services benefitting for farming communities in the country. Also worked with the Commission of Agricultural Meteorology, World Meteorological Organisation (WMO), Geneva on different aspects of agrometeorological research and operational agromet advisory services across the world. Worked as Senior International Agrometeorological Technical Consultant in Agro-Meteorological Information Systems Development Project Component-C of Bangladesh Weather and Climate Services Regional Project, Department of Agricultural Extension (DAE), Dhaka Bangladesh for development & operationalisation of Agromet Advisory Services in Bangladesh. Besides, worked as short-term Consultant. The World Bank, for development Road Map for Strengthening Agromet Advisory Services in Bhutan. At present I am working as the President, International Society for Agricultural Meteorology (INSAM) & Secretary, South Asia Forum on Agricultural Meteorology.

13. Prime activities on operational Agromet Advisory Services:

Ministry of Earth Sciences (MoES), Government of India set up a committee to suggest structure of Integrated Agromet Advisory Services (IAAS) and nominated me as Member Secretary of this Committee. I worked for the framing up of IAAS project of Ministry of Earth Sciences which was launched in April 2007. Under this project, efforts were made to develop crop and location specific advisories and disseminate the same in real time basis to the farmers at district level. Regular interactions were made with State Agromet Centres (SAMCs) & Agromet Field Units (AMFUs) for strengthening the extension mechanism through Agricultural Technology Management Agency (ATMA), Krishi Vigyan Kendras (KVKs) and Non-Governmental Organisations (NGOs). In the 12th Five Year Plan, the IAAS project was renamed as Gramin Krishi Mausam Sewa for Operational Agromet Advisory Services in the country. Under this project various activates were carried out for the improvement in Agromet Advisory Service (AAS) project which are as follows:

- A. Generation of weather forecast & agromet advisory:** Based on the Medium Range Weather Forecast, Agromet Advisory Services (AAS) bulletins were prepared for 640

districts in the country on every Tuesday and Friday. Also State Composite bulletins (23) and national AAS bulletins were also issued under these services. Along with this, in collaboration with Indian Institute of Tropical Meteorology, Pune prepared AAS bulletins based on Extended Range Weather Forecast. Besides, monthly AAS bulletins based on monthly weather forecast by IIT, Bhubaneswar has also been prepared on experimental basis.

B. Dissemination of Weather Forecast, Agromet advisories and extension activities:

Efforts were made for disseminating agromet advisories to the farmers through different multi-channel system like All India Radio (AIR) and Doordarshan, Private TV and radio channels, Newspaper and Internet, SMS and IVRS under Public Private Partnership mode. In addition, agromet advisories are also disseminated as SMS through Kisan Portal (<http://farmer.gov.in>) launched by the Ministry of Agriculture. Large number of farmers were directly benefitted by these services. Initiative has been taken to include more and more private companies for dissemination of agromet advisories to the farmers.

C. Farmers' Awareness Programmes (FAP): To popularize the AAS services in the country and to make farmers become more self-reliant in dealing with weather and climate issues that affect agricultural production on their farms, Awareness programmes on climate and weather information for the farmers were carried out at district level in the country.

D. Generation of new products for use in AAS bulletins: Initiated the preparation of new products in collaboration with Space Application Centre (SAC), Ahmedabad using the Normalised Difference Vegetation Index (NDVI) derived from INSAT 3A CCD for framing agromet advisories. A joint initiative has also been taken up by Indian Space Research Organization (ISRO), Indian Council of Agricultural Research (ICAR), India Meteorological Department, National Centre for Medium Range Weather Forecasting (NCMRWF), Noida, Mahalanobis National Crop Forecasting Centre (MNCFC), New Delhi under DAC (Department Agriculture and Cooperation) to prepare satellite derived products and value added products using geospatial data for the use in AAS Besides, prepared maps for Standardised Precipitation Index (SPI) on weekly, bi-weekly and seasonal basis and aridity anomaly maps on weekly basis.

E. Agromet Brochure: For highlighting the activities of Agromet Advisory Services, Agromet Brochures have been published in 13 different languages viz., Hindi, English, Assamese, Gujarati, Manipuri, Nepali, Punjabi, Tamil, Marathi, Kannada, Telugu, Malayalam and Bengali and circulated for wider publicity.

E. Teaching & Training Organization: Organized different training courses in the Division like Agromet Field Unit (AMFU) Training course for Technical officers, Foreign Trainees' Course, Agromet Core course, Agromet Observers' Course, Basic Agromet Course, Refresher Course, Customized Familiarization Course in Agricultural Meteorology for the professionals at State Agricultural Universities/Indian Council of Agricultural Research Institutes and taught Agricultural Meteorology in different Agrometeorological trainings organized in the Division and also at different Agricultural Institutes/Universities, Workshops, Symposia, SERC Schools. Besides lectures were delivered on Crop Yield

Forecasting using statistical and crop simulation models” for SRFs working under FASAL project.

- F. Extended range/monthly bulletin:** In collaboration with the Indian Institute of Tropical Meteorology (IITM), Pune issued Agromet Advisory bulletins based on extended range forecast in AAS particularly in forecasting of long dry spells and heavy rain on fortnightly basis during present monsoon season. These bulletins, thus prepared and were circulated through the network of AMFUs and KVKs for helping the farmers on strategic contingent planning.
- G. Dissemination of agromet advisories through DD KISAN:** Hon’ble Prime Minister Shri Narendra Modi, Govt. of India has launched a dedicated 24 hours DD Kisan channel for the farmers in the country. Inputs for crop specific weather based Agromet Advisories for the country are being prepared on daily basis and sent for telecasting through programs like ‘Kisan Samachar’ and ‘Mausam Khabar’ of DD Kisan Channel, New Delhi from the month of May, 2015.
- H. Block Level Agromet Advisories to Farmers:** Initiatives have been taken to upgrade its existing district level Agrometeorological Advisory Services to block level by using a high-resolution weather forecast at block level. As a part of GKMS, work was undertaken to establish District Agromet Units (DAMUs) in the country in existing Krishi Vigyan Kendras (Ministry of Agriculture) for preparation and dissemination of advisories at block level. Worked on generating block level medium range weather forecast and validation of the forecast. Memorandum of Understanding (MoU) has been made with KVK Baramati as technical resource centre for DAMU for agricultural experts to translate the weather forecasts into actionable farm advisories twice a week (Tuesday & Friday) using crop models, soil health card, integrated pest/disease and nutrient management.
- I. Preparation of Soil Moisture Estimation Maps:** In collaboration with International Centre for Radio Science (ICRS), Jodhpur preparation of maps for soil moisture estimation have been started for Gujarat, Madhya Pradesh, Assam, Andhra Pradesh, Kerala, West Bengal, Uttar Pradesh, Rajasthan, and Tamil Nadu. These maps were generated on by using satellite data viz. soil moisture, NDVI and brightness temperature data from SMOS, MODIS and LST values from SSMIS sensors. Besides, based on water balance method and using gridded rainfall data, soil moisture maps at 60 cm depth at district level across the country were also prepared daily and displayed in the division’s website.
- J. Rainfall Monitoring at Gram Panchayat:** In order to strengthen the Agromet advisory services at district level and also further extended these services to block level, initiatives have been taken up in setting up and monitoring of raingauge station at Gram Panchayat level. Pilot studies have been started taking 50 panchayats. Under this initiative, it is planned to develop web and mobile based applications to upload rainfall data on daily basis.
- K. Establishment of studio for recording and telecasting weather and agromet related programs:** In order to strengthen the service delivery through Television channels in respect of frequency of information, live programme on agromet advisory, customized programme from different AMFUs and also near real time information

under extreme events, initiatives were taken to set up studio at IMD, Pune with satellite linkage to be provided by Doordarshan Kendra.

L. Agromet stations with Micromet Tower for evapotranspiration estimation:

Initiatives were taken to establish Agromet Stations (AMS) with INSAT-based data transmission facility replacing existing network of lysimeters for estimation of ET on real time basis of international standards, so that the same was useful for the preparation of agromet products for framing agromet advisories.

14. Major impact reported during the work done

- All India AAS bulletins help Central and State Government organizations for taking policy decisions on agriculture.
- Multi-channel dissemination helps the farmers to adopt appropriate weather-based farm management at appropriate time and increase crop productivity.
- Advisories during extreme events help farmers to save the crop loss.
- Agromet Advisories based on Extended Range Forecasting System (ERFS) help farmers to select contingency crops during long dry spell.
- Awareness Programme helps to aware of the Agromet Services and also to collect feedback to prepare need-based advisories.
- In season yield forecast helps Ministry of Agriculture to prepare advance crop estimate.
- Capacity building programme helps to prepare and disseminate agromet advisories more efficiently.

15. Innovative content of work done

- SMS/IVRS technology for dissemination of agromet advisories to extend the services more effectively and to help the farmers for day-to-day operational farming activities. This system becomes highly useful in case of extreme events.
- Development and utilization of remote sensing products based on INSAT 3A CCD NDVI composite to identify the regions experiencing impact of moisture stress / flood situation on crops.
- On line preparation and dissemination of agromet advisories to large number of farmers through Kisan Portal.

Such innovative works ultimately help to improve the economic condition of the small and marginal farmers by increasing the crop productivity/ minimising the crop loss by communication of customized Agromet Advisories in time.

16. Outstanding Achievements

1. Preparation of **640** district level bulletins twice a week in different regional languages under GKMS project and communication of Agromet Advisories in 13 languages to 11.5 million farmers through SMS and Voice Messages.
2. Improvement in the economic condition of the small and medium farmers by increasing the crop productivity/minimising the crop loss by communicating customised Agromet Advisories on real time basis.
3. Selected as Member of Management Group of Commission of Agricultural Meteorology (CAgM) as Chairman of Open Panels of CAgM Experts WMO Commission on Agriculture Meteorology, United Nations.
4. Selected as Co-ordinator of Expert Group on Agrometeorology for Regional Association, World Meteorological Organisation, Geneva, United Nations.
5. Received Young Scientist Award in the Field of Atmospheric Sciences by the Ministry of Earth Sciences, Government of India.

17. International Assignments and activities

Assignments in World Meteorological Organisation (WMO)

Worked for the Commission of Agricultural Meteorology (CAgM) of World Meteorological Organisation (WMO), Geneva in different capacities like:

1. Member of the Expert Team (ET) of the Open Programme Area Group (OPAG) on “Agricultural Services-Agricultural Production” for RA II region of WMO
2. Member of Management Group of Commission of Agricultural Meteorology (CAgM) as Chairman of Open Panels of CAgM Experts
3. Co-Chair of Global Centre for Research and Excellence in Agrometeorology (GCREAM)
4. Co-ordinator of Expert Group on Agrometeorology for Regional Association II

Brief of the activities carried out in different international initiatives are mentioned below.

a. Open Panels of CAgM Experts (OPCAMEs): At the 16th session of the Commission of Agricultural Meteorology in Turkey in 2014, the Commission established four Open Panels of CAgM Experts (OPCAMEs) which were referred to as Focus Areas. Focus Area (OPCAME) 1- Operational Agricultural Meteorology is one of them. Focus Area 1 emphasize the importance of improving the provision of agrometeorological products, services, services delivery and communication to users of agricultural services (e.g., for crops, rangelands, livestock, forestry, and fisheries). Also provide guidance to enhance the contribution of the field of agricultural meteorology for operational applications in agricultural sectors.

b. Expert Group on Agrometeorology (EG-AgM) in Regional Association II with terms of reference

(i) To survey RA II Members to identify agrometeorological experts/staff and training needs in the Region; (ii) To make recommendations on establishing Agromet Advisory Services in RA II countries; (iii) To review the monitoring and forecasting of soil moisture conditions and their use in assessing crop water requirements; (iv) To review the monitoring and preparedness strategies for drought including drought indices and early warning systems, and the extent of their implementation in RA II; (v) To review and evaluate the operational use of seasonal to inter-annual climate forecasts applications to agriculture in RAI and make recommendations to improve the presentation of these forecasts to the agricultural community; (vi) To review studies on the socio-economic impact of agrometeorological information in RA II to agriculture, livestock management, forestry, rangelands and fisheries sectors;

c. Global Centre for Research and Excellence in Agrometeorology (GCREAM): Being Co-Chair of the initiative of establishment of GCREAM, activities have been started to implement the GCREAM. First meeting of GCREAM was organised in IMD, Pune inviting the international participants. Strong inclusive partnerships through the network of global centers of research and excellence in natural resources emphasized an inter-disciplinary approach to solving complex and interlinked problems for agriculture and water resource management in a safe environment to sustain future development.

d. Collaboration with South American Countries: Collaborative activities has been started with two South American countries i.e., Chile and Paraguay on potential mutual interest particularly related to seasonal and extended range weather forecast and its application to agriculture sector.

Asia-Africa Collaboration: Collaborative work has been started with United States Agency for International Development (USAID), Washington DC, USA on “Improving Climate Services for Farmers in Africa and South Asia (ICSFASA)”. Project on “Farmer Network on Demand Driven Climate Services for Africa and South Asia” was conceived jointly by IMD & ICSFASA. The main aim of this collaboration was the laying the foundation to establish an effective network for farmers in Africa and South Asia to share knowledge and information on climate services and products for on-farm decision making and enhancing ICTs for effective dissemination of climate products and services between Asia and Africa.

Global Federation of Agrometeorological Societies (GFAMS): International cooperation, based on resources, knowledge sharing, and mutual understanding is absolutely essential to bring proactive tangible global advancement towards uplifting the living standards and contributing to agricultural and economic food production sustainability. In view of that Global Federation of Agrometeorological Society has formed based on the consciousness of sixteen Agrometeorological Societies across the world. The objective of Global FAMS is to further promote and advance all sectors of agricultural meteorology by improving international, inter-Society cooperation and partnership, exchange of knowledge and education in all the related scientific, technological, acts disinterestedly, in the sense that it does not pursue primarily its own economic gain.

International Society for Agricultural Meteorology (INSAM): International Society for Agricultural Meteorology (INSAM) is a global initiative for popularisation of operational agrometeorology and also sharing on-going activities on meteorology and agrometeorology for the benefit of sustainable agriculture and food security across the world. At present the face of INSAM not for the global agromet community but also the global user community. I feel honoured to take up the work of INSAM as **President** for doing all the innovative activities for the agromet community in the world and especially for popularisation of agromet services for the different sectors in agriculture. This is a unique opportunity for me to work for the global agromet community under the geographical diversity across the world.

South Asia Forum on Agricultural Meteorology (SAFOAM): Weather based farm advisory services in South Asia is emerging and varies in its quality and coverage throughout the region. Considering the trans-boundary nature of weather and climate risks in South Asia, a need was felt for enhanced regional collaboration. To accomplish a mechanism of regional cooperation is needed to facilitate knowledge, data, products, information and expertise and information sharing among the member countries. With this background, South Asian Forum on Agriculture Meteorology (SAFOAM) involving all the countries in South Asia along with the international cooperation set up recently. I am at present actively involved in launching and operationalisation of SAFOAM. This Forum may accentuate the ongoing national-level modernization efforts of World Bank and other agencies in agromet service delivery to the next level through regional collaboration by converging agrometeorological resources from Governments, Academia, R&D institutions, Farmer Associations etc. from South Asia. I have the privilege to work now as **Secretary** of SAFOAM.

16. Foreign Assignments

Sr. No.	Name	Country
1	Six months research-based training on “Climate Change” at the University of East Anglia, UK under the Technical Cooperation Training Programme sponsored by the British Council Division from February to July, 1995	United Kingdom
2	Workshop on “Monitoring and early warning of drought at SAARC Meteorological Research Centre, Dhaka, Bangladesh during 28 to 30 th November 2005	Bangladesh
3	Regional symposium on climate change, food security, sea level rise and environment in south Asia, Dhaka, Bangladesh, 25-29 th August 2008	Bangladesh
4	International Workshop on the Content, Communication and Use of Weather and Climate Products and Services for Sustainable Agriculture, Toowoomba, Australia during 18-20 May 2009	Australia
5	Climate & Agricultural Risk Management in Phnom Penh in Cambodia during 15-23 November, 2009	Cambodia
6	SWFDP-Eastern Africa Training Workshop, Arusha during 28 November to 2 December 2011	Tanzania
7	International workshop on “Scaling up Climate Services for Farmers in Africa and South Asia” in Senegal, South Africa organized by World Meteorological Organisation (WMO), United States Agency for International Development (USAID), CCAFS and Climate Services Partnership (CSP) during 10-12 December 2012	Senegal

8	Meeting of the Commission of Agricultural Meteorology (CAgM) Expert Team on Strengthening Operational Agrometeorological Services, Bucharest, Romania during 25-26 April 2013	Romania
9	International Conference on Promoting Weather and Climate Information for Agriculture and Food Security, Antalya, Turkey during 7-9 April 2014	Turkey
10	CAgM Management Group Meeting, WMO, Geneva, 25-27 September 2014 and Meeting on the Implementation and Coordination of the Global Framework for Climate Services, WMO, Geneva during 29 th September to 1 st October 2014.	Switzerland
11	Sixth Session of Regional Conference on Management of National Meteorological and Hydrological Services (NHMSs) in Regional Association II (Asia), Doha. Qatar during 2-4 December 2014.	Qatar
12	Meeting of CAgM Implementation/ Coordination Team from 7-9 th October, 2015 in Bucharest, Romania	Romania
13	Improving Climate Services Delivery in Africa and South Asia RENOFASA from 29-30 th January 2015	Uganda
14	Second Meeting of the Management Group of WMO Commission for Agricultural Meteorology, Geneva, Switzerland, 17-20 October 2016	Switzerland
15	Developers Meeting on the GFCS-Relevant Climate Data, Products, and Tools, Geneva, Switzerland, December 6-8, 2016	Switzerland,
16	CAgM meeting on Agromet Products and Services for Forestry, Livestock and Fisheries from 15-17 March 2017	Brazil
17	Senior International Agrometeorological Technical Consultant in Agro-Meteorological Information Systems Development Project Component-C of Bangladesh Weather and Climate Services Regional Project, Department of Agricultural Extension (DAE), Dhaka Bangladesh from 18.10.2018 to 17.10.2020	Bangladesh
18	South Asia Hydromet Forum II, from 19-21 November, 2019.	Nepal

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- 75 Years Services to the Nation (1932-2007): A Retrospective and Futuristic Overview: Agricultural Meteorology Division, India Meteorological Department, Pune.
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2. Monsoon 2016 and Indian Agriculture: In www. CommodityIndia.com, COMPREHENSIVE AGRI-COMMODITY INTELLIGENCE, 6th November, 2016 pp.21-27.
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4. Management of agriculture under extreme weather conditions through Agromet Advisory Services in India: In Global Gateway to Agricultural Meteorology Bulletin, Year 1, No.1, November, 2017.

5. Extreme Events: Weather Service for Indian Agriculture. In Earth Science Technologies. Geography and You. July-August, 2013.
6. Impact of the Monsoon on Indian Agriculture for 2015. In In www.CommodityIndia.com, COMPREHENSIVE AGRI-COMMODITY INTELLIGENCE, July, 2015 pp.6-8.

22. Papers presented in Meetings/Seminars/Workshops

National:

- Natural Disasters and Their Mitigation for Sustainable Agricultural Development on 19th February in Refresher course in disaster management from February 15-27, 2021, Department of Geology University of Jammu, Jammu
- Agricultural disaster management and contingency planning to meet the challenges of extreme weather events on 26th February in Refresher course in disaster management from February 15-27, 2021, Department of Geology University of Jammu, Jammu.
- Orientation Programme on preparation and dissemination of Agromet Advisories at block level under Gramin Krishi Mausam Seva project for nodal officers of Krishi Vigyan Kendras of ATARI Zone X (Andhra Pradesh, Telangana & Tamil Nadu States, A joint initiative of IMD & ATARI, 1-2 August, 2018.
- Orientation Programme on preparation and dissemination of Agromet Advisories at block level under Gramin Krishi Mausam Seva project for nodal officers of 21 Krishi Vigyan Kendras (10 from Maharashtra, 9 from Gujarat and 2 from Goa) A joint initiative of IMD & KVK, 6-7 July, 2018.
- Climate Change and Climatic variability and its impacts in agriculture in XIII Agricultural Science Congress-2017 at University of Agricultural Sciences, Bengaluru.
- Consultation on Climate Adaptation & Services for Water, Food & Health Security organised by Watershed Organisation Trust (WOTR), 20-21, April, 2017.
- National Seminar: Agrometeorology for Sustainable Development with special emphasis on Agrometeorological Practices for Climate Resilient Farming and Food Security organised by the Association of Agrometeorologists & CCS Haryana Agricultural University, Hisar, India, 12-14 October, 2017.
- Operationalisation of Block Level Weather Forecast and Agromet Advisories organised at Yashada, Pune, 20th July, 2016.
- Meeting of the Working Groups in implementation of Agromet Advisory Services under Gramin Krishi Mausam Sewa, at Yashada, Pune, 19th July, 2016.
- National Conference on Natural Resource Management in Arid and Semi-Arid Ecosystem for Climate Resilient Agriculture and Rural Development, Soil Conservation Society of India, New Delhi and Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, 17-19 February, 2016.
- Roadmap and Implementation Plan of Satellite Information in Operational Agromet Advisory Services for Farmers, India Meteorological Department, Pune, February, 2015.

- National Workshop on Food Security and Climate Change, Anand Agriculture University, Anand, Gujarat, 2nd June, 2015.
- Weather information and services to agriculture: 2nd Workshop on Crop Insurance in 2014 at Mumbai.
- Workshop on application of satellite information in Gramin Krishi Mausam Sewa, Meteorological Training Institute, Pune, 27th March, 2014.
- National Seminar on Technologies for Sustainable Production through Climate resilient Agriculture organised by Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, 8-9 August, 2014.
- Climate Variability and cash Crops of Maharashtra Consultation Workshops and Conference: Coming together to build resilience, The Energy & Resources Institute, Mumbai, 2013.
- Integrated Agromet Advisory Service in India in Regional Conference on Climate Variability and Cash Crops of Maharashtra, TERI, Mumbai in January 2013.
- Programme on “Index Based Weather Insurance – Concepts, Design and implementation held at Hyderabad during 20-22 August 2012.
- “Service to the farmers through Agromet Advisory Services at 8th Convention of Grommet held at M.S.Swaminathan Research Foundation, Chennai in October 2012.
- Brainstorming Session on “Standardization and Integration of Automatic Weather Stations under National Umbrella on 3rd September 2012 at IITM, Pune.
- Evaluating the potential of Kalpana -1 Rainfall product for operational Agromet Advisory Services in India Workshop on ‘Meteorological Satellite Kalpana’: A decade of service to the Nation, held at Space Applications Centre, Ahmedabad in 2012.
- National Level Workshop on “Micro Level Action Plan at Taluka Level for Climate Resilient Agriculture” held at NASC, New Delhi during 2-3 November 2012.
- Consultation meeting on “Operational Agrometeorological Services in SAARC and other countries in RA II region” at National Meteorological Training Institute, Pune from 20-21 April 2012.
- State of art technology in weather services to Agriculture in India” Sixth Edition of India’s largest Information and Communication Technology (ICT) event in 2010 at Hyderabad.
- National Symposium on Climate Change and Rainfed Agriculture, 18-20 February 2010, CRIDA, Hyderabad, India.
- “Strategies for minimizing the negative impact of climate change on Indian Agriculture through Agromet Advisory Services” in Second Annual Review Meeting (ARM) and Third National Seminar on Agrometeorological Services for Farmers (NSASF) at Anand Agricultural University, Gujarat, 2008.
- “Forewarning of pests and diseases of major crops in India-IMD’s approach” in National Symposium on “Emerging trends of researchers in INSECTS PEST Management & Environmental Safety” held at Haridwar, 2008.
- Influence of weather parameters on population dynamics of rice bug” at Pattambi, Kerala in Tropmet 2007.

- Agricultural Drought: Aspects of Micrometeorology. 4th SERC School-DST Sponsored Programme, Central Research Institute for Dryland Agriculture, Hyderabad, 25th September- 15th October, 2006.
- National Seminar on Agrometeorological Services for Crop and Location Specific Advisories., 2006.
- One day consultation on Agrometeorology” held at M.S. Swaminathan Research Foundation, Chennai on 25th August, 2005.
- National Seminar on Agrometeorology in the new millennium: Prospectives and. Challenges. October, 20-31, 2003, PAU Ludhiana.
- Agricultural productions loss due to extreme weather events in some states of India, Tropmet 2002.
- Irrigation scheduling of cotton at different agroclimatic regions of the country”, National seminar on Agroclimatological Research for Sustainable Agricultural production – Anand Agricultural University, Anand,2001.
- Role of meteorological information in saving the crop losses due to pest and diseases attack”, 87th session of Indian Science Congress, University of Pune, 2000.
- Sensitivity of weather parameters to cotton growth at selected stations of India, Tropmet 2000.
- Possibility of inclusion of weather-based information for plant protection measures in agromet advisory service.” Proceedings of TROPMET 1999 National Symposium, 479.
- Forewarning of pink bollworm outbreak and pest weather calendar for operational crop protection in Vidarbha and Marathwada regions of Maharashtra”, Tropmet 1999.
- Rainfall variability and groundnut production in some states of India. Monsoon, Climate and agriculture. Tropmet-1997, 10-14 February 1997, organised by the Indian Meteorological Society, Bangalore Chapter.
- Models of forewarning of stemborer attack on sugarcane and pest weather calendar for operational crop protection at Muzaffarnagar, West Uttar Pradesh”, Proceedings of 58th Annual Convention of Sugar Technologists, Association of India, New Delhi,1996.

International:

- Water management, Climate Change and Agriculture: the experience from India in international meeting on “Water in Agriculture: A Better Use for a Better World” organised in Firenze in September 15,2021 by Accademia dei Georgofili, the oldest and prestigious Academy of Agriculture in Italy,
- Agromet Advisory Services: Indian Experience in the XXIII Congress of the Italian Society of Agrometeorology, 30th June-2nd July,2021.
- Managing Weather and Climate Risks in Agriculture in Bangladesh in Asia Pacific Climate Week 2021: UNFCCC(United Nations Framework Convention on Climate Change under the scenario of Climatic variability and Climate Chnge on 8th July, 2021.
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- Weather and climate based operational farm advisory services in Training Programme on “Climate Smart Agriculture (CSA)” Jointly organize by National Council for Climate

Change, Sustainable Development India and Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development, Kumasi, Ghana, On 5th and 6th May 2021,

- Challenges & Opportunities to Coping Strategies with Agrometeorological Risks and Uncertainties in South Asian Region in International Webinar on Building Climate Resilience in Agriculture through Agrometeorology and other Technological Interventions, 15-17 December, 2020.
- International Conference on Emerging Technologies in Agricultural & Food Engineering, Agricultural & Food Engineering Department, Indian Institute of Technology, Kharagpur, 27-30 December, 2016.
- Second Meeting of the Management Group of WMO Commission for Agricultural Meteorology, Geneva, Switzerland, 17-20 October 2016.
- International Conference on Climate Change, Water, Agriculture and Food Security., 2-3 November 2016, ICRISAT Campus, Hyderabad, India.
- CAgM/CAS International Conference on Atmospheric Chemistry & Agricultural Meteorology, National Meteorological Training Institute, Pune, 2-4 November, 2015.
- Workshop on Global Centres of Research and Excellence in Agrometeorology (GCREAM), National Meteorological Training Institute, Pune, 5th November, 2015.
- CAgM Expert Team on Agrometeorological Products, National Meteorological Training Institute, Pune, 6-7 November, 2015.
- Regional Association II Expert Group Meeting on Agrometeorology, National Meteorological Training Institute, Pune, 9-10 November, 2015.
- Workshop on Improving Climate Services for Farmers in Africa & South Asia (ICSFASA), National Meteorological Training Institute, Pune, 2-3 February, 2015.
- Progress & Future Plan of Agrometeorological Services in RA II Countries in Regional Conference in Regional Association II (Asia), Doha, Qatar, 2-4 December 2014.
- International Conference on Promoting Weather and Climate Information for Agriculture and Food Security, Antalya, Turkey during 7-9 April 2014.
- First Management Group Meeting of CAgM at World Meteorological Organisation, Geneva, Switzerland from 25 to 27th September, 2014.
- Meeting of the Coordination of the Implementation of Global Framework for Climate Services (GFCS) at World Meteorological Organisation, Switzerland from 29th September to 1st October, 2014.
- Sixth Session of Regional Conference on Management of National Meteorological & Hydrological Services (NMHSs) in Regional Association and Management Group Meeting of Regional Association II of WMO during 2-4 December, 2014 in Doha, Qatar.
- Meeting of the CAgM Expert Team on Strengthening Operational Agrometeorological Services, Bucharest, Romania during 25-26 April 2013.
- Training on operational Agrometeorology for serving end users requirement, organised by World Meteorological Organisation & India Meteorological Department, National Meteorological Training Institute, Pune 28th January to 9th February, 2013.
- International Workshop on Capacity Building for Agrometeorological Services from 28-29 October, 2013 at National Meteorological Training Institute, Pune.

- India's Integrated Agro-Met Advisory Services in International workshop on "Scaling up Climate Services for Farmers in Africa and South Asia" in Senegal, South Africa, December organized by World Meteorological Organisation (WMO), United States Agency for International Development (USAID), CCAFS and Climate Services Partnership (CSP) during 10-12 December 2012.
- Consultation meeting on Operational Agrometeorological Services in SAARC and other countries in RA II region, National Meteorological Training Institute, Pune, 20-21 April, 2012.
- WMO Technical Planning Workshop on Severe Weather Forecasting Demonstration Project (SWFDP) Development for the Bay of Bengal region (RA II-South Asia), India Meteorological Department, 23-27,2012.
- SWFDP-Eastern Africa Training Workshop, Arusha during 28 November to 2 December 2011.
- Climate change and Indian Agriculture" at International conference on "Eliminating Hunger and Poverty: Priorities in Global Agricultural Research and Development Agenda in an Era of Climate change and Rising Food prices held during 7-9 August, 2010 at MS Swaminathan Foundation at Chennai.
- Mobile Plus International Conference at MS Swaminathan Foundation at Chennai.
- Weather based risk management in agriculture & Integrated Agromet Advisory Services in India, International Symposium: Climate Risk Management in Rural Communities in Developing Countries of the Asia-Pacific Region, 19-22, November, Phnom Penh, Cambodia 2009.
- Operational Agrometeorological Service in India and associated RA countries in International Workshop on the Content, Communication and Use of Weather and Climate Products and Services for Sustainable Agriculture, Toowoomba, Australia, 18- 20 May 2009.
- Integrated Agrometeorological Advisory services in India" in International Conference on Challenges and Opportunities in Agrometeorology' (INTROMET-2009) held at New Delhi during 23-25 February, 2009.
- Strategies for minimizing crop loss due to pest and disease incidences by adoption of weather-based plant protection techniques through operational Agromet Advisory Services International Conference on Challenges and Opportunities in Agrometeorology' (INTROMET-2009) held at New Delhi during 23-25 February, 2009.
- Climate Change and Food Security in India" in Regional Symposium on Climate Change, Food Security, Sea Level Rise and Environment in South Asia, Dhaka, Bangladesh, 25-29 August 2008.
- International workshop on "Agrometeorological Risk Management- Perspectives from Indian Subcontinent in the International Workshop on "Agrometeorological Risk Management – Challenges and opportunities jointly organised by WMO and IMD at Vigyan Bhavan, New Delhi from 28 October to 3 November 2006.
- Monitoring and early warning of drought for efficient agricultural cropping in Workshop on "Monitoring and early warning of drought at SAARC Meteorological Research Centre, Dhaka, Bangladesh during 28 to 30 November, 2005.

- Agrometeorological Advisory to assist the rural farmers in Bangladesh in meeting the challenges of extreme weather events in International Conference on 'Sustainable Agriculture and Rural Development; A Road to SDGs' held at Sylhet Agricultural University (SAU), Bangladesh (January 23-24, 2020).

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