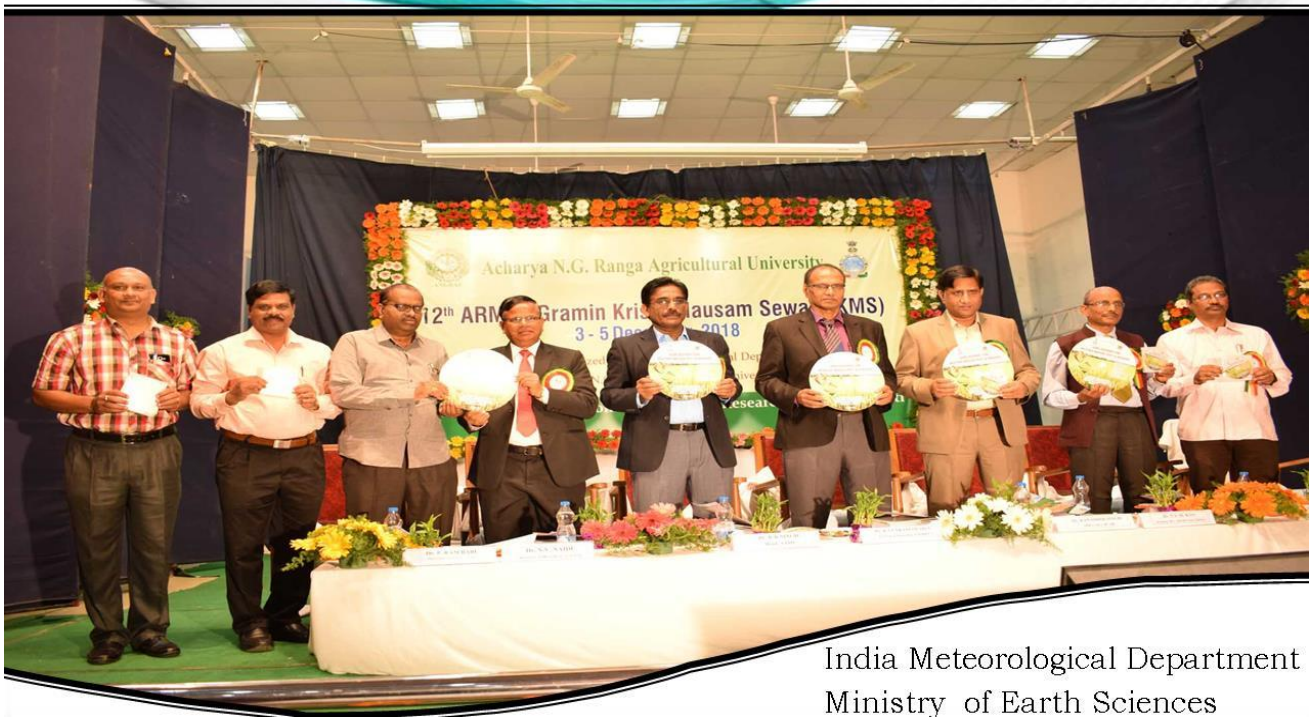
Proceedings of

TWELFTH ANNUAL REVIEW MEETING ON GRAMIN KRISHI MAUSAM SEVA (GKMS)

03-05 DECEMBER, 2018

ACHARYA N.G.RANGA AGRICULTURAL UNIVERSITY
Regional Agricultural Research Station, Tirupati, Andhra Pradesh



India Meteorological Department
Ministry of Earth Sciences

India Meteorological Department (IMD) and Acharya N. G. Ranga Agricultural University (ANGRAU), Tirupati, Andhra Pradesh, jointly organized twelfth Annual Review Meeting (ARM) under "GKMS project in the country" during3rd to 5thDecember, 2018. A number of high level dignitaries like Dr. B. Venkateswarlu, Ex-Vice Chancellor, VNMKV, Parbhani, Dr. Randhir Singh, ADG, ICAR, New Delhi, Dr. V.U.M. Rao, Former Project Coordinator, AICRPAM, CRIDA, Dr. N.V. Naidu, Director of Research, ANGRAU, Dr. Rambabu, Director of Extension, ANGRAU, Dr. K.K. Singh, Scientist G &Head, AASD, IMD, New Delhi, Dr. S.D. Attri, Scientist F, IMD, New Delhi, S.C. Bhan, Scientist F, IMD, New Delhi, Dr. K. Ghosh, Scientist E& Head, Agricultural Meteorology Division, IMD, Pune, Scientists from various institutes, Principal Nodal Officers, Nodal Officers and Technical Officers of Agrometeorological Field Units (AMFUs) participated in the meeting. Main objective of the meeting was to make in-depth discussion on the ongoing activities like weather forecasting, observational network, generation and use of various Agromet and satellite products for preparation of agromet advisories, dissemination and popularization of AAS etc. In addition to that, discussion was also made on the future strategies for implementation of block level AAS, improved weather forecasting and observations including online availability of observational data, capacity building, automated generation of Agromet Advisory Service (AAS) bulletin etc.

The meeting started inviting Chief Guest and Guests of Honour to the dias by Dr.P. Rajasekhar, ADR, RARS, Tirupati. Later, invocation of university song was recited followed by lighting of lamp.

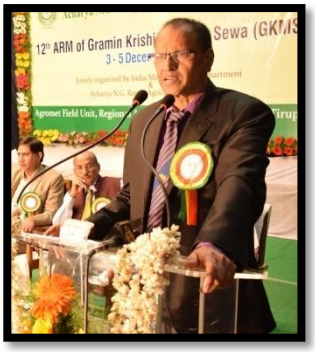
Dr. N.V. Naidu, Director of Research, ANGRAU, welcomed the dignitaries and delegates in the meeting. He explained about GKMS activities in issuing value added weather forecast and agromet advisories twice a week on real time basis for the benefit of farmers. He mentioned that Moisture Adequacy Index (MAI) was worked out for 13 districts of Andhra Pradesh, contingency bulletins were being issued along with preparation of crop calendars for different crops. He wished that the workshop would be fruitful with detailed discussions and constructive outcome.

Dr.K.K.Singh, Head, AASD, mentioned the programme highlights consisting of satellite data usage, automation of weather data and streamlining of block level advisory system for more effective outreach to the farmers.

Dr.Rambabu, Director of Extension, ANGRAU, as Guest of Honour, stated that ANGRAU is working with IMD and recently initiated 7 DAMUs at KVKs as knowledge partners. He stressed on focussed and reoriented services in location specific individualized information spread by utilizing new emerging technologies.

Dr.V.U.M. Rao, Former Project Coordinator, AICRPAM, CRIDA, as a Guest of Honour addressed the gathering and informed that medium and short range forecasts are more meaningful to support agromet advisories. He mentioned about the necessity of village level forecasts for the farmers with dynamic weather related advisories. As per his opinion, localized crop weather relationship studies at micro level need to be strengthened in future

Dr.Randhir Singh, ADG, ICAR mentioned the ill effects of climate change and he emaphasised on the village level and individual farmer level forecasts with more precision.



Dr.B.Venkateswarlu, Ex-Vice Chancellor, VNMKV, Parbhani, Chief Guest delivered the inaugural address. He stated that weather aberrations affect the crop at every stage from sowing to harvest and hence, the weather related issues are very important aspects to be addressed. He suggested that each AMFU centre should present at least 10 case studies on economic impact of AAS with regard to the benefit accrued by the individual farmers /group of farmers and share it with Government officials. He further suggested that the Head of the Division should constantly highlight the work done in Agrometeorology to the university officials. He stressed upon the needs for automation of weather data in a systematic way and dissemination of block level advisories to the farmers in time for better crop management.

Technical Session-I: Implementation Strategies at Block level AAS

Chairman: Dr. Randhir Singh, ADG, ICAR, New Delhi

Rappourteur: Dr. G. KarunaSagar, Professor & Head, SVAC, Tirupati

Implementation strategies for augmentation of Agromet Services to Block level by Dr. S.D Attri, AASD, IMD, New Delhi

Dr. S.D. Attri informed that at present, 39 millions farmers are getting agromet advisories through SMS using Farmers Portal biweekly on Tuesday and Friday and AAS bulletins are also uploaded on KVK portal of ICAR. He recommended that further dissemination may be carried out through TV,DD Kisan bulletin, Newspaper and Radio and PPP Mode. He reported that 24% farmers have access to AAS. He briefed about the shortfalls regarding accurate weather observations recording, sub-district / block level forecast, limited involvement of State Agricultural Department & other knowledge partners, limited field information available with AMFUs for the area under its jurisdiction, outreach issues through SMS and other medium. He also briefed about the future plans for strengthening weather observation system through Automatic Weather Station in each district, augmentation of network, weather forecasts and agromet advisories up to block level, expansion of AAS network to district level to support block level advisory (530 DAMUs + existing 130 AMFUs) and automation of AAS bulletin preparation.

Dynamic Crop Weather Calendar (DCWC) & its use in preparation of Agromet Advisory Services by Dr P. Vijaya Kumar, CRIDA, ICAR, Hyderabad.

Dr P. Vijaya Kumar briefly explained about the shortcomings in existing CWCs. He stated that the existing CWCs will not help in decision making under the backdrop of climate variability**.** He also explained the DCWC where dynamism to be incorporated. He informed that more data are required for the preparation of dynamic crop calendar and CRIDA is organizing for contingency based on the forecast in the month of April for the districts which are prone to drought. According to him, availability of seeds and other inputs may be put to the policy makers to appraise seed availability.

Strengthening of observational network for implementation of block level advisory and capacity building programme by Dr Kripan Ghosh, Agrimet Division, IMD, Pune

Dr K. Ghosh emphasized on strengthening of existing observational network and setting up of AWS at District Agromet Units (DAMUs) at KVKs, augmentation of agromet services to sub-district / block level, arrangement of access to data from various types of observatories by DAMUs and capacity building of manpower at DAMUs. He informed that in 2018-19, DAMUs will be started at KVKs in 200 districts under ICAR network. ATARIs along with IMD conducted orientation programme for Nodal Officers of KVKs in different zones with an objective to enhance awareness of Nodal Officers about various components of weather based AAS. ICAR-ATARIs and IMD will jointly organise training for the Subject Matter Specialists (SMS) to prepare AAS at block level.

Agromet DSS: Moderation of weather forecast and development of automated system for generation of AAS bulletin by Shri S.C. Bhan, AASD, IMD, New Delhi

Shri S.C. Bhan mentioned about the need for automated preparation of AAS bulletin in view of district/sub-district level weather forecasts and the target of directly reaching out to about 95.4 million farming households. He informed that automation of the system is required for linking of extensive crop information, value addition of forecast, weather forecast analysis & validation, dissemination of information(SMS and AAS bulletin),distinction in the advisory for irrigated and rainfed agriculture, incorporation of crop contingency plan and database repository. He mentioned that bulletins can be improvised through daily normal to be populated

in the system to calculate daily deviations of the weather parameter which is presently under process. He also informed about the prospect of preparation of past weather summary, forecast summary and integration of WRF forecast in the system.

Session II: Agromet Tools and Technology for use in GKMS

Chairman: Dr. N.V. Naidu, Director of Research, ANGRAU
Rapporteur: Dr. M. Ratnam, Senior Scientist, AMFU, Lam, Guntur

Use of weather information for livestock management by Dr. SohanVir Singh, PS, NDRI, Karnal

Dr. Sohan Vir Singh presented on preparation of agromet advisory for livestock farmers for better management of animals. He emphasized on 'Climate-Smart' solutions by breeding more productive animals, improved diets for animals aiming towards production of more protein with less feed and lower emissions, better manure management, herd management to improve output including better herd health management with less reliance on antibiotics and management of grassland (e.g. sowing improved varieties of pasture, rotational grazing). He discussed briefly about the future perspectives like identification of unique traits in indigenous animals making them resilient to high temperature and development of early warning system/ livestock advisory.

Use of Pest and Disease forewarning models in Agromet Advisory preparation by Dr K.P Suresh, ICAR-NIVEDI, Bangalore

Dr. K.P. Suresh highlighted on data collection, analysis and prediction of disease forecasting for a particular region by using the models. He also presented on application of remote sensing and GIS models and use of climate variability in diseases prediction. He further presented the early warning system designed to predict and mitigate the harm of natural and undesirable events in advance. He informed that ICAR-NIVEDI had identified priority diseases based on incidence patterns during previous 10 years and has built a strong database of these priority diseases. He discussed about the National Animal Disease Referral Expert System and said that the database is the backbone of National Animal Disease Referral Expert System (NADRES), the interactive, dynamic, online animal health and disease forewarning system.

Interpretation and use of satellite products in Agromet Advisory Services by Dr Rahul Nigam, SAC, Ahmedabad

Dr. Rahul Nigam presented on usage of agromet products developed using Satellite data in delivery of agromet advisories under GKMS scheme in India. He recommended that training is needed for interpretation and use of satellite products in agromet advisories by the stakeholders. He informed that reference evapotranspiration using INSAT-3D data can be used for agromet advisories. The prediction of crop phenological stages using satellite data and crop sowing dates are also useful in devising agromet advisories. The estimation of soil wetness index for large scale area in India using radiometer data can be used for irrigation scheduling in agromet advisories.

TNAU-AAS model by Dr.PaneerSelvam, TNAU, Coimbatore

Dr. Paneer Selvam highlighted the networks of AWS in Tamil Nadu and issue of block level forecasting and the advisories. He briefly discussed about TNAU-AAS model for automated AAS bulletin preparation. He added that there is need for timely agromet advisories and the precise methodology for quicker dissemination.

Automated generation of Agromet Advisory Bulletin by Shri Ajay Shelke, WOTR, Pune.

Shri Ajay Shelke presented on the Decision Support System which is useful in preparation and dissemination of agromet advisories like sowing, irrigation, pest and disease management and other cultural operations in the crop. He presented about various aspects of automation of weather based agromet advisories using value added weather forecast along with provision for dissemination using SMS.

Session III: Weather Forecast, Value Addition and Evaluation

Chair:S.C. Bhan, AASD, IMD, New Delhi

Rapporteur: Dr.Raihana, SKUAT, Srinagar, Jammu and Kashmir

Summary on Value Added Weather Forecasts, their Verification for Andhra Pradesh & Telangana by Dr Y. K Reddy, MC, Hyderabad

From 2018 monsoon season onwards, SAMC, Hyderabad issued forecast for all 31 districts of Telangana in tune with the district restructuring. Rainfall forecast accuracy in the monsoon season 2018 of Andhra Pradesh and Telangana is around50% for all the five days, while other seasons accuracy is more than 60%.

Forecast verification is done with state Govt. AWS data for 4 districts in Andhra Pradesh and 2 districts in Telangana for Monsoon season 2018. Overall 15.5% was obtained through VAF in these two states

Summary on Value Added Weather Forecasts, their Verification for Karnataka by Dr. Geeta Agnihotri, MC, Bengaluru

During monsoon 2018, performance of this centre in forecasting all the weather elements has been satisfactory except rainfall which needs improvement. Correct and Usable forecasts together exceed accuracy of 70% for both the parameters of maximum and minimum temperatures on all the days and majority of districts are lying in Good category.

The forecasts of maximum temperature is Good and most of the districts are in good category during Pre Monsoon 2018.The forecast of minimum temperature is reasonably good during Winter 2018with Correct and Usable together categories exceeding 70% on an average.

Summary on Value Added Weather Forecasts, their Verification for Tamil Nadu and Kerala by Dr V.K Mini, MC, Trivandrum

Value addition is required mainly for rainfall, maximum and minimum temperatures. In Kerala, as many of the stations are coastal stations, sea breeze effect is there, which is considered while value addition. A mobile app 'mKeralam' has been developed by Kerala IT Mission in coordination with IMD for dissemination of weather information *viz*. daily weather, forecast, warnings and Districtwise Agromet advisories for the farmers. This became operational by Govt. of Kerala. Disastrous weather warnings (heavy rainfall and wind warnings) are being issued through SMS, in addition to print and electronic media. It is found that forecast skill improved for rainfall, when started using GFS T1534 model output.

Severe weather warnings and alert have been issued for the farmers in Tamil Nadu. So far 8.67 lakhs registered farmers receive advisories through SMS every Tuesday & Friday.

Summary on Value Added Weather Forecasts, their Verification for West and North-East Region by Dr. Kripan Ghosh, Agrimet Division, IMD, Pune

Maximum temperature forecast during pre-monsoon season is good for Konkan, South Madhya Maharashtra and Marathwada regions except North Madhya Maharashtra (Nasik). Minimum temperature forecast in winter season is good for all subdivisions. Rainfall forecast

is good to moderate over Madhya Maharashtra and Marathwada regions. In Konkan region, quantification of heavy to very heavy rainfall needs to be monitored.

Data irregularity for the districts like Hingoli, Beed, Nadurbhar, Dhule is major drawback. Forecast for Marathwada as well as North Madhya Maharashtra is challenging due to more variability.

Summary on Value Added Weather Forecasts, their Verification for East and Central Region by ShriA.K.Baxla, AASD,IMD, New Delhi

ShriA.K. Baxla presented value added weather forecasts, their verification for east and central region. Accuracy (correct + usable) of rainfall forecast during monsoon and maximum temperature during pre-monsoon for many districts of Chhattisgarh is around 60%. Accuracy of minimum temperature forecast during winter is around 60% for Day 1 and decrease later on.

Rainfall forecast accuracy (correct + usable) during monsoon for the representative districts of West Bengal is more than 50% for Day 1 and decrease later on. Accuracy of Maximum temperature forecast during pre-monsoon is more than 60% during Day 1 to Day 3 and decrease during Day 4 and Day 5.

Rainfall forecast accuracy during monsoon for the representative districts of Jharkhand is around 40% and for Bihar (Patna district) is in the range of 60-80%. Rainfall forecast accuracy during monsoon for the districts of Odisha varies between 40 to 50% during first three days and the same for Day 4 and Day 5 needs to be improved.

Summary on Value Added Weather Forecasts, their Verification for North Region by Shri R. Balasubramanian, Agrimet, IMD, Pune

Shri R. Balasubramanian presented results of verification of value added weather forecasts for north region (Punjab,Haryana,New Delhi, Uttar Pradesh and Rajasthan)and Himalaya Region (HP, Uttarakhand and J&K). For the districts of Punjab, forecast accuracy for rainfall during monsoon ranges between 60-70%. Forecast accuracy in the model output with observed data has improved after value addition for maximum temperature (pre-monsoon) and minimum temperature (winter) for various days (Day 1 to Day 5).

Rainfall forecast accuracy (correct + usable) during monsoon for the districts of Haryana varied between 50 to 60%. Model Performance for rainfall forecast during monsoon season needs improvement. There is need for expanding observatory network.

Rainfall forecast accuracy (correct + usable) during monsoon for Delhi region varied between 40 to 50%. Rainfall forecast accuracy (correct + usable) during monsoon for the representative districts of Uttar Pradesh varied between 40 to 70% for Day 1 and more for Day 2 (50-75%). Later on, accuracy decreased.

Forecast accuracy (correct + usable) for rainfall during monsoon for Rajasthan and Himachal Pradesh varied between 70 to 80%. In Jammu & Kashmir, rainfall forecast accuracy for the districts of Srinagar, Jammu, Kupwara, Anantnag, Udhampur, Doda and Rajouri has been better compared to Ganderbal, Baramulla, Bandipora, Kargil, Leh, Poonch, Kathua and Samba.

Later, financial aspects related to AMFUs under GKMS were discussed by Dr. K.K. Singh, IMD, New Delhi.

Interaction of DGM, IMD, New Delhi, with AMFUs

Dr. K.J. Ramesh, DGM, IMD, New Delhi, greeted the delegates in the meeting. He mentioned the significance of GKMS scheme. He emphasized that by March 2020, all districts must have DAMUs and scientists from AMFUs need to train the DAMU personnel. There is

need to cover all crops in the country with significant coverage of rainfed crops in the context of climate variability and climate change. On one side with reduced rainfall and increase in temperature, there is need to go for resistant crops with some assured yields.

These efforts form the basis for extending 'Best Management Practices'. Within AMFUs' jurisdiction, AMFUs need to coordinate with respective DAMUs and enhance service. Each AMFU has to supervise the activities of cluster of DAMUs. Expectation from the GKMS service has increased. Accordingly technical support will be extended. IMD is bringing out Agromet-DSS for AAS bulletin preparation with the association of RIMES to reduce manual efforts. Dissemination through the system is also envisaged.

In addition, dynamic crop weather calendar (CWC) in association with CRIDA, Hyderabad, will be useful in fixing sowing time considering rainfall variability. IT based tools like GIS etc. bring hands-on information about crop conditions. IIT, Gandhinagar customized soil moisture estimation; combination of rainfall, crop condition and soil moisture may be used for precise AAS.

Forecast is presently generated at 12 km resolution. In addition, probability of rainfall forecast of different quantities will also be worked out to serve the farmers. For block AAS bulletin, IMD is working with WoTR for automated generation. More local data, crop data and sowing data are required to achieve the objectives

Then DGM was felicitated in the meeting by ANGRAU. Experts from AMFUs have been invited to discuss and mention the issues.

Dr.G. Srinivas, PNO, PJTSAU, Hyderabad informed that his center has developed the sowing time for all the 584 mandals of the State. For issuing real time advisories, soil moisture index (SMI) and MAI are generated. Hence his center is in need of real time rainfall information. Weekly rainfall probabilities are also considered. He also requested to provide forecasting for extreme weather events during harvesting time.

DGM has mentioned that district agricultural officers must be included in board of experts for understanding crop status. Soil moisture generated needs to be validated.

Dr. B. Ajith, PNO, KAU Thrissur mentioned that during end of the month, SMS through Kisan portal could not be sent. This needs to be considered and AMFUs must be allowed to send the SMS continuously. DGM has replied that there is character limitation and asked the AMFUs not to mix forecast with advisories.

Dr. G. Deebakaran, TO, Coimbatore has requested for the installation of ORG at village level and OPE at district level and use of WhatsApp for AAS dissemination.

DGM also informed that WhatsApp may be considered along with twitter etc.

Dr. Natrajan, NO, Namakkal has informed that advisories for poultry are issued and communicated using WhatsApp. DGM has informed that temperature and relative humidity are important for poultry.

Dr. R.S. Rana, PNO, CCSHPKV, Palampur informed that weather data is not available for HP stations. DGM has informed that the required data will be made available for HP stations.

Technical Session IV: Break out Group Discussion

Chairman:Dr. K.K. Singh, Head, AASD, IMD, New Delhi

Rapporteur:Dr. V. Sumathi, Professor, Agronomy, SVAC, Tirupati

1	Dr. K.K. Singh	Madhya Pradesh,Bihar,Odisha,Chattisgarh, Uttar Pradesh
2	Dr.S.D.Attri	Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Pondicherry, Kerala
3	A.K.Baxla and R. Balasubramanian	North East, West Bengal, Jharkhand
4	Mr. S.C. Bhan	Punjab, Haryana, Rajasthan,Delhi
5	Dr.K. Ghosh	Maharashtra, Gujarat

Regional Coordinators of IMD facilitated the group discussion for each region and the outcome is as follows.

Group-1:

Dr. K.K.Singh presented about the issues of Odisha, Chattisgarh, Uttar Pradesh, Madhya Pradesh, Bihar. He mentioned about appointment of Met Observers in AMFUs. He has explained about the constraints and suggested the remedies to be taken. He suggested to start block level advisories by January 2019 for at least four blocks in the district where the AMFUs are located. There is also need to install the observatories at the AMFUs wherever remaining and also to undertake maintenance by replacing the non-functional instruments. There is also need to upload the database of farmers and provide attention to timely delivery of SMSs. He also stressed upon the need of capacity building, development App to deliver information on weather and agromet advisory, access to historical as well as recent data etc.

Group-2:

Dr. H.S.Shivaramu, Bengaluru presented the issues of Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Pondicherry and Kerala. He has discussed about the block level advisory which will be initiated from January, 2019. For block level Advisory, crop weather data for 10 years are required and minimum of four blocks are to be considered for preparation of block level advisories. He pointed out that the forecast by different agencies is mismatching and contradictory. He highlighted about the need of training for TO and installation of observatories and replacement of instruments.

Group-3:

Dr. Prasanta Neog discussed about the issues of NE Region, West Bengal, Jharkhand and Andaman Nicobar Islands. He has pointed out about the less forecast accuracy and the special care to be taken for improvement of rainfall forecast. He discussed about the timely replacement of the instruments in the observatories. He raised the regarding timely release and disbursement of grant in aid. He also suggested to include success stories and feedback analysis in ATR (one farmer in one village). He stressed the need of capacity building for newly recruited TOs and to provide the transport allowance in north east region.

Group-4:

Dr R.S. Rana presented the issues of Punjab, Haryana, Rajasthan, HP J&K & Uttaranchal. In respect of geospatial products for generation of agromet advisories,he said that few centres are using NDVI as input which needs further validation. Economic impact assessment for each crop during *kharif* and *rabi* should be done. SPI maps need validation at block scale. As number of farmers are increased, SMS delivery is not proper. Length (no. of

characters) has been shortened which needs attention to give effective advisories. He called upon for timely release of budget for all centres (at least sanctioned up to June). He discussed about the constraints, e.g. requirement of geospatial training, common method for economic assessment, formation of association for AAS users, requirement of permanent manpower, enhancement of contingency and need for weather accuracy at block level.

Group-5

Dr. J. D. Jadhav presented the issues of Maharashtra and Gujarat. He expressed the need to incorporate the trigger values of pest and diseases in *kharif* and *rabi* seasons. He also stressed upon the need for collection and automation of data on crop, weather, soil, pest and diseases from all the AMFUs for decision support system (DSS) development. He suggested for value added block level forecast and subsequent verification mechanism. He suggested for the dissemination of SMS from m-Kisan portal for block level. Further, he expressed the need for increasing manpower and contingency funds and also continuation of existing trained RA/SRFs in GKMS/FASAL with the provision of revised grade pay.

Session V: Progress and Service Requirement at AMFUs

Chairman: Dr N.V. Naidu, Director of Research, ANGRAU
Rapporteur: Dr Chander Shekhar Dagar, CCSHAU, Hisar

North Region by Dr. Ananta Vashishth, IARI, New Delhi

She informed that all AMFUs are issuing biweekly and bilingual AAS bulletins. Advisories are regularly disseminated through various modes. Advisories were issued on extreme events like frost occurrence through SMS to progressive farmers. Farmers are demanding accurate extended range forecast and improvement of forecast accuracy.

AMFUs are planning to take advisories to more number of beneficiaries through WhatsApp, Twitter, Facebook, FM radios, mobile apps etc.

Himalayan Region by Dr. R.S. Rana, CCS HPKV, Palampur.

He stated that AMFUs at Palampur and Jammu tried for block level AAS, but found problems in variations in rainfall at district and block level. Advisories for cold waves, heavy dew, heavy rainfall were also issued by AMFUs. AMFU, Palampur devised the thumb rule for livestock advisory and fisheries in times of high temperature. SMS are sent to 62.7 lakh farmers by AMFU, Palampur.

West Region by Dr. J. D. Jadhav, CAFT, MPKV, Pune

He mentioned that AMFU, Anand incorporated NDVI and soil moisture products while preparing the advisories. AMFU, Dantiwada issued extreme weather events like heavy rainfall, thunder storms etc, AFMU, Kutch issued advisories for low temperatures and AMFU, Targhadia organised Women Farmers Awareness Programme.

Central Region by Dr G.K. Das, IGKV, Raipur

He explained that all the AMFUs are issuing weather-based agromet advisory bulletins biweekly. The AMFUs have developed good linkages with other line departments for effective services to the users. They disseminated the advisories through various modes and also assessed their economic impacts. The economic benefit reported was varied from Rs 6600 to 10500 per hectare in soybean crop. The feedback from farmers showed that 60% farmers are satisfied with AAS. R&D activities to develop pest and diseases forewarning were also undertaken. Chairman emphasized on how to improve quality of service and enhance popularity among farmers.

Eastern Region by Dr A.K. Senapati, from BCKV, Kakdwip

He reported that the AAS bulletins were disseminated through various modes including WhatsApp groups by all the AMFUs of the region. Various R&D activities on crop-weather relationships are going on. The AMFUs collected farmers' data through NGOs, ADOs, field campaigns, Kisan Suvidha and WhatsApp. Benefits accrued by the farmers by using AAS were also reported. The advisories for extreme weather events were issued and popularized through various means including YouTube. State level conference and WMO day were organized. Under R&D activities simulation study on weather-pest-crop relationship was undertaken. The chairman suggested for illustration of one or more success story in details. Dr K.K. Singh also stressed upon the crisp and concise finding.

North East Region by Dr Prasanta Neog, AAU, Sonitpur.

He explained the characteristics of the region and dissemination of AAS bulletin. He informed about the Farmers' Awareness Programs conducted and linkages developed by the AMFUs with other organizations. The economic benefit of AAS to the maize farmers adopting AAS reflected a large benefit over the non-adopters in Mizoram. Many other cases where benefits reported were mentioned as per the door step survey conducted for impact assessment. AMFUs also used district level agricultural contingency plan along with technologies developed under NICRA for quality advisories. Dr Neog also suggested follow up program for post dissemination effects of AAS.

Southern Region by Dr H. Venkatesh, UAS, Vijaypura:

He stated that the AAS was popularized by organizing stakeholders' meetings, FAPs, call centres of the university etc. The R&D activities were undertaken on crop weather sensitivity. The economic impact assessment of AAS for grape crop reflected the additional return of Rs. 2.68 lakh/ha. He also felt the requirement of extended quota for SMS service and stressed upon the delivery of weather forecast to the AMFUs before 11:00 am.

The chairman thanked speakers to nicely conclude the progress of their respective regions.

Valedictory Function

Dr.N.V.Naidu, Director of Research, ANGRAU thanked the dignitaries and delegates. He expressed that the deliberations by delegates from all parts of the country were fruitful. Field problems were brought to the IMD officials and suggestions were given specifically for strengthening the services to the farmers. He emphasized on Automation of weather data for the AAS to give real time value added advisory services to the farming community.

Dr S.D. Attri, IMD, New Delhi appreciated the presentations by the delegates. As per the NCAER, Agromet advisories worth of Rs. 42000 crores for four crops at present may be extended to 22 principal crops, livestock, poultry and fisheries. He stressed upon automation and integration of data to deliver agromet advisories for 6500 blocks in future. Remote sensing and soil moisture products are to be incorporated and for these special training for the technical staff at DAMUs is very much essential. Outreach of advisories through different modes to be taken to 9.5 crores farmers by 2020 AD. Economic benefit of the advisories may be assessed in a common mode(every AMFU -10 case studies per season), so that Government should be convinced and extend the services further more effectively.

Dr K.K.Singh, Head, IMD, New Delhi stressed on the extension of the agromet advisory services to the allied sectors (livestock, poultry and fisheries) in the present context of climate change. Block level services are initiated for delivery of crop and location specific messages. He expressed gratitude to ANGRAU and organisers and conduction of the meeting successfully.

Dr.Ashok Kumar, Registrar, SVPU, Meerut, addressed the gathering and stated that accuracy of the forecast had been enormously increased from the initiation (1991) to the present day with more than 70% accuracy. New Agrometeorologists at DAMUs may render further valuable services to the farming community. He mentioned that positive Feedback from the farmers made this GKMS project as one among 48 projects considered by PMO.

Feedback by the delegates

Dr Kailash Dakore, Dr.Jawahar Chowdhary, Dr. (Mrs.) Anupama Balliarsingh, Dr. A.L.Narayanan, Dr.G.Sreenivas, Dr.H.Venkatesh have given positive feedback about the meeting and discussions and expressed that the concrete decisions made at the meeting may strengthen the GKMS network for serving the farming community in real time basis.

Keynote address was delivered by the Chief Guest Dr. Y. HariBabu, HonourableVice Chancellor, SVVU, Tirupati. He congratulated all the delegates for successful participation in the 12th ARM of GKMS with informative presentations and fruitful discussions. The valuable Agromet Advisory Services are really beneficial to the farmers and he expressed the strong needs for extending the services to the poultry, livestock and fisheries which are also prone to the extreme weather events. In this connection he opined that interaction of the veterinary universities with IMD is very much helpful to the farmers.

Recommendations of 12thARM on GKMS at RARS, Tirupati

1. AMFUs to take suitable action for filling up of vacant posts of Technical Officer and Observer on priority (**Action: AMFUs**).
2. AMFUs to collate Agromet data for development and operationalization of Agromet-DSS (**Action: AMFUs**).
3. IMD to strengthen network of observatories and integrate data from other networks and AMFUs to arrange for establishment conventional Agromet observatories wherever remaining (**Action: IMD, AMFUs**).
4. AMFUs to upload observation from Agromet observatories in Agromet website on real time basis(**Action: AMFUs, IMD**).
5. AMFUs with support from RMC/MC to initiate block level AAS on experimental basis from 15th March 2019 in their respective districts (**Action: AMFUs, RMC/MC**).
6. Capacity building of Scientists of AMFUs on interpretation of Agromet products, remote sensing products, estimated soil moisture etc. for their effective use in preparation of Agromet advisories (**Action: CRIDA, State Agricultural Universities, IMD**).
7. Introduction and strengthening of advisories for allied sectors like livestock, horticulture, poultry, fisheries etc. (**Action: AMFUs, IMD**).
8. Synchronization of different types of weather forecasts *viz*. met sub division level forecast, warning, ERFS & FMO forecasts and district level forecast (quantitative) for preparation of Agromet advisories. (**Action: AMFUs, IMD**).
9. Provision of probabilistic forecasts for various categories of rainfall in agromet advisories. (**Action: IMD, AMFUs**).

10. AMFUs to act as Mentors for Capacity building of SMS and observers at DAMUs in establishing and strengthening of block level AAS by KVKs under their jurisdiction. (**Action: AMFUs, ICAR-ATARI, IMD, RMC/MC**).
11. Web service for data access to the AMFUs and DAMUs for block level AAS (**Action: IMD**).
12. Sharing of high resolution soil moisture estimates based on land based observation and RS for its validation and use by the AMFUs and DAMUs. (**Action: IMD, AMFUs, DAMUs**).
13. Enhancing outreach of advisories and use of social media (**Action: DAC&FW, AMFUs/ DAMUs, IMD**).
14. Feedback collection by the AMFUs on usefulness and requirements from the users (**Action: AMFUs**).

Photo Gallery