Proceedings of the Sensitisation Programme on Agrometeorology in Nepal

Organized by the South Asian Forum for Agriculture Meteorology (SAFOAM)

5th April, 2022

Programme Details

Date: 5th April 2022 **Time**: 03:00-05:00 pm (Nepal Time)

Venue: Zoom (Meeting detail is provided in bottom of the agenda) **Chairman**: Dr. L. S. Rathore, President, SAFOAM,

Time: 02.30-03.00 PM
Registration and setting up the IT equipment
Time: 03.00-03.05 PM
Topic: Welcome address
Resource Person: Dr. Archana Shrestha, Deputy Director General, Department of Hydrology and Meteorology (DHM), Nepal
Time: 03.05-03.15 PM
Topic: Presentation on Strengthening of operational Agrometeorological Advisory Services in Nepal using SAFOAM Knowledge Platform

Resource Person: Dr Nabansu Chattopadhyay Secretary, SAFOAM

Time: 03.15-03.25PM

Topic: Presentation on Present Status of Agrometeorological Advisory Services in Nepal
Resource Person: Mr. Manoj Thakur on behalf of Nepal Agriculture Research Council (NARC) and Dr. Indira Kadel from DHM

Time: 03.25-03.35 PM
Topic Comments from the international expert on Agrometeorology
Resource Person: Dr. Manav Sivakumar Founding Editor-in-Chief, Weather and Climate Extremes (Elsevier) Senior Consultant, WMO, Geneva Switzerland

Time: 03.35-04.15 PM
Topic Discussions

Resource Person: Both Sides (Participants from Nepal & International Participants)

Time 04.15-04.20 PM
Topic Remarks by Secretary, Secretary, Ministry of Agriculture and Livestock Development, Bagmati Province

Resource Person: Dr. Sharan Pandey, Secretary, Ministry of Agriculture and Livestock Development, Bagmati Province

Programme (Continued)
Time 04.20-04.25PM **Topic** Remarks by the Director General, Department of Hydrology & Meteorology (DHM)
Resource Person: Mr Kamal Ram Joshi, Director General, DHM
Time 04.25-04.30 PM **Topic** Remarks by Executive Director
Resource Person: Dr. Deepak Bhandari, Executive Director, Nepal Agricultural Research Council (NARC)
Time 04.30-04.35 PM **Topic** Remarks by the Secretary**,** Ministry of Agriculture and Livestock Development
: Resource Person: Dr. Govinda Sharma, Ministry of Agriculture and Livestock Development, Central Ministry, Nepal
Time 04.35-04.40 PM **Topic** Vote of Thanks
: Resource Person Mr Manoj Thakur, SAFOAM

Background of the Sensitisation Programme on Agro-meteorology

As we all know that 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 livestock. 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. Yet, in most countries in South Asia Region, 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. As all the countries in South Asia are heavily dependent on agriculture, there is an urgent need to strengthen agrometeorological services in all of them.

South Asian Forum for Agricultural Meteorology (SAFOAM) was launched on 9th February 2021. The goal of this forum is to provide agrometeorological advisory services especially for the poor, unprivileged and unreached famers in South Asian Region (**Afghanistan**, **Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, Pakistan and Maldives**). A number of Founding Members of SAFOAM from different member countries, representatives from different organisations and international experts presented the present status, gaps, need and challenges etc. in operational agromet advisory services presently operating in South Asia Region along with useful suggestions for the proposed activities, structure and other technical and administrative issues, immediate plan and also the future strategies and activities.

The salient objective of the Forum is to bring together various functionaries working in area of agrometeorology to;

√ Share information about national Agromet Advisory Services including outreach & challenges of these services

√ Sharing common strategic mission & vision in adaptation & mitigation of future challenges of weather and climate on agriculture

√ Innovative approach in management of weather & climate hazards and extreme events to promote greater resilience in agriculture

√ Identify priority areas like use of reliable and timely sub-seasonal to seasonal forecast in agriculture, use of remote sensing on operational agro-meteorology services etc. to strengthen regional collaboration and;

√ Discuss and establish institutional arrangements needed to sustain and scale up ongoing national and regional efforts in the delivery of agromet services.

Based on the discussion and the useful recommendations made in launching meeting following six thematic areas have been identified.

1. Present Status and existing strategies for meeting the need, gaps, requirements etc. for operational Agromet Advisory Services in South Asian Countries

2. Administration/Constitution/ By Laws/ Finance etc. for SAFOAM

3. Utilisation of satellite derived products in Agromet Advisory Services for South Asian Countries.

4. Web Portal for South Asia Forum on Agricultural Meteorology.

5. New Dimension of Agromet Advisory Services in hill region in South Asian Countries.

6. Build capacity in ICT program management and also build such cadre and mentor them for ensuring continuity of Agromet success and innovation sustenance.

To meet the goals of SAFOAM and to kickstart country specific activities, South Asian Forum on Agricultural Meteorology (SAFOAM) has started to launch country specific sensitization program. This program is mainly organized for higher Government officials at Ministry/ policy decision levels/ bureaucrats and policy makers, which will be an interactive session (2 to 3 hours) with two or three small illustrative presentations. Importance, economic aspects of Agrometeorological Advisory Services along with the case studies are included in this program.

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Programme

South Asian Forum on Agriculture Meteorology (SAFOAM) organized virtually a half-day programme entitled "Sensitisation Programme on Agricultural Meteorology" for policy and decision makers in coordination with SAFOAM-Nepal Chapter at 3.00-5.00 PM on 5th April 2022. The meeting was chaired by Dr. L.S. Rathore, President of the South Asian Forum for Agricultural Meteorology The programme consisted of interactive session along with two small illustrative presentations. Importance, economic aspects of Operational Agrometeorological Advisory Services along with the case studies were also included in this programme. Ultimate objective of the meeting was to prepare a roadmap for various programme on agrometeorology from farmers to officers/scientists' levels engaged with the agricultural activities in Nepal. 43 distinguished personalities including Secretaries, Joint Secretaries from Ministry of Agriculture, Director General of the Department of Meteorology and Hydrology (DHM), officers/scientists from DHM, different Agricultural Departments of Nepal, Nepal Agricultural Research Council (NARC), scientists, academia participated in this programme.

Kindly find below the video link of the meeting.

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As per the programme schedule **Dr. L.S. Rathore,** President, SAFOAM chaired the entire programme. In the beginning Dr. Rathore welcomed all the participant for their valued presence in the important meeting. He presented a brief account of the meeting and afterwards requested all the participants to introduce themselves. All the participants introduced themselves mentioning their credentials and areas of expertise After the introduction part, Dr. Rathore requested Dr. Archana Shrestha, Deputy Director General, Department of Hydrology and Meteorology (DHM), Nepal and Founding Member of SAFOAM to deliver the welcome address.

At the outset **Dr. Archana Shrestha**, has given warm welcome to all the high-profile dignitaries in Nepal and the distinguished SAFOAM members and other participants to the important meeting of SAFOAM. She appreciated the kind of initiatives taken for the development of agrometeorology in Nepal and South Asian Region (SAR). She emphasized the importance of meteorology in agriculture especially for the farmers

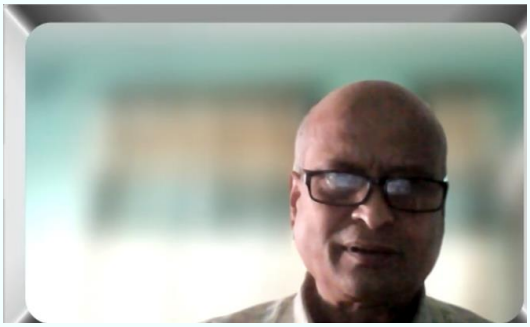
She said that reliable weather forecast in South Asia is in developmental stage and its application in agriculture through integration mechanism is very much required for developing meaningful agromet advisories. She also said that due to non-availability of reliable forecast, weather information could not be utilized in agriculture in the past. However, in recent times, due to huge investment and

evolving state of art technology, weather forecasting has been improved significantly and its useable form in agriculture. Also mentioned about the issue of seasonal rainfall forecast for monsoon season in April and stressed for proper use in agriculture She talked about the need of climate smart agriculture. She informed that DHM at present provides weekly weather information and forecast to Nepal Agricultural Research Council (NARC) for preparation of agromet advisories and also generate seasonal weather forecast and other climate information for its use in agriculture. She was also referring to last year post monsoon heavy rainfall causing huge loss of crops. She also mentioned that the data recorded in automatic weather station could be used in agromet research and also forewarning of pest and diseases incidences particularly in mountain region. She concluded that good beginning has been made and expecting more such interactions in future.

Dr. Rathore appreciated the on-going activities of DHM. He said that Dr. Shrestha has properly mentioned about the challenges under climatic variability and climate change. He added that due to interventions of World Bank (WB) and others, at present there is lot of improvement in weather forecasting. He also said that at present number of technical experts, scientists, academia and other are the integral part of SAFOAM and able to help the agromet advisory services in the country. In order to set the tone of the meeting, **Dr. Nabansu Chattopadhyay** Secretary, SAFOAM was requested to inform the participants the proposed strategies of SAFOAM in helping the Government of Nepal in strengthening of operational Agromet Advisory Services in the country.

Dr. Chattopadhyay informed the on-going and future impact of climatic variability and climate change in agriculture and also proposed strategies and solutions to be adopted by SAFOAM to reduce the loss of crops in South Asia and especially in Nepal. He also showed how the heavy rainfall damaged the standing crop in November in 2021. He also explained how SAFOAM would work with Nepal in three areas i.e., capacity building, education & research programme including modernization of agrometeorological observation network, setting up experience sharing mechanism for providing guidance on implementing agro-meteorological advisory service, improving the ability to use different types of forecasts in farm level decision making, wider dissemination of agrometeorological information and use of remote sensing in Agromet Advisory Services. Also showed the success stories, economic assessment of operational Agromet Advisory Services and feedback from farmers in India and Bangladesh. He concluded by mentioning that SAFOAM, as knowledge platform, in collaborative mode proposes to work with the various organizations in Nepal i.e., Ministry of Agriculture, Irrigation and Livestock (MAIL), Ministry of Agriculture, Ministry of Agriculture and Livestock Development, Ministry of Land Management, Agriculture and Cooperative, Ministry of Food Technology, Ministry of Agriculture and Cooperative, World Economic Forum (WEF), Food and Agriculture Organization, International Centre for Integrated Mountain Development (ICIMOD), Department of Hydrology & Meteorological Department, Nepal Agricultural Research Council (NARC), World Bank, Academia, many individuals from the Nepal Meteorological Authority and various Nepal Ministries, in agro and hydrometeorological techniques and tools to establish a demand based operational Agromet Advisory Services. Presentation of Dr. Chattopadhyay is attached along with the proceedings.

Dr. Kadel, Department of Hydrology and Meteorology, Nepal specifically talked about the weather and climate services related to the agromet advisory services. She mentioned about forecast at different spatial and temporal scale, flood forecast, sub-seasonal to seasonal outlook for medium to long term planning, climate data and reports, climate monitoring at different temporal scale for short term planning, drought monitoring and pest and disease early warning system which are being carried out by the Meteorological and Hydrological Wings of the Department of Hydrology and Meteorology in Nepal. She also informed about the meteorological data services and said that from 1940 onwards the observatories were set up and at present 500 observatories even in high altitudes are working for different purposes. And among them, 37 agrometeorological observatories are set up for recording number of weather parameters required for agromet advisory services. She informed about the different climatic products including temperature monitoring, drought monitoring, precipitation summary, climate and climate change reports etc. are also generated by DHM and these are shared with NARC, Ministry of Agriculture and Ministry of Livestock for preparation of agromet advisory service bulletins jointly.



Mr. Manoj Thakur, Former Senior Scientist, Nepal Agricultural Research Council (NARC), made elaborate presentation on the preparation, dissemination of Agromet Advisory in Nepal based on the weather forecast, climate products at different temporal and special scale from 2015 onwards and how the bulletins were made scalable to 77 districts as on today. According to him, significant improvement is required for dissemination of agromet advisories at grass root level. Besides, he showed some Agromet Advisory bulletins highlighting different components including weather, crop, livestock etc. He also showed different features of Agromet bulletins in provincial level i.e., in 7 provinces. Mr. Thakur informed that agromet advisories are prepared based on the meteorological data and weather forecast shared by the Department of Hydrology & Meteorology. He also said that suitable advisories are prepared by the experts for number of crops and livestock like coffee, cow, buffalo including fodder crops based on the climatic information and information technology. Besides, additional information is also provided as per the choice of the users. According to him, at present Agromet Advisory bulletins are displayed in WAMIS website of WMO including other social media like Facebook, websites, Nepal TV, Radio on weekly basis. He also talked about different issues, challenges, gaps in operational Agrometeorological Advisory Services particularly in preparation of local level advisories and its dissemination, lack in coordination under federal system in the country, limited agrometeorological research, proper agrometeorological observations for agromet research, drought forecasting, forewarning of pest and disease attack, information on contingency plan, application of sub-seasonal to seasonal forecast in agriculture and strategies for proper feedback system. He stressed for the joint collaboration among the DHM, NARC and SAFOAM to address all the issues mentioned above.

Dr. Rathore appreciated the deliberation and said that Mr. Thakur has set up the tone for further discussion. He continued that Mr. Thakur nicely brought out the status and kind of Agromet Advisory Ser vices (AAS) in Nepal is operating since long. In order to understand the gap areas and how to fill

up the same and also to meet the emerging requirements in Nepal, Dr. Rathore now requested **Dr Mannava Sivakumar**, Founding Editor-in-Chief, Weather and Climate Extremes (Elsevier) Senior Consultant, WMO, Geneva Switzerland to address the participants. Prior to the address of Sivakumar, Dr, Rathore informed the multi-dimensional credentials of Sivakumar in the field of agrometeorology especially in product development, research, teaching, education, services etc. Dr, Rathore also requested to address how to fill the gaps in operational research, development of products and tools and education system in Nepal as there is no agromet department in Nepal.

Dr. Sivakumar said that under World Bank project from 2013 onwards, he was associated with the project entitled Building Resilience to Climate-Related Hazards (BRCH) project and Pilot Project on Climate Resilience (PPCR) programe. He said that he had the privilege to work with both DHM and NARC and also worked with Dr. Poonam Pillai, Senior Environmental Specialist in the World Bank. He said that Nepal population is largely rural and agricukture is the mainstay of the economy providing the livelihood more than 70 per cent of the population and share of agriculture to the total GDP is about 34 per cent and the largest contributor in the economy. As per the Ministry of Agriculture in 2012, agriculture production is relatively low due to the low crop productivity which are due to large number of factors including erratic monsoon rainfall, less irrigation facilities etc. He added that all types of climate and natural disasters are very much prevelant in Nepal. And as per the climate change projections, frequency and intensity of the extreme events will increase in future. He said that collection of meteorological and hydrometeorological data are important issue in Nepal. He has given a brief account of different types of crops and their contributions to total GDP. Crop productivity are influenced by weather and climate. In high mountain, plant growth is limited by low temperature and short growing season. Quantitive agrometeorological data are absolute requirement for research and production process of crops including livestock and forestry in Nepal. Agrometeorological data are not only meteorological data but also phenological data, crop management, pest and disease cycle, land use, soil type and other economic information. Recent advances in remote sensing such as detection of soil moisture, estimation of evapotranspiration, rainfall etc. would be new source of data for agrometeorological applications. Users such as farmers, ranchers, foresters with rapid access of weather and climate information along with the agromet advisories with decision aids will have enormous economic implications. Detail observation and monitoring and real time dissemination of meteorological information and derived indices are important for tactical agrometeorological decisions in short time planning at different growth stages. He talked about roving seminar and distribution of thermometers and rain gauges, training and capacity building, study visits in different countries like, USA, India, China, Kenya Thailand, one day project implementation workshop, local personal training for local people, training in crop modelling, GIS, agricultural resource mapping, index insurance in agriculture i.e., weather index insurance, dissemination of agromet advisries through creation of web portal. Preparation of agromet bulletin by joint collaboration among the Ministry of Agriculture, DHM and NARC. For on farm application digital display board, solar system, phoneset. leased internet facility, distribution of sim, climate smart mobile application development, FAQ etc. were also informed. He concluded that considerable improvement and implementation in the agromet service could be made under the World Bank project. The task of review, gaps, recommendations for agrometeorological indicators have been addressed. Considerable progress has been anticipated in dissemination of agromet information and products for the farmimg community in different agroecological zones in

Nepal.

Dr. Rathore appreciated the presentation of Dr. Sivakumar as this has given elaborate view points for what can be done to to further augment the agromet advisory services system in Nepal by covering the entire spectrum of agromet advisory service system. This will further help all of us future discussion during the next course of the meeting. He also said that next 40 minutes discussion might be made on the critical issues and points raised by Dr. Sivakumar and earlier presenters. Before such discussion Dr. Rathore requested Dr. Saran Pandey, Secretary, Agriculture, Bagmati Province to address the gathering.

Dr. Saran Pandey said that the information received from the three presentations are very useful for Bagmati province for implementation of agrometeorological issue. He assured that he would try to implement the related activities in collaboration with SAFOAM and others. He was mentioning the effectiveness of such system and also wanted to know the role of the provincial Government in this respect. He informed that still there is a gap among the policy level, institution level and wanted to know the gap areas and how to fill the gaps for better implementation and effectiveness. He said that we should know whether any survey was made whether farmers are benefited by the service. Once again, he assured that during the current fiscal year, he would try to implement the operational agromet advisory services in the province as erratic weather is the devastating climatic phenomena which affect the agriculture in the country. He also mentioned about the pest and disease outbreaks and its impacts on declining agricultural productivity. He stressed for more regional cooperation to minimizes the loss of crops due to bad weather anomaly. He stressed for joint initiative to minimize the knowledge of weather impact on agriculture at farmer level, better use of technology, more stress on capacity building programme. According to him, for sustainable agriculture, use of weather particularly skillful weather forecast well in advance is very much required. He talked about the incidences of fall army warm in maize and other pests and diseases outbreaks which result in food insecurity. He mentioned that importance should be given on agromet research and training. Once again, he said that the new concept of regional collaboration in agriculture particularly on agrometeorology would perhaps resolve number of issues for better agricultural production.

Dr. Rathore expressed thanks to Dr. Pandey for giving a brief aspect of operational agromet advisory service particularly in Bagmati province and also his guidance on how these can be further improved under joint collaboration mode. After that, Dr. Rathore initiated the discussion particularly on gap areas on spatial and temporal resolution of weather forecast, climatic information etc. and also extended range and seasonal weather prediction. Dr. Rathore then requested Dr Madan Lal Shrestha and Dr. Archana Shrestha to inform about the on-going and future plans of DHM in this regard and also requested what kind of international cooperation is required to modernize the system.

Dr. Madan Lal Shrestha, Academician, Nepal Academy of Science & Technology, said that it is really a big challenge for DHM to touch upon the activities at the grass root level especially with the farmers. According to him, there must be close collaboration with other organizations within the country and other international organizations. He informed that as far as agriculture and meteorology sectors are concerned, there are other activities that were taken up other than PPCR in Nepal. According to him, taking such issues in provincial manner under federal system would be more effective.

He mentioned some on-going activities jointly taken up by WFP and Govt of Nepal in order to reach the farmer. Under this initiative it is going to establish Provincial level Climate Change Management Information Centre and Municipal Agrometeorological Information Centre at grass root level throughout the country phase wise. He opined that these centres would be able to do good work for the farmers at local level. He is also the team leader of this initiative. He informed that such centres have already established at seven municipalities in three districts of Kanali province and would start working shortly. He also stressed for more and effective collaboration between DHM and NARC within the country and also SAMA and SAFOAM to implement the operational agromet advisory services meaningfully at the grass root level i.e., farmers.

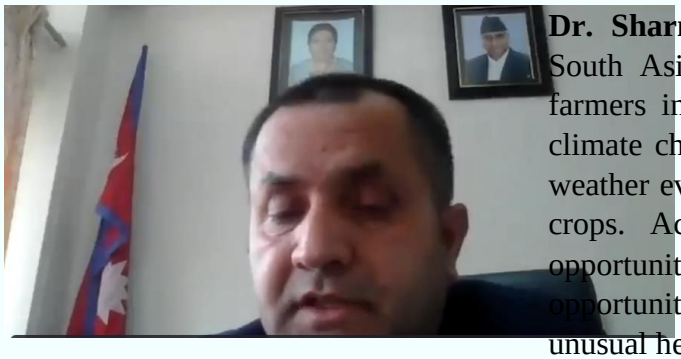
Dr. Rathore appreciated Dr. Madan Lal Shrestha for sharing the information of setting up of Provincial level Climate Change Management Information Centre and Municipal Agrometeorological Information Centre and he said that in future duplication work might be avoided and jointly can do work with them efficiently. Dr. Rathore said that this is a great outcome of the meeting and he could foresee wonderful work on agrometeorology by joining hands with these centres.

Dr. Archana said that as per the objective of SAFOAM, learning from each other is required to improve AAS in South Asia. She said that SAFOAM meeting really catalysis the same. She was also same opinion with the Secretary, Ministry of Agriculture and others that time has come to work together even closer as of now for giving useful services to the farmers. She also said that there is enough scope to learn from the past incidences. Citing examples once again she mentioned the untimely post monsoon rainfall which impacted the rice harvest in Nepal and India in November last year. Though DHM could issue the right forecast timely, but it could not reach at the right time to the farmers and other stake holders because of absence of proper dissemination mechanism. She added that stake holders were not aware and attributed that there is certain gap in total system for forecast generation to reception of the weather forecast and early warning. She said that all concerned organisations i.e., DHM, Ministry of Agriculture, NGOs etc. collectively should work on this issue. Also requested the concerned departments of Ministry of Agriculture to integrate the weather forecast into their system also as it is the time to bring meteorology in agriculture. She also suggested that the agrometeorological wing at local, federal, provincial and national level, meteorology should be integrated. She also talked about research, communication, dissemination, understanding of each other technical languages, presence of meteorological community in agriculture for better communication, biological science etc. Finally, she said that DHM would work hard for generating skillful weather forecast, climate products for agromet services in Nepal.

Dr.A.K.S. Huda, School of Science, Western, Sydney University, Australia, responded to the issue of capacity building already been mentioned by the earlier presenters. He said that capacity building for the farmers in mountain is an important issue under climate smart agriculture. He informed that he visited Pokhra village in Kaski district in Nepal. He also said that cultivation of coffee is an important and upcoming area in mountain in Nepal. He said that he has interacted with the farmers and issues that are very important are climate, soil, season, water lifting and value chain. He further emphasized that climate not only important for production but also quality. He also informed that after organizing a workshop in Nepal with University in Nepal, NGOs, and ICIMODE, a consortium has been created. He suggested that a

linkage may be established with the consortium, as mentioned above, and SAFOAM to take further initiative on different aspects on climate smart agriculture in mountain region in Nepal.

Dr. Rathore appreciated the concept of development climate smart agriculture in mountain and also the proposal to work with ICIMODE and the consortium in Nepal to further work on different aspects of agromet services in Nepal. Dr. Rathore now requested **Dr. Govinda Sharma**, Ministry of Agriculture and Livestock Development, Nepal to give his address and further guidance for providing better services to the farmers through operational Agromet Advisory Services.



Dr. Sharma said that agricultural system in Nepal and South Asia is highly vulnerable to extreme weather and farmers in this region are at higher risks because of the climate change and as a result a number of unprecedented weather events occurred and ultimately caused huge loss of crops. According to him, though there were lots of opportunity in agricultural sector but losses are more than opportunity. In this context, Dr. Sharma was referring the unusual heavy rainfall in last November which ultimately caused substantial loss of standing paddy crops. The losses are equivalent to 12 billion in Nepalese currency and it was almost 14 billion when the losses of livestock, sugarcane etc. is combined with paddy loss. Rice was heavily impacted and rice was almost harvest stage. He suggested that special attention and special early warning should be issued well in advance through media, Ministry and others, different from regular system, so that appropriate measure can be taken to save the crop loss. Thus, there is need to develop some strategy during such incidences in future. He emphasized for more awareness among the farmers on the importance of weather in agriculture and need based training and awareness programme for the farmers using some technology, tools etc. He said that climate service system and climate tools would be very effective to manage such system. He informed about the Apps in Nepali language already developed and in practice which may be linked for dissemination of information. In order to address all the issues, Dr. Sharma suggested to organize an urgent meeting with the members of different concerned organization in Nepal along with the members of SAFOAM. Once again, he mentioned that repeated extreme weather events, weather aberration affected the crops and livestock in Nepal and particularly the rural poor farmers are affected and undergo chronic poverty and life cycle and this is likely to be worse under climatic variability and climate change and ultimately great impact on GDP and reduce agricultural production. Farmers are need to be alerted for their livelihood and for that there is great need to share experience in cross boundary system. Nepal being a mountainous region, climate services, climate monitoring systems are not adequate and therefore we need to improve these areas, information, forecast. There is need to integrate the knowledge system of number of international forums, organizations, agencies (SAFOAM, SAMA, RIMES, ICIMODE, CIMET, IWMI), already working in Nepal of and take them in one platform. He mentioned WB funded AAS project and the activities as started in 2015. He said at present seamless seasonal long-range weather forecast for the monsoon season along with other temporal range should be used for planting, intercultural, ready to harvest, and commodities to send market. He also talked about the requirements of reliable and higher precision early warning system at local condition under diverse weather situations, local AAS, forecast of temperature, pest and disease forecast etc. He also said that more improvement is required on capacity enhancement, best solution to work with federal Government level and provincial govt on communication to the farmers. He said that meaningful message should reach to the farmers. Once again, he said that. drastic changes in weather should be communicated to various organization, media, knowledge centres etc. so that it

should ultimately reach to the farmers to take appropriate action. He concluded by appreciating SAFOAM for this initiative and assured fullest cooperation and support from himself and from the Government of Nepal

Dr. Rathore: thanked Dr. Sharma for assuring his kind support. He said that as a knowledge pool SAFOAM will support capacity building and other areas and specifically get back to him the areas of collaboration which he has already given his green signal. Proceedings of the meeting will be shared with him shortly

Dr.Y.S. **Ramakrishna,** Ex- Director, Central Research Institute for Dryland Agriculture (ICAR), Hyderabad, India really appreciated both the Secretaries for their assurance in join hands with SAFOAM in development of AAS in the country. Looking at the huge crop loss in last year, as mentioned by the Secretary Dr. Govinda Sharma, there is a great need for development of AAS. He said that as far as the capacity building, research, education, SAFOAM can help Nepal. Both sides commitment and knowing the exact requirements from Nepal, it is possible to share knowledge from SAFOAM. In the second stage, we can come forward and take concrete decision.

Dr. Anand Kumar Gautam, Nepal Agricultural Research Council (NARC), mentioned two important areas related to the operational Agromet Advisory Services. These are spatial extent of agromet advisory preparation and its proper utilization and secondly the preparation of agroclimatic zoning map for Nepal. According to him, DHM is doing weather service nicely but they should engage the different stakeholders how to use this information. He stressed the need for agroclimatic zoning map and requested SAFOAM to help to develop such maps. He has discussed the spatial extent of preparation of agromet advisories from national to local level.

He also requested SAFOAM to help in preparation of biotic and abiotic stress map and organizing for capacity building programme as not more human resources are available to handle the agromet advisory system in Nepal. He also urged the required help and guidance from SAFOAM in preparation of skillful sub-seasonal to sub-seasonal forecast and its utilization in agriculture. Besides, he wanted to know the modalities for different NGOS's to work with SAFOAM.

Dr. Rathore appreciated the apt suggestions given by Dr. Gautam.

Mr Kamal Ram Joshi, Director General, Department of Hydrology and Meteorology, Nepal said that the impact of climate change on agriculture and the DHM activities have already been highlighted.in this meeting. He said that among the challenges, technology adaptation is an important issue. He continued that using sophisticated technology at present, analysis of weather observations and weather forecast are generated in DHM. But he is very much concerned how this information could reach the local farmers and he said that the

same may be considered as challenge.

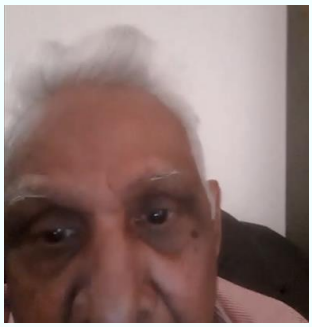
Referring to the last November incidence on crop loss due to unusual heavy rain, he informed that though DHM issued the weather forecast timely, but it could not reach to concerned people. Here, he feels that the technology adaptation can solve the issue. The gaps among the policy makers, scientists and farmers need to be identified. He has also mentioned about the institutional cooperation at national and international levels The linkages among the policy makers, scientists and farmers need to be upgraded. Stressed for national and international cooperation. Talked about the modalities of SAFOAM to work with the Government of Nepal. According to him, social aspect needs to be evaluated by collection of feedback whether the farmers are really benefitted by this service. He asked to check out all the mechanism whether this is working properly. He suggested that it should be more practicable, useable. Talked about capacity building and appropriate mechanism for. early warning as a part adaptation process. He talked about the integrated approach involving the regional experts in South Asia region.

Dr. Rathore thanked Mr. Joshi for his suggestions and guidance

Dr. Deepak Bhandari, Executive Director, Nepal Agricultural Research Council (NARC), Nepal said that he is very much delighted to observe the initiative for the proposed road map for. various programme on agrometeorology for farmers engaged with agricultural activities. He said that agrometeorology, being a crucial sector in climate smart agriculture, is gaining popularity in global context. According to him, keen attention for agromet advisory services to better serve the farmers and stake holders needs to be paid so that crop loss could be minimized and ultimately enhance the food security in the country.

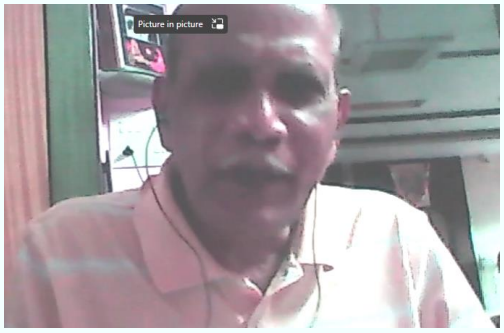
In the present scenario, AAS in Nepal is in preliminary stage though weather information and weather forecast are applied in day to day in most of the cropping system. Research in agrometeorological aspect seems to be negligible for generating considerable outputs in Nepal. Under the climate change scenario Nepal is ranked as 4th vulnerable country in the world and experiencing the impact of climate change in agricultural sector. In the last winter season, a large variation of temperature was observed over the country. He said that it is possible to increase the crop production by providing timely agroclimatic information to minimize climatic hazards in vulnerable zones in the country. He informed about the PPCR project wherein agromet advisories are prepared for targeted farmers way back in 2015. At present, NARC is developing climate resilient technology for reducing the impacts of climatic hazards, however still lagging in providing climate related technology and information to various agroclimatic zones in the country with respect to increase in climate related challenges. He spoke about specific research for specific outputs, capacity building of researchers, reliable academic courses, exposure visits. Expect of SAFOIAM to help capacity building of researcher, training, short term courses, pest and disease forecasting, knowledge sharing. Expecting this forum would develop roadmap for climate resilient agriculture so as to reduce the crop damage and also to develop strategies in fostering farmers for adopting climate resilient technologies to reduce crop damage and ultimately enhance the livelihood of the farming community of Nepal. At the end, he assured full cooperation from NARC side and join hands to implement the above-mentioned activities for the benefit of farming communities in Nepal.

Dr. Rathore thanked Dr. Bhandari for his guidance and assurance for full cooperation in such joint initiative by SAFOAM and NARC to achieve the target as mentioned.



Dr.B. V. Ramana Rao, Editor in Chief, Journal Agrometeorology. Telangana State, India said that vulnerability to climate change increases with altitude. Thus, AAS will be highly use in such cases. He said that big think tank and expertise in SAFOAM can help Nepal in development in different areas including operational Agromet Advisory Services. Capacity building and research priorities in agrometeorology may be the main focus. According to him, provincial government must develop the capacity of generation of agrometeorological advisory at micro level

Dr. Rathore opened the further discussion and asked specific suggestions/comments from the participants of the meeting.



Dr. GGSN RAO, Former Project Coordinator (Agrometeorology), AICRP on Agrometeorology (AICRPAM), ICAR - Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad, INDIA briefly shared his experience of working with Nepal on Agromet Advisory Service way back in 2015.As Nepal is hilly region, weather alerts a few hours in advance would be much helpful to the farmers. Emphasized on training, research for AAS and opening of agromet course for manpower generation for handling the AAS in Nepal in a sustainable manner.

Dr. Chattopadhyay said a recommendation may be made to form a working group involving SAFOAM members and officials/scientists from Nepal to prepare some strategies to work together on some activities as discussed in the meeting. Dr. Rathore fully agreed to the suggestions made by Nabansu.

Dr. Rathore requested Dr. Huda to throw some light on funding support from donor agency including donors from Australia as Dr. Huda has enough experience in doing number of projects across the world with international funding.

Dr. Huda appreciated the discussion on exploring the funding opportunities for SAFOAM to work with Nepal and other countries in South Asia. He said the joint group, to be prepared with the participants from Nepal and members of SAFOAM in other countries, may approach some international donors including Australia. Besides, he mentioned that some dialogue is going on among Australia, India and Nepal on some bilateral agreement and possible funding in different areas. He suggested that SAFOAM may explore this opportunity for possible funding to work in Nepal and Bhutan, Bangladesh and other countries in South Asia. He assured that he would help at the best possible way to get the international funding for SAFOAM looking at the enormous interest of the high-level administrators, scientists, meteorologists, academicians in Nepal for establishing much required agromet system in the country.

Dr. Rathore informed that WB is funding on targeted activities on agrometeorology in Bangladesh and Bhutan. He continued by saying that a joint working group involving SAFOAM members and officials/scientists from Nepal would be prepared to identify the broad gaps which has been identify in today's meeting and may start with 2-3 activities initially and prepare a proposal and then approach the donor agencies for their guidance and assistance

The meeting was ended with vote of thanks by Mr. Manoj Thakur

Some important suggestions/recommendations of the meeting.

1. It has been agreed that Government of Nepal and SAFOAM will work together and provide full support to establish a self-style Agromet Advisory System in Nepal. It has been assured that during the current fiscal year, implementation of the operational agromet advisory services system in the provincial level will be explored.

2. SAFOAM will share knowledge. after knowing the exact requirements from Nepal in the beginning preferably in services, research, capacity building and education, In the second stage, it is possible to come forward and take concrete decision. An urgent meeting with SAFOAM and different concerned organizations in Nepal may be organized. The said meeting may be organized in Kathmandu in August,2022 with the support from the Government of Nepal, World Meteorological Organisation, World Bank and others.

3. Linkages may be established with the Provincial level Climate Change Management Information Centre and Municipal Agrometeorological Information Centre already been established by WFP and Govt of Nepal in order to provide service at the grass root level.

4. Linkage may also be established with the consortium comprising of University in Nepal, NGOs, and ICIMODE and School of Science, Western, Sydney University, Australia and others and SAFOAM to further initiative on different aspects on climate smart agriculture in mountain region in Nepal.

5. A joint working group involving SAFOAM members and officials/scientists from Nepal would be formed to identify the broad gaps which has been identified in today's meeting and may start with 2-3 activities initially and prepare a proposal and then approach the donor agencies for their guidance and assistance

Weather Radar in Nepal

Automatic Weather Station in Nepal

Loss of Paddy Crop due to untimely rainfall in Nepal

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