SAFOAM NEWS LETTER

South Asia Forum on Agricultural Meteorology

This Issue……

Launching of South Asia Forum on Agricultural Meteorology

South Asian Forum on Agricultural Meteorology (SAFOAM) was launched on 9th February, 2021 to strengthen regional cooperation in agrometeorological advisory services of the member countries in South Asia. Sixty-two members from seven countries namely, Afghanistan, Bangladesh, Bhutan, India, Myanmar, Nepal and Sri Lanka participated in the meeting. The aims and objectives of the meeting was elaborated by Dr N. Chattopadhyay, President, International Society for Agricultural Meteorology& Former Deputy Director General, Agricultural Meteorology Division, India Meteorological Department. Elaborate discussion was made on different thematic areas under the moderation of Dr.L.S.Rathore, Consultant, The World Bank & Former Director General of India Meteorological Department. At the end, patronage address was given by Dr. Shailesh Nayak Director, National Institute of Advanced Studies& Former Secretary, Ministry of Earth Sciences, Govt. of India.

Dr.Shailesh Nayak

Dr.L.S.Rathore

Dr. N. Chattopadhyay

Message from the President……..

It is with a sense of immense satisfaction and pleasure I am writing Foreword of the inaugural issue of the South Asia Forum on Agricultural Meteorology (SAFOAM) Newsletter. It provides overview of SAFOAM activities

Despite the technological and scientific progress, the agricultural production and quality are highly weather and climate dependent in South Asia. Also, agriculture has a challenge to cope with climate change and variability and extreme weather conditions which significantly impact farm production in this region. At present there is need to enhance the quality of weather forecast and climate services and more so on application of meteorological information in various sectors particularly in agriculture in South Asian Region (SAR). There are number of constrains in application side of agrometeorology especially in SAR where the operational agro-met advisory services are in different stages. In India and Bangladesh, it is at advanced stage, in Nepal, Sri lanka, Pakistan in modest stage, in Bhutan & Afghanistan it is initial stage and it has yet to start in Maldives. When applications of weather and climate information to agriculture are concerned, the agromet community in South Asia really have important role to play. Already a number of forums, agencies and organisations like South Asia Hydromet Forum (SAHF), South Asian Meteorologist Association (SAMA), Regional Integrated Multi-Hazard Early Warning System (RIMES), the International Maize and Wheat Improvement Centre (CIMMYT), The International Centre for Integrated Mountain Development (ICIMOD), International Water Management Institute (IWMI) are doing excellent work to improve agricultural production in South Asia. Though different governments and semi government agencies are making their best efforts in improving the quality of life of farming community in this region, the agromet community in South Asia have to collaborate among themselves and more important is the involvement and cooperation across the boundary of the nation in this region. Based on this, the Idea of formation of SAFOAM is floated. This effort is very timely as many new developments in this area are happening concurrently in this region. The aims and objectives of SAFOAM also would be free exchange of ideas to help sharing of knowledge and information respecting the administrative set up within the respective government in member countries.

One of the important tasks of this forum would be to generate products for entire South Asia and place in seamless digital platform to prepare agromet advisories and corresponding Agromet Advisory Service bulletins. More challenges would be on the development of institutional mechanism along with good Standard Operating Procedure (SOP). for process-based simulation of different agromet products including remote sensing products. Under this forum no replication of work, competition, repetition work would be taken up; on the contrary the forum would capacitate the fellow agrometeorologists who are serving the different countries to facilitate by providing products that would keep us alive with the new information in regional basis and these products are nowhere available. The most interesting and challenging would be to share dynamic information and also, we need to deliberate the new products most important by different countries and regular update of the same. At this point of time there is a need to identify the low hanging fruits and ride on kind of transformative process which can be done or happen with the existing data available freely in public domain and our disposal would be knowledge pool for proper strategies of training for the new entrains from the member countries.

SAFOAM activities are steered up at the three levels. At the first level, concept of roadmap has been initiated and as a result six core groups with relevant themes have been formed. At the second level, six core group meetings were organised where in depth discussion was made on different thematic areas in order to make the foundation of roadmap of SAFOAM. According to me, second level of distillation is marvellous. At the third level of distillation finalisation of the roadmap as well implementation strategies of SAFOAM were made. I am happy to see the work so far has been done from the launching of the forum. Overall structure of SAFOAM was being built up concurrently by building different components of the forum. As far as the Govt. of India's involvement on this initiative and sharing of data is concerned, Govt. of India is very keen in such collaboration in South Asia. Initially, there is need to establish a good footing in the forum and subsequently Govt. of India might be approached with clear transparency.

. I also take this opportunity to convey sincere thanks to Advisory Committee and Founding members of SAFOAM for their guidance and also for their generous contributions.

Dr.L.S. Rathore

Background of SAFOAM

South Asia is highly prone to extreme weather events and weather aberrations that frequently cut across national borders and result in major impacts on crops and live-stocks. Repeated exposure to such hazards and climatic variability often pushes the poor, particularly rural poor engaged in agricultural activities, into chronic poverty. This is likely to get worse with climate variability and change. The productivity of key economic sectors such as agriculture is also compromised by limited access to information services relating to trans-boundary and local weather phenomenon by sectors and communities. Yet, in most countries in SAR, despite demand, access to weather based information services is limited and the monitoring, forecasting, technical human resource capabilities and organizational arrangements that contribute to the supply of such information products and services, are not adequately in place.

Because all the countries in South Asia are heavily dependent on agriculture, there is an urgent need to strengthen agrometeorological services in all of them. To support these activities, the network of weather observatories in each of these countries must be strengthened. The weather forecasting capabilities should be increased in all the South Asian nations. Information should be freely exchanged across the countries. The research wings of agrometeorological institutions should be strengthened. Increase awareness among the farmers regarding the importance of weather information for agricultural decision-making is required. Need-based training and the use of information and communication technology to reach the farmers effectively on a near-real time basis need to be planned. Improvements of Climate Service Information system and Climate Service tools in South Asia along with cross-regional experiences with participatory agricultural climate services projects in sub-Saharan Africa are very much essential. Documentation of success stories of Climate Services in both South & South Asia & sub-Saharan Africa create examples for enhancing agromet services. Mechanism for regional cooperation through collaboration in exchange and capacity building of climate service and the extension activities in these countries need to be strengthened.

To address all the issues mentioned above, there is need to work collectively by all the countries in South Asia. Hence, there is an urgent need to strengthen regional cooperation among agrometeorological services of the member countries. **Thus, a need was felt to form a Forum i.e., South Asian Forum on Agriculture Meteorology (SAFOAM)** to strengthen regional collaboration. List of the Founding Members of SAFOAM is available in **Annexure I.**

Objectives:

Among others, the key aims & objectives of SAFOAM are:

- Enhance agro-meteorological information sharing.
- Improving impact based forecasting skills with special emphasis on high-impact weather events in agricultural sector.
- Develop agromet decision support tools.
- Deliver user-oriented services to farmers.
- Address common implementation challenges.

Social Media for SAFOAM

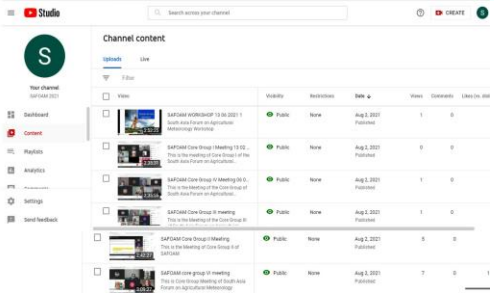
Following Social Medias have been created under SAFOAM platform.

1.Official Email and group email of SAFOAM

Official Email: Created
USER ID:safoam2021@gmail.com

2.Group E-mail: Created
safoam2021@googlegroups.com

3. Facebook: Created
4. Twitter: Created
userid: SAFOAM2021
5. Utube Channel: Created
6. Whats App Group: Created
7. LinkedIn: To be created shortly



Founding members of SAFOAM

- List of founding members along with their photographs and present status are given in Annexure -1

Advisory Board

Twenty members Advisory Board was formed. The proposed functions, constitution and responsibilities of the Advisory Board are shown as below.

√ To finalise the constitution of SAFOAM, roadmap and future action plans.

√ **To** guide and approve the work plan of the programme initiated by the different committees before its implementation.

√ The advisory committee will initiate formation of other sub-committees. It was also suggested that one or two senior professionals from academia and research institutions may also be a part of the Advisory Committee.

√ At least one meeting within 6 months to review the overall performance of the forum and, if need be, advise accordingly.

Executive Council of SAFOAM

In the General Body meeting of SAFOAM held on 8th July, 2021, Executive Council & Council members of SAFOAM was constituted by the Founding members of the forum. Each member of the council was apprised of their proposed activities and responsibilities. The structure of the Executive Council & Council members is as follows

Country Chapter

In addition to the Executive Council, SAFOAM will have financially autonomous country chapters to manage finances for activities in their respective countries. The Council may at its discretion or on receipt of a request in writing to create a branch of the Forum for furtherance of the objectives of the Forum. Such a branch shall be called a Chapter of the Forum. There can be more than one chapter from the same country. Each Chapter shall be constituted and its affairs carried on in accordance with rules and regulations to be laid down from time to time by the Council. Each Chapter shall have a Chairman, Secretary and Treasurer. If the strength of Chapter's member is 50, a Joint secretary may be taken and if the strength of the chapter is 100 then a Co-Chairman and Two additional members may be taken as office bearers. This will constitute the Chapter Management Committee. The two-year term of the Chapter Management Committee shall be concurrent to that of the Council.

National Members

National Members of SAFOAM are representatives of SAR countries and shall be responsible to attend all the meetings of the Executive Council and General Body. They shall contribute to the activities as assigned by the Executive Council and carry forward the objectives of SAFOAM, including enhancing membership from their respective countries.

Formation of different Core Groups under SAFOAM

SAFOAM activities were steered up at three levels. At the first level, concept of roadmap has been initiated and as a result six core groups with relevant themes have been formed. Following six Core Groups were formed to prepare the roadmap and implementation strategies of SAFOAM

Core Group I Present Status and existing strategies for meeting the need, gaps, requirements etc. for operational Agromet Advisory Services in South Asian Countries .	**Group Leader**  **Santanu Kumar Bal** , Project Coordinator (Agrometeorology) (I/C), Central Research Institute for Dryland Agriculture, Hyderabad, India

Core Group II Administration/Constitution/ By Laws/ Finance etc. for SAFOAM"		Prof. A.M.Sheikh, Former Vice-Chancellor, Anand Agricultural University, Gujarat, India
Core Group III Utilisation of satellite derived products in Agromet Advisory Services for South Asian Countries		Dr. Bimal K Bhattacharya, Group Director & Scientist G, Space Applications Centre, ISRO,Ahmedabad, Gujarat, India
Core Group IV Web portal for SAFOAM"		Dr.N.Chattopadhyay President, International Society for Agricultural Meteorology Former Deputy Director General & Head& Scientist F, Agricultural Meteorology Division, India Meteorological Department
Core Group V New Dimension of Agromet Advisory Services in hill region in South Asian Countries		Dr.Archana Shrestha, Deputy Director General, Meteorological Forecasting Division, Department of Hydrology and Meteorology, Kathmandu, Nepal
Core Group VI Build capacity in ICT program management and also build such cadre and mentor them for ensuring continuity of Agromet success and innovation sustenance		Mr, Founder and CEO Smartex Cognitive, XCED, APAC CEdMA, California, USA

Roadmap & Implementation Strategies of SAFOAM

In depth discussion among the members of the forum was made by organising different Core Group meetings. Subjects of discussion in these meeting covered from present status of agromet advisory services, gap area, requirements, challenges, constitution, use of satellite information, creation of web portal, services in hilly areas and ICT, agromet success and innovation sustenance in South Asia. Besides, a number of useful recommendations were made to steer the activities in reality in South Asia Region. Afterwards, a need was felt to organise workshop inviting all the members, international experts and funding agencies where further deliberation and refinement of various ideas and finally the preparation of the

Meeting of Core Group I

Meeting of Core Group II

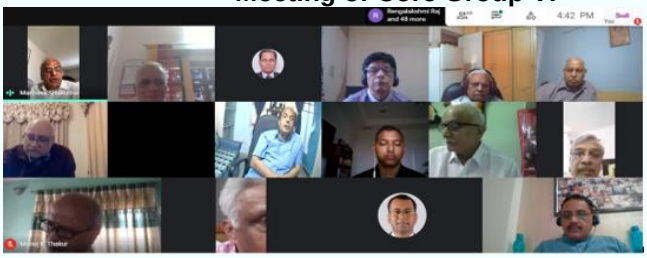
Meeting of Core Group III

roadmap of SAFOAM as well as implementation strategies would be made in a holistic manner.

In view of that a workshop was organised on 13th June,2021. There were two sessions in the workshop. In the first session, Group leaders of the different Core Groups delivered a brief presentation mentioning the salient points of discussion made in the respective Core Group meetings along with the recommendation for getting suggestions from the broader group meeting in the workshop. In the second session, panel discussion for preparation of road map and ultimately the implementation strategies were made.

Meeting of Core Group IV

Meeting of Core Group VI



SAFOAM Workshop

Initial Feedback from countries in South Asia Region

There is need to understand the present status, gaps, farmers' need etc in different countries in South Asia. Based on this information received from the experts in each country, future activities of SAFOAM will be prepared including capsule courses on agrometeorology for different levels engaged in agromet services including farmers. Information collected from different countries in this regard is as follows.

	Nepal	Bhutan	Bangladesh	Srilanka	India
Weather Forecast availability	*	*	***	***	****
Observatory availability	*	**	**	***	*****
Issue of Agro-Met advisory bulletins					
- scale	National	District	District	National	District
- time interval	weekly	weekly	Bi-weekly	weekly	Bi-weekly
Panel of experts					
Trained manpower	No	Few	Few	No	Available
Availability of Agromet. products	No	..	Yes	..	Yes
Drought monitoring	No	No	No	Yes	Yes
Flood warning	Yes	Yes	Yes	Yes	Yes
Soil moisture network	No	Yes	Yes	No	Yes

	Nepal	Bhutan	Bangladesh	Srilanka	India
Conduct of Farmers' awareness program	Yes	Yes	Yes	Yes	Yes
Availability of satellite observational network	No	No	Yes	Yes	Yes
Dedicated web portal	Yes	Yes	Yes	Yes	Yes
Trainning facility for scientists (Agromet product development, agro-met advisory content development etc.)	No	Yes	Yes	No	Yes
Research in the discipline of Agricultural Meteorology	No	No	Not adequate	Not adequate	Yes
Degree/ courses w.r.t. Agricultural Meteorology	No	No	No	No	Yes

* indicates the different levels of weather forecast & observatory

Activity Plan for 2021-22

After in-depth discussion among the Founding Members, it has been decided to take up the following activities during 2021-22.

- Finalisation of the constitution and registration of the SAFOAM.
- Creation of google group to share ideas, views, and information exchange among the members.
- Logo of SAFOAM approved by the Members.
- Hosting of the Web Portal of SAFOAM.
- Formulation of Funding Mechanism. Submission and arrangement for funding to take up a few activities as outlined earlier.
- Take up 2-3 activities under short term period on capacity building, education, research, monitoring, publication etc.

- A series of Webinars and one E-conference, lectures on topic of regional importance to be organized. All the activities should take place mostly in Cyberspace to minimize financial aspect.
- Focus on regional cooperation and collaboration like SAARC, SASCOF programs etc.
- Some collaborative work with RIMES and others.
- To work closely with newly formed SAMA & South Asia Hydro-Met Forum.
- It was suggested that the group meetings under different categories may be conducted initially on monthly basis and later it could be quarterly.
- Publish quarterly e-Newsletter.

Webinar

Webinar on Livelihood Enhancement through Agroclimatic Risk and Opportunity Management with Engagement Practices was arranged on 12th June,2021.

Speaker of the webinar was A.K.S. Huda, School of Science, Western Sydney University, Australia.
The presentation included outcomes and a path forward building upon recent work on two successful pilot projects undertaken in India by the research team in West Bengal and Tamil Nadu.. It demonstrated livelihood improvements through capture of excess rain water normally lost and applied using climate -smart practices to diversify agricultural production and improve water use efficiency. This resulted in commercially viable small-scale businesses, and the participation of women labour. The Tamil Nadu pilot demonstrated the benefits of climate -smart agricultural practices and climate change adaptation strategies through an International collaborative project during 2014-2019.

A.K.S. Huda, School of Science, Western Sydney University, Australia

The presentation outlined thoughts on scaling up and out of pilot outcomes to other communities in India, and beyond, that would have far-reaching benefits in contributing to enhanced livelihoods, reduced poverty, improved productivity and increased small-holder competitiveness

Webinar on Activities on Agrometeorology in Italy: Research and Services Speakers was organised on 26th June, 2021.
The speakers of the webinar were: Dr. Francesca Ventura: University of Bologna, Italy Federico Spanna: Piedmont Regional Agrometeorological Service, Italy Chiara Epifani: The Council for Agricultural Research and Economics, Italy.

Federico Spanna **Chiara Epifani**

The webinar gave an overview of the situation of agrometeorology in Italy, with respect to teaching and research in universities, research at national and regional level and the transfer of new knowledge to technicians and farmers. An overview of the main research themes, traditional and innovative, and of the existing operational services were also presented

Agrometeorological Activities in different South Asian Countries

Afghanistan

Currently with the World Bank support, early action plan on weather and climate is being developed and expected to be completed by 2021. It is expected to manage and update the current areas and extending to remote areas like district. At present there is no proper institutional arrangements in developing agromet advisories.In spite of its presence in agriculture and meteorology departments, the agromet advisories is not trully going to farmer but only to the central part of communication system having ICT facilities.

Scientists with the USGS Agro-Meteorology (Agromet) Project assisted the Afghan Government in collecting and analyzing agricultural and meteorological data in relation to crop production, irrigation, water supply, energy, and aviation.
Key aspects of the program involved in establishing a country-wide network of meteorological data-collecting stations and creating an extensive national database for the analysis of meteorological, hydrological, and agricultural information.

As part of the project, more than 100 agromet observation stations were installed throughout Afghanistan. These stations enable acquisition of current, valid agromet data that are essential for modeling and forecasting crop yields
Accurate agromet data are also important for assessing Afghanistan's water supply and demand, estimating snow melt and water runoff, gauging the need for irrigation and hydropower, and validating satellite data.
Furthermore, continuous monitoring of key weather parameters can provide the earliest indications of potential crop failures and subsequent food shortages.

Agro-meteorological stations across Afghanistan are providing farmers vital information on climatic and soil conditions, enabling them to grow and irrigate their crops more effectively.
Five newly installed stations, supported by On-Farm Water Management Project (OFWMP) under the Ministry of Agriculture, Irrigation, and Livestock, are providing more reliable, timely information through an automated system.
OFWMP, which works to improve agricultural productivity by enhancing the efficiency of water use, is supported by a $25 million grant from the Afghanistan Reconstruction Trust Fund.
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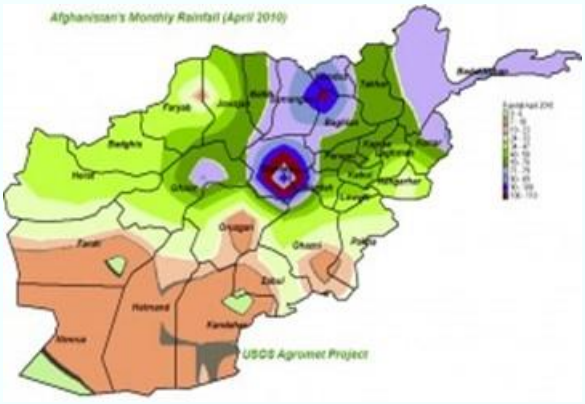
The automated stations are connected to satellites and automatically relay the recorded information through Internet to the administrator's website on an hourly basis.

Agromet project participants also helped in establishing an operational crop yield forecasting system (primarily for wheat) as well as a national monitoring and early warning system for droughts and floods.

They helped to train nearly 200 people, including many individuals from the Afghan Meteorological Authority and various Afghan ministries, in agro and hydrometeorological techniques and tools.

With Afghan colleagues, USGS team members were also involved in publishing regular and timely agrometeorological reports, seasonal analyses, and special bulletins, and disseminating these documents among national and international agencies and NGOs



Bhutan

Though the Bhutan agromet service system started in 2019 at the Extension Wing of the Department of Agriculture (DOA) and formally institutionalised, but on the operational aspect, much could not be done. Under agromet initiatives, there are number of issues and challenges. Two national agencies i.e., National Centre for Hydrology & Meteorology (NCHM) and DOA are jointly operating this service in Bhutan. All the weather observation data and weather forecast are received from NCHM. Presently, there is insufficient workforce in DOA to carry out mandated service. However, various organisations like Agriculture Research & Development Centre, National Plant Protection Centre, National Soil Survey Centre, Extension Division, IT Centre etc. are involved in this system. At present agromet service is at infancy stage in Bhutan. Agriculture Decision Support System (ADSS) prepared by RIMES for generating agromet advisory is being used on pilot mode in the country. This ADSS web portal is used for preparation and as well as dissemination of agromet advisories. Though some training is given, agromet advisories generated through ADSS in still not used at community level as it is in pilot mode operated in some districts and need for more validation.Research development, capacity building and training in IT application .is essential for successful implementation of the program

Manned Class A Station in Bhutan

Because of insufficient and inaccurate data/ information fed into the system, the performance of ADSS is not up to the mark. ADSS is developed on machine learning and the deliverables coming out of the system were tested last few years. It appeared that the information like crop calendar and other data should be rectified and it was also felt that ADSS alone would not serve the purpose, other areas should also be ventured. Though sizeable weather observatories are functioning, more weather observatories are required to carryout agromet advisory service in the country at district & block level. At present Government of Bhutan is focussing on the advancement of AGROMET system. Some funds like Green Climate Fund (GCF) which are also supporting the project. Under the support of World Bank. presently “A Roadmap for Strengthening of Operational Agromet Advisory Services in Bhutan” have been prepared for onward activities on operational Agromet Advisory in Bhutan.

Myanmar

Agromet Advisory project is operating in the country from 1982 under the Division of Meteorology & Hydrology. Primarily weather forecast is provided under this project and disseminates the same along with the advisories and bulletin to the users with the help Department of Agriculture. Though the agromet bulletins are issued but truly that does not contain agromet advisories Seasonal weather forecast is used and supported by RIMES, in producing the agromet bulletin where some advisories for farmers are given, However, these are on experimental mode but working and exploring to prepare advisories under World Bank project. Mobile application is also a part of dissemination process. During 2015-18, this project was supported by RIMES especially on early warning system in some pilot areas initially in dry zone of the country. Besides, World Bank also supports the country under the broad areas like agroecological mapping, weather monitoring & forecasting, capacity building, agromet services. There is need in upgradation of agromet advisory services. and encourage and assist in agrometeorological research and its publication which will ultimately help in Agromet Advisory Services (AAS) in the country and hence is need of the hour. The research in agrometeorology is very limited in spite of the presence of agricultural universities in the country.

Myanmar

Meteorological Department

Nepal

The subject of Agromet Advisory Services was not taken into consideration till 2012 in Nepal. During 2013-14, a number of discussions were made to implement the operational agromet advisory services and finally in 2015, with the World Bank assistance ,agromet advisory services started in the country by joint collaboration between Nepal Agricultural Research Council (NARC) and Department of Hydrology & Meteorology. Using weather forecast along with the past weather and crop status; these services were started for 26 districts in the country. AAS bulletins are issued on provincial level using the 72 hours forecast on every Friday and aiming to prepare in district level and local level agromet advisories in future. Agromet advisories are disseminated by the

At present farmers in Nepal have shown confidence and appreciate the information generated by the meteorological and hydrological fusion products for agriculture in Nepal. Some good studies made in Nepal in this regard. PPCR project has been completed and further initiatives were taken up for further continuation of the project. There is need for more AWS in the country especially to the hill stations and also the importance of the same to the weather-based insurance in the country. Moreover, the AAS should be farmer's friendly as the farmers are not literate

Agriculture Information Centre, central agency for dissemination of information in Nepal. Dissemination is done through SMS, mobile apps and radio. Roving seminars in 26 districts for capacity building of the farmers were arranged for popularisation and awareness of the agromet advisory services. Short- and long-term plans for the improvement of operational Agromet Advisory Services have been formulated. More attention needs to pay as climate is changing in Nepal along with capacity building on use of ICT technology and remote sensing application in agrometeorology, use of artificial intelligence, district and seasonal forecast. Weather insurance. PPP is not so strong in Nepal. Smart agriculture, AWS in Hill station, climate change adaptation programme are being encouraged.

enough to adopt these services. In respect of data sharing, research on crop weather relationship, effect of weather on pest & disease etc.

The Agriculture Management Information System (AMIS)

The Agriculture Management Information System (AMIS) is implemented by the Ministry of Agricultural Development (MoAD) on four sub components mentioned below.

1. Infrastructure
2. Agro/climate-Info Products
3. Agro-Info dissemination and
4. Capacity Building
5. Support for PMU, M&E and Outreach

Objective of AMIS

The prime objective of this component is to provide critical and timely agro-climate and weather information to farmers in order to increase productivity and reduce losses from meteorological and hydrological hazards. Other objectives are bulleted as below.

1) Provide a mechanism to deliver timely relevant agro climate and weather information under early warning system and deals as agriculture decision support tools to farmers, and other stakeholders.
2) Provide open data access for information and web portals.
3) Build ICT assisted communication opportunities to strengthen the voice of the farmers on agricultural issues.
4) Diminish the impacts of extreme climate related events.
5) Protect lives & assets.
6) Support agriculture livelihoods

Different Activities under AMIS

Roving Seminar

Crop Simulation Modelling Training

Dissemination through Call Centre


Mobile SIM Distribution


Kisan Call Centre

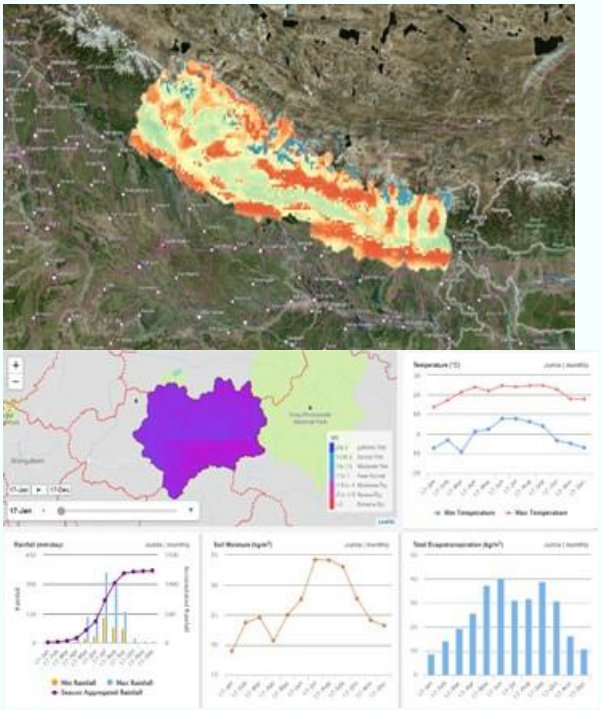

GIS Training

Drought monitoring and early warning system in Nepal

The Ministry of Agricultural Development (MoAD), Government of Nepal and the International Center for Integrated Mountain Development (ICIMOD) join hands to develop the drought monitoring and early warning system for Nepal.

The system incorporates suitable earth observation datasets and land surface and climatic models to produce key drought indices to inform on the agricultural drought condition in Nepal

The agricultural drought information system allows the user to visualize drought indicators aggregated at district level along the growing season of key cereal crops in Nepal**.**



Bangladesh

Newly and emerging Bangladesh Agromet Advisory Service System and the active involvement with the World Bank funded project on Agromet Advisory Services (AAS) project from inception is doing exceedingly well. Number of important activities like preparation of AAS bulletins (district, national levels), special advisories under extreme events and dissemination and also sharing of information among different committees including National Agromet Committee, different organisations including Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), etc. during preparation of advisories are significant progress in this regard. BAMIS PORTAL (www.bamis.gov.bd) was developed under this project.. All the weather forecasts are available and the same is displayed in BAMIS portal. Agromet Advisory Services bulletins

At present 30000 farmers were selected from the 15000 farmers' organisations, developed the infrastructure at district and upazila level by providing instruments (TABS rain gauge, kiosk, weather board, agromet room) including focal persons at different districts and upazilas in Bangladesh. Different information generated based on the data received from BMD and BWDB and through BAMIS PORTAL are disseminated to the farmers and also Sub-

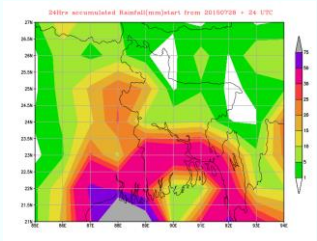
(district, national levels), are prepared in collaboration with Bangladesh Meteorological Department (BMD), & Bangladesh Water Development Board (BWDB).. At present 43 weather observatories are functioning well and the same is used in agromet advisory system. Bangladesh will shortly open agromet course in two leading Agricultural Universities (Bangladesh Agricultural University (BAU) and Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU. Sub-seasonal forecast is being used under experimental mode in issuing advisories during flash flood and cyclone.

Management of Extreme Events
Flash flood Guidance system

- Rainfall threshold analysis in flash flood pilot areas
- Establishment of Real Time rainfall station in Sylhet and Cox's Bazar

Web based flash flood guidance and dissemination system development
Uses WRF 3 days and ECMWF 10
Flood Forecasting and Warning Center (FFWC) of the Bangladesh Water Development Board (BWDB) under the Ministry of Water Resources (MoWR) and Department of Agriculture Extension (DAE), Ministry of Agriculture will jointly issue flood forecast &Agromet Advisories under flood like situations
Drought monitoring is being made by using Standard Precipitation Index (SPI) at weekly and monthly basis

Assistant Agricultural Officers who used to visit the 12 farmer groups once a week and also SMS agromet advisories are communicated to farmers through BAMIS PORTAL. In Bangladesh agriculture production system is highly vulnerable to extreme weather events. Almost every year there is considerable loss of crops in some parts of the country. Recently a number of agrometeorological information and products are generated under the assistance of World Bank for providing sensible advisories at right time and right areas to save the loss of crop and ultimately contribute food security in the country.



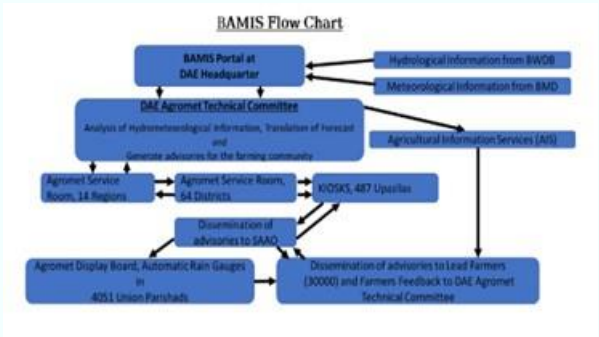
Accumulated Rainfall of Cox's Bazar (mm)

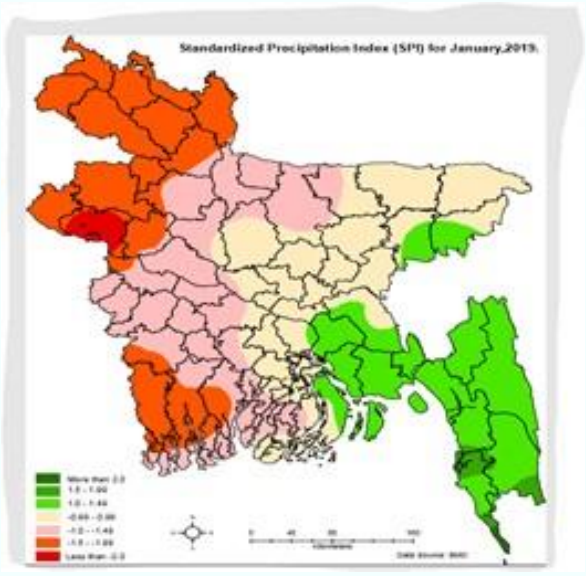
Duration (hrs)	28-07-2015	29-07-2015	30-07-2015	31-07-2015	01-08-2015	02-08-2015	03-08-2015
24	76	171	109	64	28	11	5
48	76	247	280	173	93	39	16
72	76	247	356	345	201	104	44
120	76	247	356	420	449	384	238
168	76	247	356	420	448	459	465
240	76	247	356	420	448	459	464
Advisory	NFF	FFW	FFW	FFW	FFA	FFA	FFA

Flash Flood Advisory

FFW: Flash Flood Warning	Flash Flood Warning on 29-07-2015 to 31-07-2
FFA: Flash Flood Alert	Flash Flood Alert on 01-08-2015 to 06-08-2015
NFF: No Flash Flood	No Flash Flood on 28-07-2015

Create Advisory





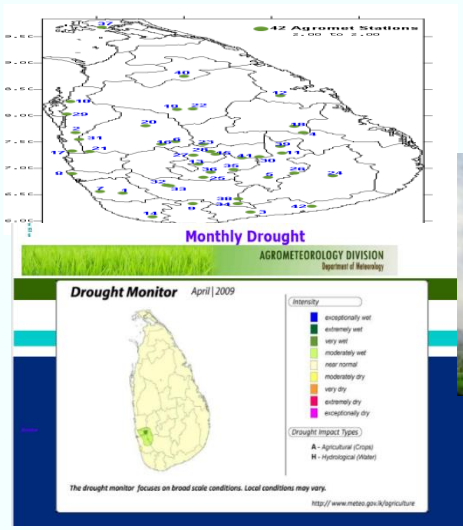
Modes of Communication of Agromet Advisories

- Bangladesh Agro-Meteorological Information portal is a dynamic web portal developed under Agro-Meteorological Information Systems Development Project (Component C:BWCSRP), DAE with a view to disseminate agro-meteorological services and other related information to the different users especially to the farmers in Bangladesh. Meteorological data from Bangladesh Meteorological Department and hydrological data from Bangladesh Water Development Board are accumulated in BAMIS portal. After being translated and validated by the DAE Agromet Technical Committee the information are disseminated at present to the 30000 lead farmers. It is linked with other relevant stakeholders. Also DAE officials and farmers are also connected. Bangladesh Agro-Meteorological Information portal includes:
- Weather and Climate information across Bangladesh
- Updated 64 districts agromet advisories twice in a week and one national agromet advisory once in a week.
- Agromet information in respect of crop, weather sensitivities on crops, pests and diseases information and its linkages with weather along with control measures, Crop Weather Calendars etc.
- Development of Agro-Meteorological products including satellite products to help different users to make tactical & strategic decisions.
- Dissemination of agro-meteorological and hydrological information, forecasts and agromet advisories through different modes to the farmers through Department of Agricultural Extension and Agriculture Information Service.
- Information on extreme events
- Special Agromet Advisory Services for livestock, poultry and fishery
- Feedback from farmers
- Others

Sri Lanka

Agrometeorological network was started in 1973 with the guidance and donations given by United Nations Development Programme (UNDP) as a result of it, so many agrometeorological stations were established island wide under certain institutions such as coconut research, rubber research, agriculture research, paddy research and tea research at the beginning. Data are continuously received from all stations and those data are quality controlled and processed by agromet division other than this we supply data for academic purpose research and other relevant projects

Though Agromet Division established in Meteorological Department in 1976, agromet advisory services for the farmers on agroecological zones in selected parts of the country was started in 2009 by joint collaboration between Meteorological Department & Agriculture Department. However, still the agromet advisories are not easily understood by the farmers. Recently under Green Climate Fund (GCF) fund from UNDP, agromet advisories are prepared based on seasonal forecast at agroecological zones in three river basins in the country. Dry land area is very vulnerable to extreme events and climate variability and climate change. RIMES is supporting agromet services by sharing the seasonal forecast also. The agromet bulletins are prepared on national level and disseminated to the different stake holders in provincial and national level. Working on drought monitoring as well as on weather insurance and other sectors. RIMES and Irrigation Department, Government of Sri Lanka jointly started working on agromet advisory system. Successful initiative at pilot scale in northern Sri Lanka is being made by International Water Management Institute (IWMI), insurance company and local agrarian Govt. of Sri Lanka in issuing demand driven agromet advisories in local language. However, farmers' demand is that agromet advisories should be consistent and regular in nature. Under World Food Programme, initiatives have been taken on last mile services through development and maintenance of agromet portal in Sri Lanka where the national bulletins at agroecological zone are uploaded. At present there is no provision for uploading local AAS bulletins and still the correct and timely information is not reaching to the farmer in Sri Lanka.



Agro-Meteorology in Maldives

Maldives is low lying island and at present Maldives is not giving any agromet services. but the services is the priority for Govt of the country and would be addressed in future and more stress would be given to capacity building

Climate Information users and utilization of information in Maldives

Relationship with climate information users

There is a framework for cooperation with the following user sectors.

Agriculture, Water management, Disaster Risk Reduction, Energy resources, Health and welfare, Transportation

Method of provision of climate information

- E-mail, TV and/or radio

Efforts/activities to enhance the utilization of climate information

- - User Workshops
- - Publicity and educational activities

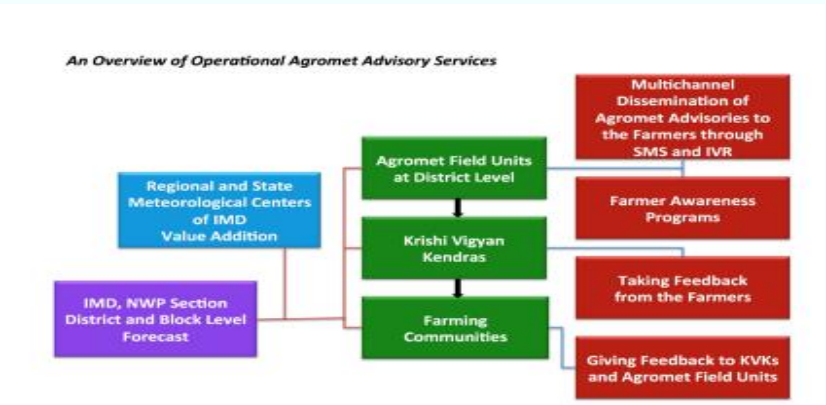
Information on severe weather events to news papers (not on the web

Maldives Meteorological Services

India

The Agromet Advisory Services of the India Meteorological Department (IMD) in the Ministry of Earth Sciences is providing location and crop specific actionable weather and climate services and products that link in available technologies, best practices and go the last mile to reach all farmers in the country. The Agromet Advisory Services have now been established at district as well as block levels in India. These Services meet the real-time needs of farmers and contribute to weather-based crop/livestock management strategies and operations dedicated to enhancing crop production and food security. They are making a tremendous difference in agricultural production by assisting farmers in taking the advantage of benevolent weather and in minimizing the adverse impact of malevolent weather. Today, IMD is implementing operational agrometeorological schemes across the country under a six-tier structure ranging from top-level policy planning body in Delhi to Krishi Vigyan Kendras at district level.

All of the information is geared to help farmers maximize output and avert crop damage or loss. The Agromet Advisory Services also has an end-user group feedback mechanism to help the district level forecasters to tailor their services further. In a survey conducted by the National Council of Applied Economic Research (NCAER), 93% of farmers responding agreed that numerical weather prediction were reliable, and asserting that they used the information in making decisions during different farming stages, from sowing to harvesting. The economic benefit has been estimated at US$ 7.575 billion per year and is extrapolated to rise to US$ 32 billion if the entire farming community in the country were to use Agromet Advisory Services in their agricultural activities.



Agromet Advisory Services use multi-channel dissemination channels including mass media, group awareness campaigns and individual contacts in order to reach more farmers. Around 43 million farmers are currently subscribed to the SMS advisories, but there is still a need for greater dissemination and to convince farmers of the sustainability of the positive impacts observed in the long term. A participatory, cross-disciplinary approach is taken to deliver climate and weather information and enhance awareness in these user groups. organized these group awareness campaigns in different parts of the country. Farmers receive informative brochures and pamphlets outlining weather-based farming guidelines; information on crop management practices in the district; about pests and diseases, severe weather conditions, crops that can be grown under stress conditions and contingency plans; and on the District Agromet Bulletin – all in local languages. To further improve the relevance of these services, local-level Agromet Advisory Services have been proposed. High-resolution weather forecasts at local level is being used to develop this services. These local-level forecasts have shown incremental benefits of up to 13% over district-based advisories. The weather forecast and warnings have enhanced livelihood security for the rural community.Meghdoot, a joint initiative of India Meteorological Department(IMD), Indian Institute of Tropical Meteorology(IITM) and Indian Council of Agricultural Research(ICAR) and Research centres of AICRP on Agrometeorology aims to deliver critical information to farmers through a simple and easy to use mobile application. Damini Lightning apps is developed by IITM,Pune and ESSO. The apps is monitoring all lightning activity which are happening in specifically for all India and alert you if lightning is happening near users by GPS notification under 20KM and 40 KM.

Visit to Farmer Field

Farmer Awareness Programme

Feedback from Farmers

Pakistan

National Agromet Centre has established five Regional Agromet Centers (RAMCs) in the major agriculture plains of the country, where the major crops are monitored thoroughly on agrometeorological grounds and at the end of each season a comprehensive document (Crop Report) is produced on regular basis.These RAMCs are located at Rawalpindi (Potohar), Faisalabad (Central Punjab), Usta Muhammad (Eastern Baluchistan), Quetta (Northern Baluchistan) and Tandojam (Lower

Sindh). Crop reports mainly portray the post analysis study based on impact of weather on particular crop in the relevant area.

Agromet Centres issues weekly Agromet Advisory Service bulletins which covers the post analysis outcome (including the data tables, figures/maps and a comprehensive discussion portion) based on all the important Agromet data for the past week collected mainly from a network of 34 agromet stations throughout Pakistan (working under National Agromet Centre NAMC, Islamabad) besides meteorological network of PMD.

The agromet data being utilized comprise of all the important meteorological and agriculture related elements like air temperatures, soil temperature, rainfall, air humidity, cloud cover, growing degree days, general weather pattern, crop condition report including phenological report etc. Besides this, a comprehensive farmers advisory is also included which covers the general forecast for the coming week along with crop specific as well as animal care suggestions.
Besides, following bulletins & reports are also issued.

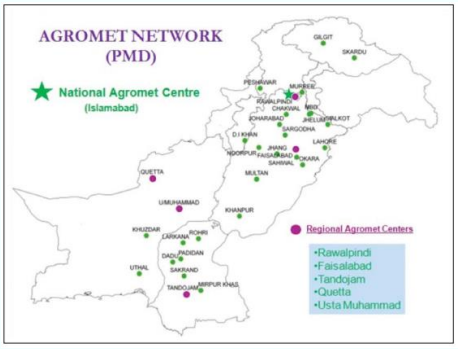
Decadal Bulletins

Monthly Bulletins

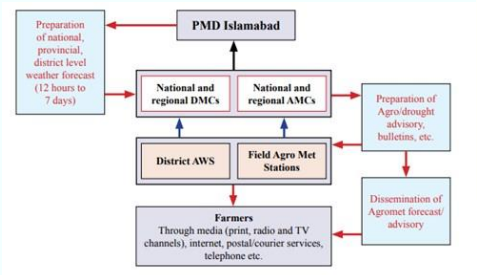
Crop Calendar & Harvest Calendar

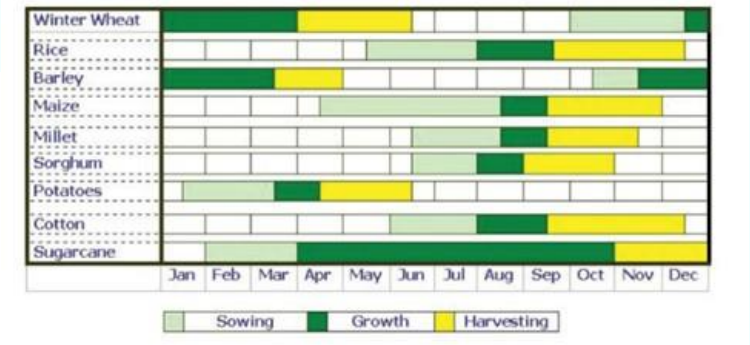
Below are the types of information included in a typical agromet advisory bulletin prepared by the PMD:

- Advisories on dates of sowing/planting and the suitability of carrying out intercultural operations.
- District specific weather forecast in quantitative term, for the next 10 days for rainfall, cloud, maximum/minimum temperature, wind speed/direction and relative humidity, including warning of hazardous weather likely to cause stress on standing crops and suggestions on how to protect them.
- Information on soil moisture status and guidance for application of irrigation, fertilizer and herbicides, etc.
- Warnings of major pests and diseases of principal crops and advice on plant protection measures.
- Manipulation of crop microclimates, e.g. shading, mulching, other surface modifications, shelter belt, frost protection etc. to protect crops under stress.
- Advisory on the judicious management of land, water and farm inputs, particularly pesticides, herbicides and fertilizers. Advisories for livestock on health, shelter and nutrition



Timely dissemination of agrometeorological information online and through mass media is part of a process that empower the farmers with scientific knowledge and to take appropriate action for enhancing agricultural production. SohniDharti is the first agricultural TV channel of Pakistan that provides information relating to agriculture and rural development(http:// www.sohnidharti.tv/). A TV channel and an FM radio station are also being set up in the public sector to educate farmers about modern farming technology suiting their needs.
The Internet is a new and cost-effective technology that can provide research and technological development information in an accurate and timely manner. Additionally, the Internet is also effectively used to offer training modules to agrometeorologists and help them improve the quality of their products. Besides, through the National Agromet Centre agromet bulletins are disseminated. There are few other agencies providing bulletins through their websites or radio services.





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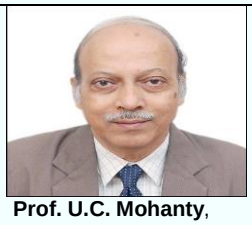
Immediate Past President, Indian Met Society, Patron India Water Foundation



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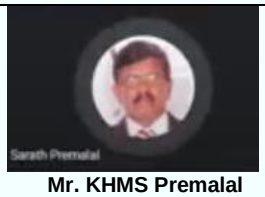
 **Dr. Abdul Muyeed** Sectorial Consultant, Care Project, RIMES, World Bank & Former Director General, Department of Agricultural Extension, Bangladesh	 **Mr. KHMS Premalal** Former Director General of Meteorology, Sri Lanka	 **Prof Dr M C Varshneya** Former Vice-Chancellor Anand Agricultural University Gujarat
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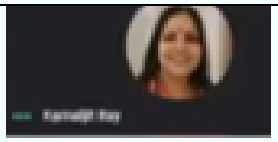 **Dr.(Mrs) Kamaljit Ray** Sc-'G', Ministry of Earth sciences Room No. 319, Prithvi Bhavan Lodhi Road, New Delhi-	 **Dr.R K Mall** Professor & Coordinator DST-MahamanaCenter of Excellence in Climate Change Research&CoordinatorEnvironmental Science & Technology (RGSC) Institute of Environment and Sustainable Development Banaras Hindu University, Varanasi - 221005 India	 **Dr..S.Pashupalak** Former Vice Chancellor Orissa University of Agriculture and Technology.(OUAT) Orissa
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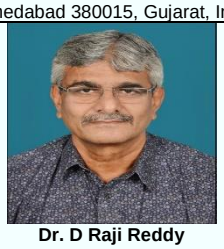

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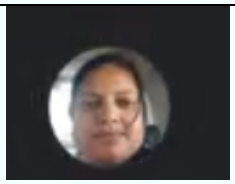
 **Dr.Sanjib Bandyopadhyay** Deputy Director General of Meteorology, Regional Meteorological Centre, Kolkata, West Bengal	 **Dr T.Prathima** Sr.Scientist (Agromet), RARS.Tirupati, Andhra Pradesh	 **Ms. MalathiSeetamraju** Agricultural Meteorology Division, India Meteorological Department Pune
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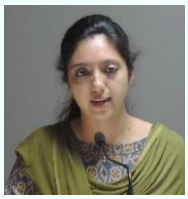
 **Mr. Manoj Lokare**, GeoSpatial Researcher, Aberystwyth University, United Kingdom	 **Dr.Natarajan A** Professor and Head Animal Feed Analytical and Quality Assurance Laboratory Veterinary College and Research Institute, Namakkal - 637 001 Tamil Nadu	 **Dr.Rucha Dave** Anand Agri, Univ, Gujarat
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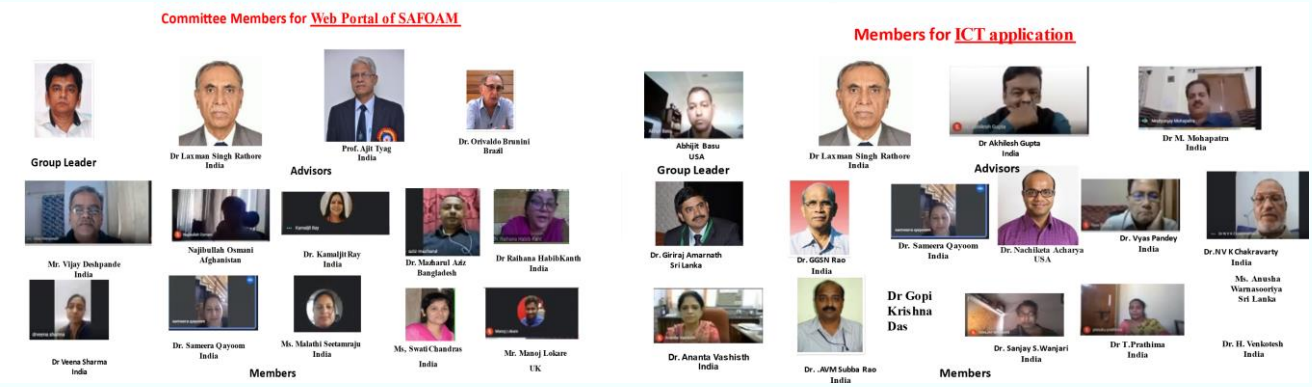
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Important Links

- ✓ India Meteorological Department - **https://mausam.imd.gov.in/**
- ✓ Agricultural Meteorology Division, India Meteorological Department **(** https**://**www.imdagrimet.gov.in)
- ✓ Bangladesh Meteorological Department - **http://live4.bmd.gov.bd/**
- ✓ Bangladesh Agrometeorological Information System **(http://** www.bamis.gov.bd)
- ✓ Nepal Meteorological Forecasting Division - **http://www.mfd.gov.np/**
- ✓ Sri Lanka Department of Meteorology - **https://www.meteo.gov.lk/**
- ✓ Pakistan Meteorological Department - **https://www.pmd.gov.pk/en/**
- ✓ Bhutan National Centre for Hydrology and Meteorology - **https://www.nchm.gov.bt/**
- ✓ Myanmar Department of Meteorology and Hydrology - **https://www.moezala.gov.mm/**
- ✓ Afghanistan Meteorological department - **http://www.amd.gov.af/**
- ✓ Maldives Meteorological Service - **https://www.meteorology.gov.mv/**

Forthcoming Event (s)/Opening (s):

Webinars/Symposia/Conferences

- National Conference on Managing Weather and Climate Risks in Agriculture at Srinagar, India (March 24-26, 2022) (https://www.agrimetassociation.org/file/1321701735S-kashmir-2021-Final-Revised-06-Oct-2021-(1).pdf)

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