National Initiative on Climate Resilient Agriculture
AICRPAM Component

AICRPAM - NICRA

Annual Report 2014-15

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON AGROMETEOROLOGY
ICAR-CENTRAL RESEARCH INSTITUTE FOR DRYLAND AGRICULTURE
Santoshnagar, HYDERABAD


कृषि मौसम विज्ञान विभाग

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All India Co-ordinated Research Project on Agrometeorology
ICAR–Central Research Institute for Dryland Agriculture
Santoshnagar, Hyderabad-500 059

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Citation: Rao, V.U.M., Bapuji Rao, B., Sarath Chandran, M.A., Vijayakumar, P. and Rao, A.V.M.S. 2015. National Initiative on Climate Resilient Agriculture - AICRPAM Component, Annual Report 2014-15. ICAR–Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad-500 059, Telangana, India. 36 p.

Printed at
Balaji Scan Pvt. Ltd.
A.C. Guards, Hyderabad.
Tel : 040-23303424
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www.balajiscan.com

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1. NICRA - Background information

India is becoming more vulnerable to climate change as extreme weather events are on rise and major portion of population derive their livelihoods from agriculture and allied sectors. Depending on the magnitude and distribution of warming, climate change impact projections for the mid-term (2012-2039) period for India indicated a 4.5 to 9% yield reduction which may roughly amounts to 1.5% of GDP every year. Realizing the impact of climate change, the Government of India has prioritized the research on climate change and a mega project "National Initiative on Climate Resilient Agriculture (NICRA)" has been initiated in 2010-2011 with the following objectives:

- To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies
- To demonstrate site specific technology packages on farmers' fields for adapting to current climate risks
- To enhance the capacity building of scientists and other stakeholders in climate resilient agricultural research and its application.

In the vulnerable regions, the outcome from the project is anticipated to bring enhanced resilience of agricultural production systems to climate variability. The project is comprised of four components.

- Strategic research on adaptation and mitigation
- Technology demonstration on farmers' fields to cope with current climate variability
- Sponsored and competitive research grants to fill critical research gaps
- Capacity building of different stake holders

In evolving strategic research in climate change, the foremost task would be identification of climatic risk prone areas. This in turn has to be followed by determination of location specific climatic risks and then strategies to overcome them. Also, utility of Agromet advisories to minimize the losses due to aberrant weather on short-term and climate change on long-term basis has to be assessed. In this backdrop, AICRPAM-NICRA project has been initiated with the following objectives:

- To create weather and crop information acquisition and monitoring system through AWS and Field Information Facilitators' (FIF) network.
- Delineating hotspots for weather anomalies at micro - level through benchmark survey and climatic analysis at selected districts/villages/sites for principal cropping/farming systems.
- Quantification of crop responses to weather and its extremes by integrating statistical and dynamic modeling techniques.
- Customizing micro-level Agromet advisories and their efficient dissemination through ICTs.
- Development of strategies to combat weather extremes through field research.
- Conduct awareness/training programs on climate change, and workshops for capacity building on Agromet advisories.

2. Weather data acquisition and value addition

2.1 AWS data products

In an attempt to utilize the real-time AWS weather data from AICRPAM-NICRA-AWS network of 100 AWS stations, map products viz. weekly, monthly and seasonal rainfall maps, heat & cold wave maps were developed using spatial interpolation technique. A novel product "Dairy Heat Load Index" (DHLI) was

developed for the country to quantify the risk of heat stress in grazing dairy cattle. DHLI takes into account of temperature, relative humidity, effect of wind speed and amount of solar radiation on cows' heat load. At a DHLI value of 77 or below, the cattle is expected to cool down and recover from heat stress. The upper threshold value depends up on type and condition of cattle and the environment. Monthly DHLI values were estimated for all months. But summer months viz., March, April and May are found important for the heat stress, maps of first six months for the years 2013 and 14 were developed and presented in Fig. 1(a) and (b).

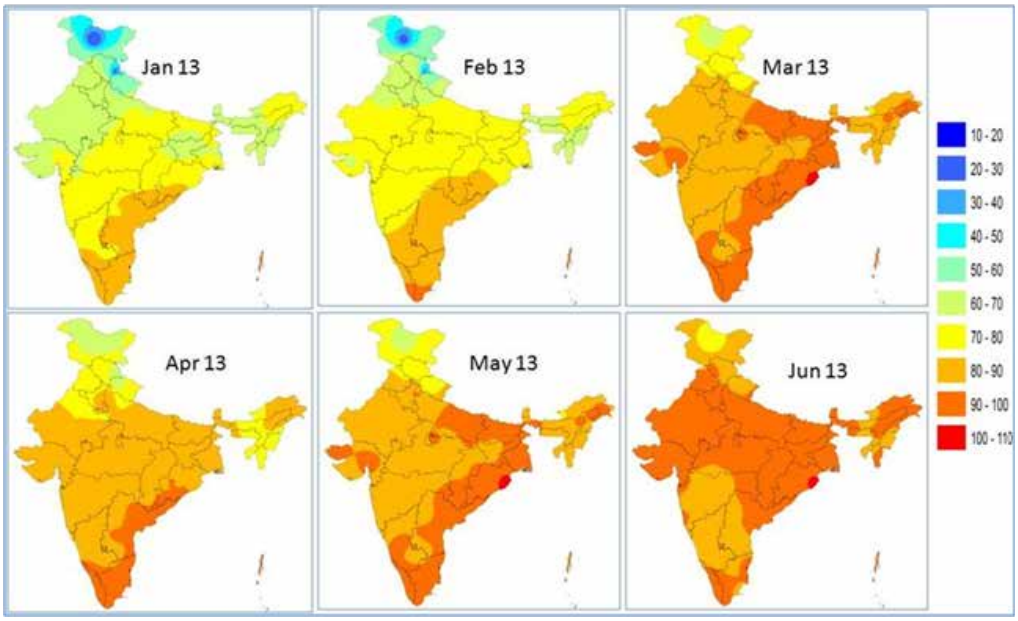

Fig. 1(a): Spatial variability of Dairy Heat Load Index (DHLI) during 2013

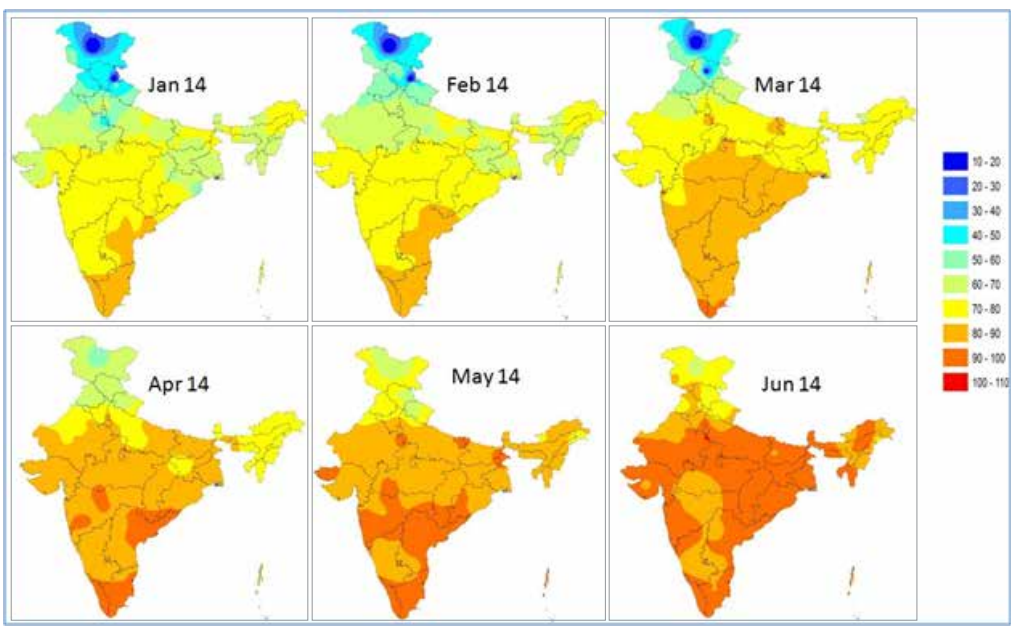

Fig. 1(b): Spatial variability of Dairy Heat Load Index (DHLI) during 2014

The DHLI analysis indicated that the heat stress persisted along the east coast, Bihar and UP more during March, April and May months of 2013 in between 80-100. During June month the stress was shifted to central and northern parts of the country as DHLI ranged between 90 and110. In the year 2014, DHLI values ranging from 80 to100 were observed in most parts of the country. In the month of June stress was observed over central and northern parts as well as over southern parts of the country with DHLI ranging between 90 and110. June month during both the years was stressful for dairy animals in Central and northern parts of the country. The limitation in developing the spatial maps is the fewer number of weather stations covering the country.

3. Research accomplishments

3.1 Sensitivity of Indian wheat yields to temperature: District level dynamics

Wheat yields during 1970-2012 period in major wheat growing districts were found to be inversely related to minimum temperatures (Tn) especially during post-anthesis period. Correlations worked out between temperatures and wheat yields are shown in Fig.2. Growing season maximum temperature (Tx) showed a negative association with yields over 162 districts (81.3% area) and of these wheat yields over 58 districts (35.5% area) showed a significantly negative association with Tx (Fig. 2a). Monthly Tx values correlated with wheat yields indicated that Tx of January and February had a significant negative association with 78 (43% area) and 54 (20% area) districts wheat yields, respectively. A significant and positive influence of seasonal Tx is noticed over a small area (7 districts and 2.6% area). This may be due to either cultivars being grown are less susceptible or prevalence of Tx lower than the cultivars' optimum. Off all the months, Tx of March showed a significant negative association over small area confined to western parts of the country, mainly in the state of Rajasthan, a region that experiences a relatively warm climate.

About 52% variance in year-to-year changes in wheat yields was explained by Tn. District wheat yields when correlated with seasonal Tn (Fig. 2c) resulted in more area (42.7%) with more number (77) of districts showing significantly negative association compared to seasonal Tx (35.5% area with 58 districts). Wheat yields over 7.2% more geographical area are influenced by Tn compared to Tx. There is practically no area that exhibited a positive association between seasonal Tn and wheat yields. Among different months, Tn during February and January has considerable areas (79.2 and 86.7% area, respectively) showing negative association with district wheat yields. Tn of November and December could exert negative impact to a limited extent. Wheat yields from the more geographical area showing negative correlation with Tn in comparison with Tx is an indicative of role of nighttime warming. A regression of district yields for the period 1980–2011 on temperature variables only for those districts where the correlations were negatively significant resulted in a mean yield decline of 204 kg ha^{-1} with 1 °C rise in Tn. This is approximately 7% of Indian wheat yields. Exposure to continual Tn exceeding 12 °C for 6 days and terminal heat stress with Tx exceeding 34 °C for 7 days during post-anthesis period are the other thermal constraints found in achieving high productivity. It is suggested to consider inclusion of early maturing, high yielding and heat tolerant wheat lines in the breeding program for Indian conditions. Thermally sensitive areas evolved from this study may be explored to identify such wheat lines for their adaptability in to future climates.

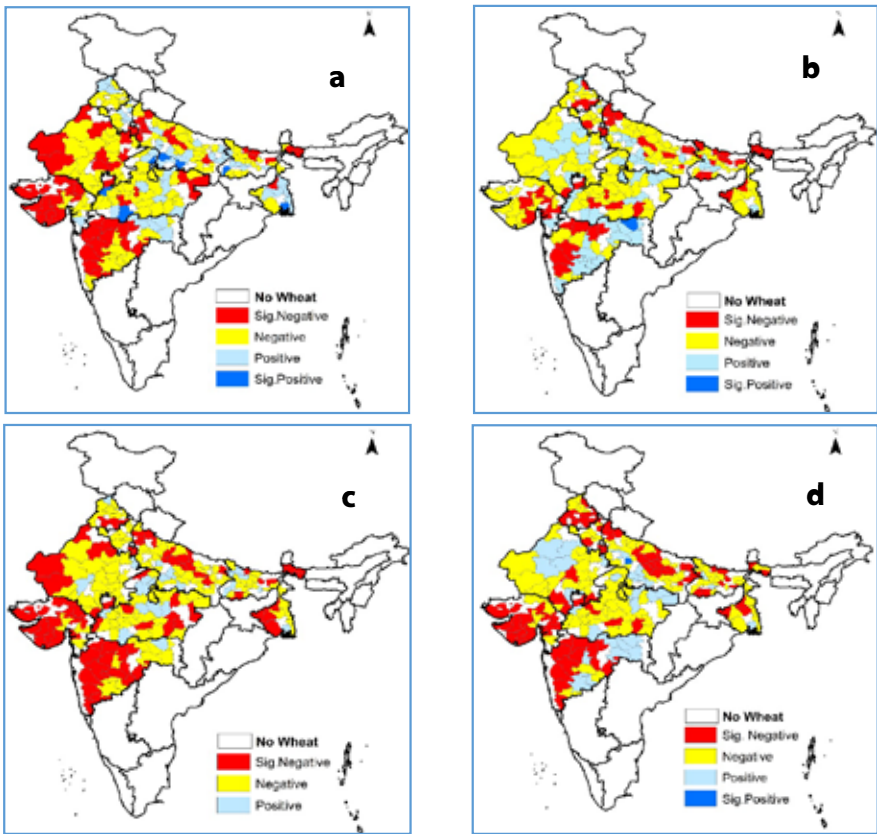

Fig.2: Correlation between (a) seasonal Tx; (b) February Tx; (c) seasonal Tn; (d) February Tn and district wheat yields

3.2 Temperature thresholds and sensitive growth stages in Wheat

Critical phenological stages for heat stress, the impact of heat stress during these stages and temperature thresholds for obtaining above average, average and below average yield of wheat was worked out. Eleven years' experimental data for three cultivars (HD-2285, K-8804 and K-9107) under three sowing dates at the Kanpur Centre located in the Indo-Gangetic Plains of Uttar Pradesh were used. Dates of occurrence of eight important phenological stages recorded in each crop variety under all the three dates of sowing over the study period was used. In order to understand the relationship between yield and phenological behavior, stage-wise temperature, both simple linear regression models and second degree polynomial models were used. Among the eight phenological stages, the milk stage (growth stage 73) was identified as most sensitive for high maximum and minimum temperatures to adversely affect yield (Table 1). The rate of yield reduction with unit increase in maximum and minimum temperatures (°C) was found to be highest in K-8804 and lowest in HD-2285. The optimum ranges of maximum temperature during anthesis, milk, dough and maturity stages are 19.7–21.9, 24.2–26.5, 26.1–28.8 and 29.5–30.8 °C, respectively and those for minimum temperature are 4.3–6.2, 8.3–9.7, 11.5–12.4 and 13.0–15.1 °C, respectively. The thresholds of temperature during critical stages and quantification of heat stress on yield will be of use in devising weather-index-based crop insurance products in wheat and also for breeding temperature-stress-resistant genotypes.

Table 1: Temperatures (°C) during different phenological stages of three wheat cultivars for obtaining three different categories of yield

Yield category	GS 5	GS 14	GS 21	GS 31	GS 60	GS 73	GS 83	GS 91	Yield (kg ha^{-1})
HD -2285 Maximum temperature (°C)									
Above average	30.1	32.0	-	-	19.7	24.2	26.1	30.8	5143
Average	23.8	22.0	-	-	25.1	28.8	31.3	34.4	4522
Below Average	17.6	11.9	-	-	30.5	33.4	35.6	38.3	3901
HD-2285 Minimum temperature(°C)									
Above average	-	-	-	4.4	4.3	9.7	11.5	13.0	5143
Average	-	-	-	8.0	10.2	13.1	15.2	17.4	4522
Below Average	-	-	-	11.7	14.7	17.2	19.0	21.5	3901
K-8804 Maximum temperature(°C)									
Above average	29.0	27.9	18.5	16.2	21.5	25.6	27.9	30.3	4820
Average	23.8	22.2	21.4	22.6	25.9	29.5	32.4	35.4	4124
Below Average	18.6	16.5	25.8	28.4	30.3	33.3	36.9	40.5	3428
K-8804 Minimum temperature(°C)									
Above average	-	-	5.2	4.3	6.1	8.3	11.9	13.8	4820
Average	-	-	8.2	9.1	10.7	14.5	16.4	18.4	4124
Below Average	-	-	10.3	12.0	15.4	17.4	19.3	23.1	3428
K-9107 Maximum temperature(°C)									
Above average	27.5	28.4	-	14.8	21.9	26.5	28.8	29.5	4313
Average	24.8	22.2	-	23.2	26.3	30.2	33.1	36.0	3759
Below Average	18.1	16.1	-	31.7	30.7	34.0	37.5	42.4	3204
K-9107 Minimum temperature(°C)									
Above average	14.0	12.1	-	2.0	6.2	9.0	12.4	15.1	4313
Average	8.1	6.9	-	8.3	11.1	14.8	16.6	18.2	3759
Below Average	2.2	1.7	-	14.6	16.0	17.8	20.7	23.8	3204

(GS 5- Emergence state; GS 14- CRI; GS 21- Tillering; GS 31- Jointing; GS 60- Anthesis; GS 73- Milk; GS 83- Dough; GS- 91- Maturity)

4. Outreach Activities

4.1 Micro-level Agromet Advisories

A major objective of AICRPAM-NICRA project is the customization of micro-level agromet advisories and their effective dissemination through Information Communication Technologies (ICTs). The cooperating centers have started value addition to the block-level weather forecast issued by IMD since September 2014. For customization of micro-level agromet advisories, Bijapur, Bhubaneswar and Udaipur centers have developed their own system of dissemination of AAS in the previous year in 2013-14. Following the examples set, Raipur, Kovilpatti and Jammu centers have developed the system of dissemination of AAS in the selected NICRA villages.

Raipur center has developed a dissemination system which involves IMD block level weather forecast, FIFs' information about field conditions, Agromet department of IGKV Raipur, KVK of Mahasamund and farmers, the end user. The flow chart of procedures involved in preparation and dissemination of micro-level AAS by Raipur center is depicted in Fig. 3.

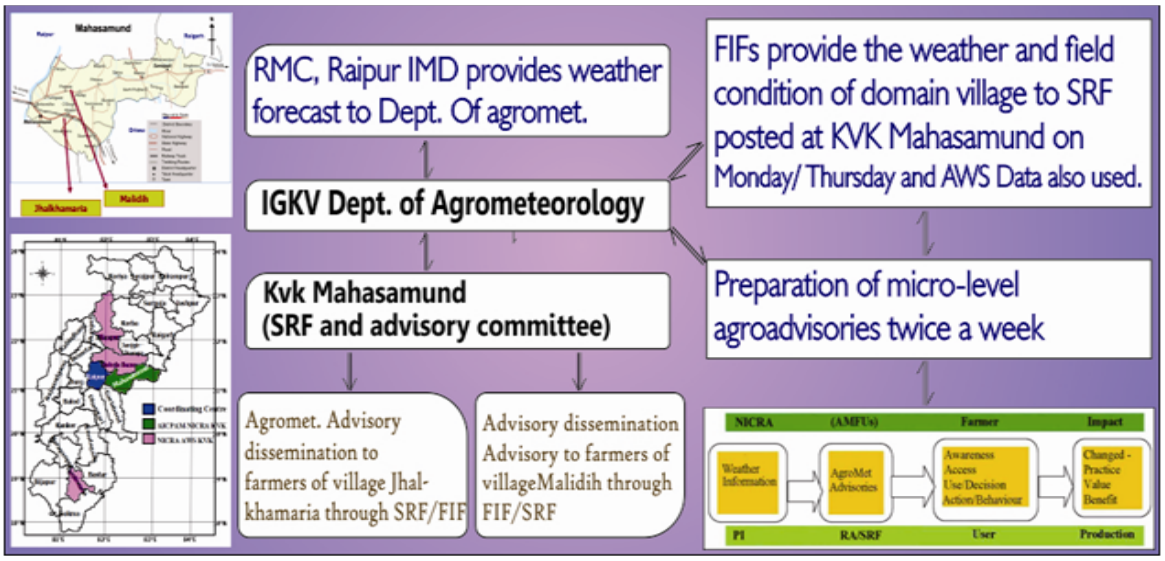

Fig. 3: The AAS development and dissemination system adopted by Raipur center

The AAS development and dissemination adopted by Kovilpatti center is presented in Fig. 4.

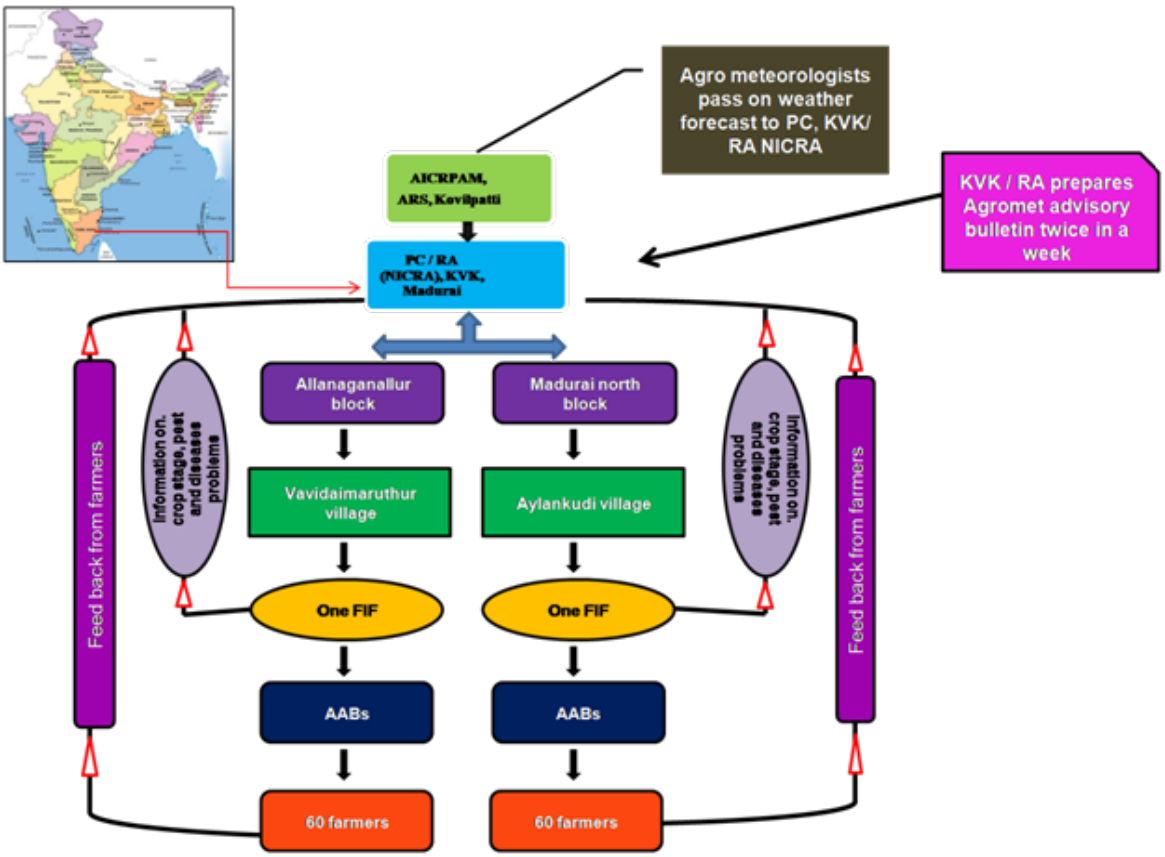

Fig. 4: Flowchart of AAS dissemination system adopted at Kovilpatti

Jammu center has adopted the system originally developed by Bijapur center and is presented in Fig. 5.

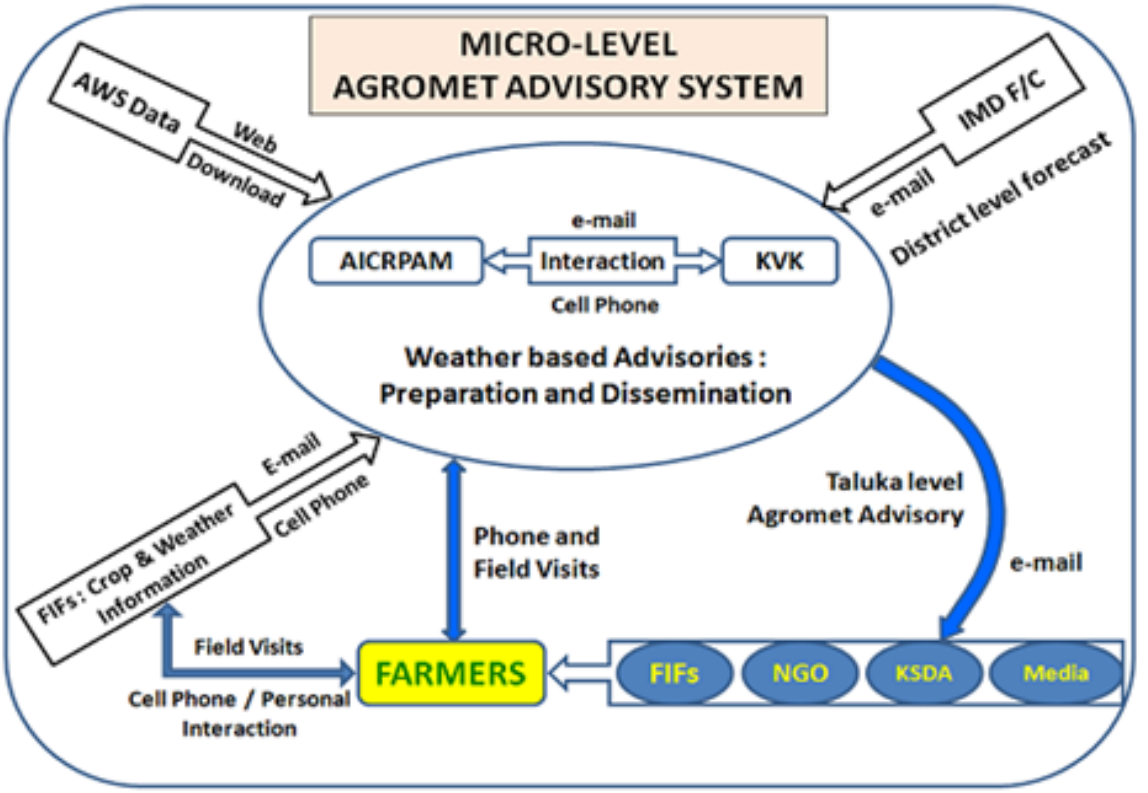

Fig. 5: Flowchart of AAS dissemination system adopted at Jammu

The important feature of all these systems are identical - there is a field information facilitator (FIF), who communicates the status on crop growth, other information related to general crop conditions of the NICRA village to KVK. The inputs from multi-disciplinary team of KVK, guided by Program Coordinator, the micro-level information about crop condition and other related information provided by FIF and the block level weather forecast issued by IMD were put together to prepare the AAS bulletins. More improvement in the performance of AAS is envisaged with more accurate block level weather forecasts from IMD.

4.2 Economic impact of Agromet Advisory Services

The ultimate aim of weather based AAS is to help the farmers in enhancing the economic benefit by suggesting management practices suiting the anticipated weather conditions. Impact assessment is an essential tool for assessing the viability of any activity. Economic impact assessment of AAS issued to farmers of NICRA adopted villages were carried out at various centers. There were mixed results, farmers gained and in few cases they were losses as well, which are described below.

At Bangalore, AAS issued for NICRA adopted village Nayanahalli resulted in savings ranging from ₹800-3500 in grapes (Table 2)

Table 2: Economic impact of AAS at Nayanahalli village, Karanataka

Name of the Farmer	Crop/stage/Date	Farmer Intended to take up	Forecast / Advisory given	Action taken by the farmers	Savings	Benefit/amount
R. Srinivas	Grapes, 17-08-2014	Spray of Ridomil Gold	Postpone the pesticide application because of likely chances of Rainfall	Withheld fungicide application	Saved wastage on Fungicide and labour	Saved ₹1,300
R. Venkatesh	Grapes, 21-08-2014	Spray of Pesticides Live Confidor, Acrobat	Don't plan for pesticide application because of likely chances of Rainfall	Farmer didn't take up pesticide sprays according to AAS	Avoided inefficient / unjudicious use of pesticides	Saved ₹800
Anjaneya Reddy	Grapes, 06-10-2014	Application of Captafol	Chances of occurrence of moderate rain, postpone the spray schedule	Postponed the spray	Saved wastage of Pesticide by heavy rain	Saved ₹1,500
N.V. Srinivasa	Grapes, 13-12-2014	Fungicide spray,Z-78 and Acrobat	Likely chances of light rain postpone the pesticide sprays	Farmer postponed the spray	Avoided the wastage of pesticides	Saved more than ₹2,000
N.M. Lakshminarayana	Grapes, 13-12-2014	Fungicide spray, Equation Pro, COC	Light to moderate rain expected. Postpone the pesticide sprays	Farmer postponed the spray	Avoided the wastage of pesticides	Saved ₹3,500
T. Krishnamurthy	Grapes, 13-12-2014	Fungicide spray, Hilcopper, Sumicidin	Light to moderate rain expected. Postpone the pesticide sprays	Farmer postponed the spray	Avoided the wastage of pesticides	Saved ₹520

At Bijapur center, there was a mixed response as Maize was benefitted, while wheat crop suffered loss due to AAS issued (Table 3).

Table 3: Economic impact of AAS at Belgaum district, Karnataka

Date	Crop stage	Field Operation planned	Forecast	Advice	Advice followed?	Actual weather that prevailed (RF/ cloud etc)	Effect on crop	Benefit/ Loss
11-11-2014	Vegetative Stage	To give irrigation to the crop	Forecast of light rainfall during next five days: 7 mm	Not to give irrigation to the crop	Not followed	November 14 and 15th: RF: 25.3 mm	—	Water, electricity, labours wasted and there was minor loss of crop vigour. Loss: ₹1500 ha^{-1}
9-12-2014	Harvesting Stage	—	Forecast of moderate rainfall: 11mm	Harvest the crop immediately and store in safe place	Yes	54.8 (Dec 13th)	Saved the produce from rain	Yield: 75 q ha^{-1} Benefit: ₹1100/q. Benefit: ₹15,000 ha^{-1}

Faizabad center has assessed the economic impacts of AAS issued to Banpurwa village for paddy and potato crops (Table 4)

Table 4: Economic impact of AAS for paddy at Banpurwa village, UP

Date	Crop stage	Crop status	Field operation planned	Forecast	Advice	Actual weather that prevailed RF/Cloud	Effect on Crop	Benefit/Loss
10-9-2014	PI	Normal	To give irrigation to the crop	5 mm rainfall	Not to give irrigation to the crop	Rainfall 00 mm	Soil moisture deficit	Loss of ₹1200 ha^{-1}
24-9-2014	PI	Normal	To give irrigation to the crop	00 mm rainfall	To give irrigation to the crop	Rainfall 00 mm	Normal soil moisture	Benefit of ₹1500 ha^{-1}

At Anantapur, the impact of AAS was assessed at Yagantipalle and Yerragudi villages and the results are presented in Table 5

Table 5: Economic impact of AAS at Yagantipalle and Yerragudi villages, Andhra Pradesh

S. No.	Name of the farmer	date	Crop	Rainfall Forecast	Suggestion	Observed Rainfall	Farmer adoption	Benefits
1	Venkata Subba Reddy	21-05-2014	Land preparation for sowing	12.4 mm	Postpone irrigation	12.4 mm	Postponed irrigation	Saved labour and electricity chargers for irrigation (₹625 ha^{-1})
2	B.Ravi Shankar Reddy	11-06-2014	Jasmine	30-70 mm	Postpone irrigation	62 mm	Postponed irrigation	Saved up to ₹1000 ha^{-1}
3	Boya Subbadu	12-07-2014	Kharif maize	3-11 mm	Postpone spraying	10.6 mm	Postponed spraying	Saved ₹900/-
4	M.Chalapathi	29-07-2014	Kharif maize	0-6 mm	Postpone irrigation	7.4 mm	Postponed irrigation	Irrigation was postponed and saved ₹600/-
5	Rameswara reddy	27-10-2014	Kharif maize	0-15 mm	Postpone harvesting	10.5 mm	Postponed harvesting of maize	Delayed harvesting of maize and saved ₹300 q^{-1} and ₹7500 ha^{-1} in total.
6	Nagasubba reddy	25-11-2014	Foxtail millet	25-90 mm	Postpone harvesting	97 mm	Postponed harvesting	Delayed the harvesting of korra up to 1 week. Because of this, shattering losses occurred loss up to ₹1600/-

Jammu center has analyzed the economic impact of AAS issued to NICRA adopted villages and the results are presented in Table 6.

Table 6: Economic impact of AAS at Chappaki and Sherepur villages, Jammu & Kashmir

Name of the farmer	Date	Crop	Forecast	Advisory given	Observed rainfall	Action taken by farmers in response to AAS	Saving	Benefit/ Amount
Sahil Sharma (Chappaki)	21-01-2014	Wheat	6 mm rainfall	Postpone the irrigation, harrowing, weeding and fertilizer application	88 mm	Postponed the irrigation, harrowing, weeding and fertilizer application	Saved wastage on oil, labour charges and fertilizer	₹1400/-
Bhushan Kumar (Sherepur)	02-09-2014	Maize	14 mm rainfall	Drain out the excess water from the field	194.6 mm	Drained the excess water through drainage channels	Saved the crop from lodging	Saved the crop
Som Lal (Sheerpur)	21-01-2014	Mustard	6 mm rainfall	Postpone the irrigation, harrowing, weeding and fertilizer application	88 mm	Postponed the irrigation, harrowing, weeding and fertilizer application operation	Saved wastage of oil, labour charges and fertilizer	₹900/-
Sardari Lal (Chappaki)	04-02-2014	Wheat	17 mm rainfall	Postpone the intercultural and plant protection measures	25 mm	Withhold the intercultural and plant protection measures	Saved the labour charges and pesticides wastage	₹1200/-
Bodh Raj (Chappaki)	04-02-2014	Mustard	17 mm rainfall	Postpone the intercultural and plant protection measures	25 mm	The intercultural and plant protection measures were postponed	Saved the labour charges and pesticides wastage	₹900/-
Vishal Verma (Chappaki)	21-02-2014	Wheat	4 mm rainfall	Postpone the chemical spray to crop suffering from Karnal bunt and yellow rust	26.8 mm	Withheld the fungicide application	Saved the wastage of fungicide and labour	₹600/-

The center also compared the yields of maize, mustard and wheat crops grown by farmers those who followed and not followed AAS' these were which significant differences as could be noticed in Fig 6.

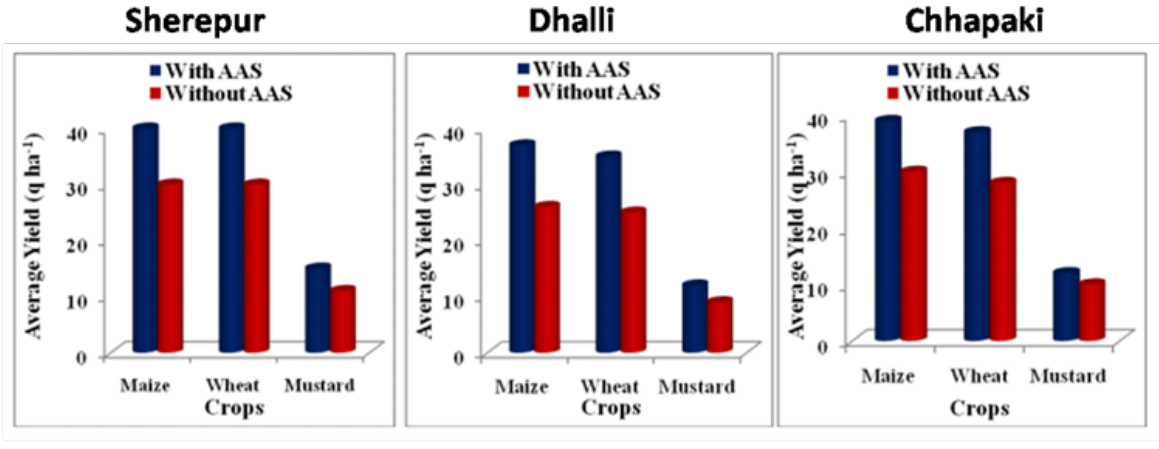

Fig. 6: Comparison of yield in different crops with and without adopting AAS at Sherepur, Dhalli and Chhapaki villages of Jammu & Kashmir

At Udaipur, AAS bulletins were issued for two villages, viz., Nakli and Bhagwanda of Rajasaamnd district has resulted in mixed response as explained in Table 7.

Table 7: Economic impact of AAS at Nakli and Bhawanda villages of Rajasaamnd district, Rajasthan

Date	Name of farmer	Operations planned	Forecast given	AAS made	Action taken by farmers in response to AAS	Rainfall received	Benefit/loss
13-5-2014	Ramesh Chandra (Village: Nakli) Area: 2000m^2	Not to plan on spraying insecticide	No rainfall in next five days	Spray insecticide to control fruit borer in Okra	Sprayed insecticide to control fruit borer in Okra on 14-5-2014	64mm rainfall with hailstorm received on 14-5-2014	Due to rain insecticide was washout and crop was damaged due to hail storm. A loss of ₹6000 was noticed

16-5-2014	Verdi ChandKumawat (Village: Bhagwanda) Area: 1500 m^2	Apply Irrigation to cauliflower	3.0 mm rainfall on 17-5-2014	Avoid irrigation and spraying of insecticide in crops	Postponed the Irrigation	8.0 mm rainfall received on 17-5-2014	Saved labour and fuel charges, amounting to ₹1000/-
5-9-2014	Radheshyam Keer (Village: Nakli) Area:3000 m^2	Apply insecticide to control stem borer in maize	6.0 mm rainfall on 5-9-2014	Avoid spraying of insecticide	Postponed the spraying of insecticide	8.6 mm rainfall received on 5-9-2014	Saved labour charges amounting to ₹500/-
12-9-2014	Bhawer Lal Kumawat (Village: Bhagwanda) Area: 3000 m^2	Postpone spraying insecticide on Blackgram	No rainfall in next five days	Plant protection measure should be apply in crops	Spray insecticide (Dimethote) in black gram on 15.9.2014	3.1mm rainfall received on 15-9-2014	Rain occurred just after spraying the insecticide A loss of ₹2000/- was noticed
15-7-2014	Radheshyam Keer (Nakli)	Sowing of maize after 15th July	Light to moderate rainfall in next five days	Avoid sowing of maize after 15th July. Sow pulses and maize+ green gram intercropping	Sow guar and Maize+ green gram	Next four days heavy rainfall was received	Guar crop in 1000 m^2 was completely failed due heavy rainfall Loss of ₹6000/-. He got 300 kg maize from 1500 m^2 but green gram was failed in intercropping due to heavy rain Thus he got benefit of ₹4500/-

4.3 Farmers' awareness programs

Farmers' awareness programs are an important aspects of adaptation to climate change. It is also a mechanism to sensitize people about the science of climate change and adaptation and mitigation options possible. It also engenders a 'bottom-up' approach to planning and implementing policy to complement the more traditional 'top-down' approach adopted by governments. Ideally, personal visits and discussions with farming communities are preferable, but news papers, radio and television can act as medium of mass communication. Keeping this view, it is felt necessary that climate change awareness has to be inculcated in the farming community through climate change awareness programs of AICRPAM-NICRA. The details of the climate change awareness programs conducted by different centers are presented in the Table 8.

Table 8: Details of farmers awareness program conducted at different locations during 2014-15

Centre	Name of the village	Date of Awareness Programme	No. of farmers attended	Men	Women
Anand	KVK Mangalbharati and Farmers Training Centre Chhotaudepur	25-11-2014	1698	1698	0
	KVK Dethali and Farmers Training Centre Chhotaudepur	26-11-2014	1492	0	1492
	AAU Anand and KVK Mangalbharati	22-01-2015	140	140	0
Anantapur	ARS, Prakasam	20-03-2015	100	100	0
Bangalore	S. Raguttahalli, Chintamani	31-10-2014	145	145	0
	KVK Magadi taluk	14-03-2015	120	101	19
Bhubaneswar	Biju Patnaik Scince college, Badagada	27-03-2015	156	84	72
	Kantabada	28-03-2015	196	188	8
	Karadapalli	29-03-2015	198	160	38
	Nakihana	29-03-2015	197	132	65
Bijapur	Sirsi	22-12-2014	110	11	0
	Yallapur	23-12-2014	75	75	0
Chatha	Sherpur Kathua	26-04-2014	125	93	32
	Sherpur Kathua	12-11-2014	114	69	45
	Sunjwaan Kathua	30-01-2015	157	95	62
	Sherpur Kathua	28-06-2014	49	35	14
	Chappaki Kathua	09-07-2014	39	29	10
	Dhalli Kathua	23-07-2014	32	23	09
	AMFU-Rajouri	10-03-2015	250	150	100
	Sherpur Kathua	15-03-2015	150	122	28
Dapoli	Kolad village, Raigad	11-02-2015	154	65	89
Faizabad	Banpurwa and Rajapur kala KVK Bahraich	10-10-2014	122	122	0
Hisar	CCSHAU Hisar on Kisan Divas	23-12-2014	250	250	0

Jorhat	Khumtai	02-04-2014	162	100	62
	Thengal Gaon	04-04-2014	100	55	45
Kanpur	Collectrate, Auditorium, Banda,	18-02-2015	235	231	4
	Late Parasuram Umrao Mahavidhyalay Ajampur Gadwa, Fatehpur	26-02-2015	273	263	10
Kovilpatti	Buchampatti	25-02-2015	100	100	0
	Karisalkalampatti	16-12-2014	100	100	0
	ADA Office Sedapatti	11-03-2015	100	100	0
Ludhiana	RRS, Faridkot	18-09-2014	400	320	80
	RRS, Bathinda	27-09-2014	400	380	20
Mohanpur	Dokshin Durgapur	24-11-2014	127	87	40
	Gopalganj village,	19-01-2015	27	24	3
Palampur	KVK, Bara	28-01-2015	301	121	180
Parbhani	CRS, Nanded	30-03-2015	200	185	15
Raipur	Jhalkhmaria	17-07-2014	60	0	60
	NICRA-GKMS, IGKV	06-08-2014	75	50	25
	Muretitola Ambagarh Chowki	10-12-2014	40	0	40
	Gotatola Block Mohla	23-12-2014	72	0	72
	KVK, Rajnandgaon Village Bharegaon	16-02-2015	60	0	60
	Village Malidih	24-02-2015	72	0	72
Ranchi	KVK West Singhbhum	23-03-2014	100	100	0
Ranichauri	Neeri, Chinyalisaur	18-12-2014	60	60	0
	Tulyara, Chinyalisaur	30-12-2014	65	65	0
	Hitanu, Dunda	24-01-2015	70	70	0
	Badethi, Dunda	14-02-2015	70	70	0
Samastipur	Rice Research Station, Jhanjharpur	22-07-2014	150	150	0
	KVK, Saraiya, Muzaffarpur	27-11-2014	120	110	10
	KVK, Jale, Darbhanga	20-02-2015	127	118	9
Solapur	Sugar factory, Akluj Tal Malshiras along with KVK, Mohol	07-02-2014	241	210	31
	Members of KVK Mohol at KVK farm Mohol	08-02-2014	190	163	27
	Bajar Samiti ,Pandharpur along with KVK, Mohol	08-02-2014	119	113	06
	Farmers of Yerala and ORP Project at Jat Tahesil, Dist - Sangli	21-08-2014	263	245	18
	Farmers and agril. Officers at ZARS, Solapur	11-09-2014	135	113	22
	Council member and farmers of Satara and Solapur district	24-09-2014	213	170	43

	Tribal farmers of Natawade Tal- Shirpur, Dist- Dhule	18-10-2014	317	254	83
	Tribal farmers of Karanjali Tal- Navapur, Dist- Nandurbar	20-10-2014	344	252	92
Thrissur	Puthanangadi	24-12-2014	45	44	1
	Angadippuram				
Udaipur	Rayala, Bhinder (Udaipur)	15-10-2014	117	77	40
	DasanakiBhagal, Kumbhalgarh (Rajsamand)	09-01-2015	94	59	35

4.4 Farmers' feedback on AAS

Documenting farmers' feedback on the effectiveness of AAS issued at selected villages is a way to assess the performance of the project which may also help to find the improvement in the areas. Feedback was collected by different centers and presented below. At Dapoli, the usefulness of AAS during different growth stages of crop was surveyed and the results are presented in Table 9.

Table 9: Analysis of usefulness of AAS for various crop production activities at selected villages of Dapoli center

Sr. no	Particulars	Aasage village, Tal. Lanja		Haral village, Tal-Rajapur	
		No of farmers	Percentage (%)	No of farmers	Percentage (%)
1.	Planning farm operation	44	73.33	46	77
2.	Plant protection	55	91.67	52	87
3.	Fertilizers application (Proper dose)	52	86.67	45	75
4.	Water management in field crops	31	51.67	27	45
5.	Sowing/transplanting/seed rate manipulation	52	86.67	54	90
6.	Harvesting of crops at proper stage	43	71.67	49	82

The feedback indicated that at Aasage village, farmers are very satisfied with AAS related to plant protection, fertilizer application and timing of different field operations. But, advisories related to water management in field needs improvement. Similar trend was observed in Haral village also.

At Faizabad center, farmers were asked to rate AAS issued by the project and the team also collected feedbacks from them and the results of analysis are the feedback are presented in Table 10.

Table 10: Rating of AAS issued at NICRA villages of Bahraich district, UP

S. No.	Parameters	Farmers responded	Rating (%)
1.	Excellent	25	42
2.	Very good	12	20
3.	Good	9	15
4.	Satisfactory	9	15
5.	Irrelevant	5	8

Major feedback obtained from farmers include:

- The weather based AAS bulletins issued regularly is useful for increasing the productivity of crops and hence socio-economic status.
- AAS played an important role in planning their agricultural activities.
- All the farmers appreciated the timely dissemination of AAS.
- Resource poor farmers are not able to adopt the AAS well in time.
- Farmers are willing to believe in adoption of AAS only after the supply of inputs on time.

Jammu center has also collected feedback about AAS from farmers and salient points of the feedback are mentioned below.

- Regularly getting weather based Agromet advisory and weather forecasts
- Farmers expressed that weather forecast based agro advisory is fruitful for them as they can select high yielding varieties of different crops and can do other farm practices such as sowing, weeding, irrigation, fertilizer, pesticide spray (time and doses) at right time depending on the suitability of weather conditions which ultimately helps in reducing the cost of cultivation and save inputs.
- Inconsistency in the accuracy of the weather based forecast in Agromet advisory regarding rainfall was reported. However weather forecast prediction given in Agromet advisory matches about 77 per cent with the actual conditions.

Feedback by farmers from Kovilpatti center is as follows:

- The farmers felt that the block level forecast was more useful than the district level forecast.
- Farmers showed hesitation in following new techniques in crop management.
- Farmers were ready to use new varieties released from Tamil Nadu Agricultural University.
- Farmers followed most of the agrochemicals recommended in the Agromet advisory services and very few followed the organic recommendations.

Raipur center has collected feedback by pre-designed questionnaire during Farmers' Awareness Programme (FAP) on 6th August, 2014. The summary of feedback is given in Table 11.

Table 11: Summary of feedback given by farmers about AAS at Mahasamund district, Chhattisgarh

Questions that were put to farmers	Farmers' response	Percentage
Whether receiving agro-advisories services?	Yes-35 No-16	69
If receiving, whether receiving on time	Yes -29 No -6	83
If receiving, by which method ?	By hand-01 By message-24 By paper display-10	3 68 29
Whether you are getting benefit out of this AAB?	Yes -35	100
Whether you are getting benefit from Kisan Call Centre (KCC) ?	Yes-10	20
Whether you use weather based computer website based weather advisory?	Yes-04	8
Whether you are receiving messages regarding agricultural related information?	Yes-24	47
Whether you want improvement in services?	Yes-26	74

It was found out from the impact analysis that out of 51 farmers for, 69 per cent opined that they are receiving agro-advisory services either under GKMS or NICRA-AICRPAM project. But response of farmers was that only 83 per cent are receiving in real time basis. About 3 per cent farmers are receiving by hand, 68 per cent farmers are covered under bulk messaging network and 29 per cent are receiving by other methods of display, press clipping, AIR etc. However, it was agreed upon 100 % farmers who are receiving the agro-advisory bulletins that they are getting benefit out of these functional weather forecasting.

Feedback from farmers at Akola center is as follows:

- Advisory contains important information about the weather, crops, need based crop management, plant protection and contingency plans.
- Farmers are getting AAS regularly, but they prefer real time rainfall forecast mostly.
- Weather and crop advisories facilitates effective crop management. Advisory on crop protection measures are very much useful.

4.5 Micro-level agroclimatic analysis

Agroclimatic analysis is a powerful tool to characterize the climate and crop performance of a specific region. It can also be used to assess the climate variability and/or climate change occurred in a region and its impact on agriculture. Thus, it helps in undertaking best agricultural practices possible in cultivation by utilizing the favorable weather conditions and avoiding/minimizing risks that arise due to extreme/ adverse weather events. Agroclimatic analysis in a micro-level will give a better spatial resolution to climate variability analysis and its impact on agricultural production. Under AICRPAM-NICRA project, some of the cooperating centers have attempted it in selected NICRA districts and the results are discussed below.

Akola center has carried out trend analysis of monsoon rainfall, rainy days and extreme rainfall events of Buldhana district using Mann-Kendall test and the results are furnished in Tables 12 and 13.

Table 12: Trend analysis of monsoon rainfall and rainy days for the period 1971-2014 in Buldhana district, Maharashtra

Taluka	Mann Kendall test statistic		Trend	
	Rainfall	Rainy days	Rainfall	Rainy days
Buldhana	+0.030 (NS)	+0.354(NS)	Increasing	Increasing
Chikhli	+0.920 (NS)	+0.293(NS)	Increasing	Increasing
Jalgaon Jamod	+1.81 (S(0.1))	+1.669(S(0.1))	Increasing	Increasing
Khamgaon	-0.141 (NS)	+0.704(NS)	Increasing	Increasing
Malkapur	+0.101 (NS)	+0.728(NS)	Increasing	Increasing
Mehkar	+1.365(NS)	+1.345(NS)	Increasing	Increasing
Shegaon	+0.629(NS)	+1.506(NS)	Increasing	Increasing

All talukas showed non-significant increasing trend in monsoon rainfall and rainy days, except Jalgoan, Jamod taluka where both parameters showed significant positive trend.

Table 13: Trend analysis of extreme rainfall events for the period 1971-2014 in Buldhana district, Maharashtra

District	Rainfall events			
	25-50mm	50-75mm	75-100mm	>100mm
Buldhana	-0.789(NS)	-1.851 (S(0.1))	-0.627(NS)	+2.003 (S(0.05))
Chikhli	+0.678 (NS)	-0.961 (NS)	+0.000(NS)	+1.163(NS)
Jalgaon Jamod	+2.347 (S(0.05))	+0.526(NS)	+0.587(NS)	+0.445(NS)
Khamgaon	-0.509(NS)	-0.293 (NS)	+1.285(NS)	+0.020(NS)
Malkapur	+0.344(NS)	+1.214(NS)	-0.789(NS)	-0.890(NS)
Mehkar	+1.659 (S(0.1))	-0.152 (NS)	-1.780 (S(0.1))	+0.324(NS)
Shegaon	+1.257(NS)	-0.791 (NS)	+0.260(NS)	-0.565(NS)

The analysis indicated that for events exceeding 100 mm rainfall on a single day, Buldhana taluka showed a significant positive trend. All other talukas showed non-significant increasing or decreasing trends. In case of 75-100 mm rainfall, Mehkar taluka showed significant negative trend whereas Buldhana taluka showed significant negative trend in the 50-75 mm category. Jalgoan Jamod taluka showed significant positive trend in the category of 25-50 mm rainfall.

Bangalore center has analyzed the deviation in southwest monsoon rainfall from 30 year normal rainfall data for selected NICRA villages. For Patrenahalli the deviation was -18.88 mm, Nayanahalli -14.98 and Mylappanahalli village 14.09 mm. Nayanahalli village showed more deviation in the monsoon rainfall i.e. -62.58 mm in the month of June followed by July (-55.31 mm).

4.6 ITKs related to agrometeorology documented

At Palampur center, information regarding the color of moon and the related weather conditions during post monsoon (1 October to 31 December, 2014) was documented by FIFs in their respective villages of Hamirpur and Kangra district (Table 14). A total of 397 observations were made and it was observed that moon was seen in 92.2% cases out of which the 43.1, 6.9 and 1.4 % cases the yellow colour of moon was found associated with cloudy, rainy and windy conditions, respectively. In 18.3 and 5.6 % cases, the white colour of the moon was found associated with windy and cloudy conditions.

Table 14: Information on Indigenous Traditional Knowledge gathered from different blocks of Hamirpur and Kangra districts of Himachal Pradesh

Sr. No.	Name of Observer	Name of the Block, district	Total obs.	Moon obs.	Cloudy (no obs.)	Observed color of the moon															
						Yellow					White					Red					
						Total Obs.	CS	C	R	W	Total Obs.	CS	C	R	W	F	Total Obs.	CS	C	R	W
1.	Sanjeev Mehar	Bhoranj Hamirpur	15	12	3	7	2	-	-	-	5	5	-	-	-		-	-	-	-	-
2.	Sushil Kumar	Tauni Devi Hamirpur	75	68	7	13	2	9	2	-	53	51	2	-	-	-	2	1	1	1	-
3.	Dinesh Kumar	Bijhari Hamirpur	75	72	3	2	1	-	1	-	68	43	1	-	22	2	2	-	-	1	-
4.	Monu	Panchrukhi Kangra	76	69	3	16	4	12	-	-	52	40	5	-	7	-	1	-	-	-	-
5.	Sanjeev	Palampur Kangra	72	69	3	13	8	4	1	-	55	45	3	-	7	-	1	1	1	-	-
6.	Sansar	Palampur Kangra	84	76	8	63	55	6	1	1	13	13	-	-	-	-	-	-	-	-	-
Total observations			397	366 (92.2%)	27 (6.0%)	114	72	31 (43.1%)	5 (6.9%)	1 (1.4%)	246	197 (80.1%)	11 (5.6%)	0	36 (18.3%)	2	6	2	2	2	0

(Obs.-observations; CS-clear sky; C-cloudy; R- rainy; W-windy; F-fog)

4.7 Interventions made in NICRA villages

Parbhani

The normal southwest monsoon rainfall for Gangapur taluka (where the NICRA villages, viz., Shekta and Shiregaon are located) of Aurangabad district is 555 mm. During SWM season of 2014, the taluka received only 308 mm rainfall. In order to conserve soil moisture, timely intercultural operations like hoeing was suggested in crops like cotton, soybean and ginger. As there was a long dry spell during crop growth stage, opening of a furrow 20-25 days after sowing after every two rows was suggested for widely spread long duration and crops like cotton, pigeon pea and after every 4-6 rows of crop for closely spaced short duration and short spacing crops like jowar, soybean, greengram, blackgram to conserve the rain water.

5 Success stories

5.1 Success story of a farm woman

Mrs. S. Meenakshi Ammal, who hails from Allikundam NICRA Village of Kovilpatti Centre has 8 acres of land under cotton cultivation. SVPR 2 variety was grown during Rabi 2014-15. During the crop growing period, a series of AAS bulletins were issued which was followed as such by the farmer. Details of the AAS issued is given in Table 15.

Table 15: Details of AAS issued at Allikundam NICRA village during Rabi 2014-15

Date	Advisory given	Reason behind the issue of AAS
19-08-2014	Initiate sowing/ seed treatment	Start of pre-monsoon rain
06-09-2014	Gap fill on the 10th day	For optimum plant stand in the field
20-09-2014	Thinning	For optimum plant density in the field
08-10-2014	Avoid spraying of insecticides	About rainfall 22 mm was expected
15-10-2014	0.5 % urea and 1% KCl spray to check nutrient deficiency	Sufficient moisture available due to rain
22-10-2014	Nipping of terminal buds	To arrest vegetative growth
04-11-2014	Foliar spray of TNAU Cotton Plus	To mitigate mid season drought and reduce flower and square shedding
19-11-2014	Spray to control Bacterial leaf blight	Moist and humid conditions favor leaf blight disease
26-11-2014	Imidacloprid 100 ml ha^{-1} or NSKE 3% spray	To control leaf hopper infestation due to humid weather
31-01-2015	Harvesting during morning time and proper storage	To harvest quality kapas to fetch higher price in market.

Cost benefit analysis was done and a comparison (Table 16) was made between Meenakshi Ammal and another farmer who did not follow the advisory.

Fig. 7: (A) Harvesting of cotton at woman farmers filed who followed AAS (B) Visit of PC (AICRPAM) to the woman farmer's cotton field during harvesting

Table 16: Comaprison of BC ratio analysis between AAS and non-AAS farmers in rainfed cotton

Input details	AAS Farmer	Non-AAS Farmer
Field preparation cost (₹ ha^{-1})	1500	1500
Seed cost (₹ ha^{-1})	1900	1900
Seed treatment (₹ ha^{-1})	650	50
Fertilizer cost (₹ ha^{-1})	4850	7300
Labour cost (Weeding, Nipping, spraying of fertilizers and pesticides) (₹ ha^{-1})	4750	4500
Cost of plant protection (₹ ha^{-1})	9500	14000
Harvesting (Transport and picking)	7500	5500
Cost of cultivation (₹ ha^{-1})	30650	34750
Kapas yield (q ha^{-1})	25.5	21.25
Price of cotton (₹ q^{-1})	2800	2800
Total income (₹ ha^{-1})	70,700	59,500
Net profit (₹ ha^{-1})	40,050	24,750
Benefit cost ratio	2.30	1.71

Higher profit obtained by Mrs. Meenakshi Ammal is attributed to:

- She followed all the AAS issued and carried out all farm operations in time.
- She avoided insecticide spraying two times due to rainfall forecast.
- She used organic inputs like bio fertilizers, Neem seed kernel extract (NSKE) and pheromone trap

5.2 *In situ* soil moisture conservation for *rabi* sorghum at Jalgoan KP village, Maharashtra

Rabi sorghum, which is the main crop in the NICRA village is raised utilizing the residual moisture accrued by the rain of August and September. The recommended sowing period for Rabi sorghum is 15th September to 15th October. Under the technology demonstration component of NICRA project, it was advised to prepare large beds of 10 x 10 m across the slope to allow infiltration of rain water and hence conservation of soil moisture. The rainfall for months of August & September is 67.4 and 150.1 mm respectively. Thus

farmers were advised to prepare broad beds for in-situ moisture conservation in agromet advisories dated 12th and 19th August in view of average weekly rainfall and forecasting medium rainfall. Some interested farmers followed the advisory and prepared the beds. A rainfall of 190.6 mm was received during the last ten days of August 2014. So, the crop was sown on time, but a prolonged dry spell has occurred thereafter. Only 2 mm rainfall was recorded in September and no rains were received up to 25th October 2014. Thus the crop didn't receive any rainfall for 40-45 days, which affected the crop badly. But the crop stand on those farmers fields who adopted in-situ moisture conservation technique was quite good compared to non-adopted farmers (Fig. 8). A comparison of yield and income obtained by those who followed AAS and those who did not follow AAS is given in Table 17.

Table 17: Comparison of income obtained by adopting AAS and not adopting AAS by rabi sorghum farmers in Jalgaon KP village, Maharashtra.

Treatment	Seed yield Kg ha^{-1}	Fodder yield Kg ha^{-1}	Cost of cultivation ₹ha^{-1}	Gross income ₹ha^{-1}	Net income ₹ha^{-1}	Remark
Farmers practice	750	1700	10598	24120	13522	Farmers who adopted in-situ moisture conservation were able to get a benefit of ₹7634 ha^{-1} under rainfed conditions.
In-situ moisture conservation	1130	1850	12624	33780	21156	

From the table, it can be seen that seed yield was considerably higher for those farmers who prepared beds for soil moisture conservation. Even though the cost of cultivation was slightly higher, it was compensated by higher net income.

Fig. 8: Crop stand in rabi sorghum fields where soil moisture conservation beds were prepared (right) and those not prepared

5.3 Silage production to meet the fodder demand at Jalgaon KP village, Maharashtra

Water scarcity has emerged as a problem in the NICRA village after December 2014. Due to this, farmers were not able to irrigate fodder crops like maize. Thus, farmers failed to provide fodder to animals in summer months, which has led to low milk yield and poor health status of cows.

Silage production was suggested as an alternate option to meet the fodder demand. A silo pit was constructed to feed 20 kg of silage per day per cow. Cultivation of fodder maize was done on 0.3 ha area with available irrigation. Silage was prepared from green maize (75%), sugarcane tops (25%) available with the farmers in the month of December (Fig. 9). Due to this intervention, 20Kg silage per day per animal is now available to feed for three months. The silage prepared in the month of December is available to feed the livestock from month of February to May. In this year, seven farmers have adopted silage making technology on their own. KVK has demonstrated silage making technology in three farmer's fields.

Through AAS, cultivation of maize for fodder was suggested in the month of September itself, so that it can be used for silage production in December. A comparison of benefit and cost involved with milk production involving silage and without silage is given in Table 18.

Table 18: Comparison of milk production with and without feeding silage at Jalgaon KP village, Maharashtra

Particulars	Milk yield (Liters per day per cow)	Percent increase in milk yield	Gross cost	Gross return	Net return	B:C Ratio
Demonstration	12.00	15	18600	27360	8760	1:1.47
Local check	10.20	-	20520	23256	2736	1:1.13

It can be seen that the farmer who adopted silage making got 15% more milk yield. He could also provide green fodder throughout summer months.

Fig. 9: Silage production to meet the fodder demand in Jalgaon KP village, Maharashtra

6 Activities under TSP

Jorhat

An irrigation project covering 50 ha land area is under process using TSP fund. Mr. H.K. Sharma Regional Manager of Jain Irrigation visited Thengal gaon for having a brief idea of the total cropped area, to know the interest of the villagers and to obtain the primary information required to irrigate the definite area (Fig. 10).

Fig. 10: Initial discussion and site visit for the irrigation project more than 50 ha of land area near the Dhanshiri River of Golaghat district

A training session on mushroom cultivation was organized at Thengal gaon on 22 December 2014 at the request of a women self help group. Dr. (Mrs) Daisy Senapati, Senior Professor, Department of Pathology, AAU, Jorhat was the lead speaker (Fig. 11). The SHG was cultivating mushroom without technical knowledge which led to contamination of mushroom bags. A detailed explanation of nutritional value of mushrooms, along with the scope of cultivation of mushroom in north east India and cultivation procedures of mushroom were given.

Fig. 11: Training on mushroom cultivation conducted at Thengal gaon, Assam.

7. Appendices

7.1 Location of NICRA-KVKs

AICRPAM Center	Name of NICRA - KVK	District	Block/Thasil/ Mandal	Name of NICRA Village(s)
Akola	KVK (Dr. PDKV), Buldhana,	Buldhana	Buldhana	1.Yelgaon 2. Devpur
Anand	KVK, Mangalbharti	Sankheda	Chhotaudepur	1. Manjrol 2. Navapura
Anantapur	KVK, Yagantipalle	Kurnool	Banaganapalle	1.Yagantipalle 2. Yarragudi
Bangalore	KVK, Chintamani	Chikkaballapur	Chikkaballapur	1.Patrenahalli 2. Nayanahalli 3.Mylappanahalli
Bhubaneswar	KVK, Bhanjanagar	Ganjam	Ganjam	1.Ekalpur 2. Padampur
Bijapur	Birds KVK, Tukkanatti,	Belgaum	Gokak	1.Bailhongal 2. Raibag
Chatha	KVK, Kathua	Kathua	Kathua	1. Chhapaki Khurd 2. Sherpur Bala 3. Dhalli
Dapoli	KVK, Deodhe	Ratnagiri	Lanja	1. Haral 2. Assage
Faizabad	KVK, Bahraich	Bahraich	Kaiserganj	1. Rajapur 2. Banpurwa
Hisar	KVK, Sirsa	Sirsa	Sirsa	1. Kharian Panihari 2. Farwain Khurd
Jabalpur	KVK, Chhattarpur	Chhattarpur	Nowgang	1.Chakuda 2. Maanpura
Jorhat	KVK, Khumtai	Golaghat	Kothalguri	1. Thengal Gaon 2. Kachupathar
Kanpur	KVK, Daleepnagar	Kanpur Dehati	Shivrajpur Billhaur	1. Daleepnagar 2. Saibashu
Kovilpatti	KVK, AC & RI Campus, Madurai	Madurai	Madurai	1. Allikundam 2. Puchampatti
Ludhiana	KVK, Fatehgarh Sahib	Fatehgarh Sahib	Fatehgarh Sahib	1. Badhose Kalan 2. Boranga Zer
Mohanpur	Ram Krishna Ashram KVK	South 24 Paraganas	Kultoli	1. Bongheri 2. Gopalganj
Palampur	KVK, Bara	Hamirpur	Nadavn	1. Mann 2. Treti
Parbhani	KVK, Aurangabad	Aurangabad	Gangapur Aurangabad	1. Shekta 2. Dhawalapuri 3. Shirgaon

Raipur	Mahasamund	Mahasamund	Mahasamund	1. Jhalkhamaria 2. Malidih
Ranchi	KVK, Palamu	Palamu	Palamau	1. Chianki 2. Sua
Ranichauri	KVK, Ranichauri	Uttarkashi	Chinyalisaur Dunda	1. Neri 2. Tulyada 3. Hitanu 4. Badethi
Samastipur	KVK, Saraiya	Muzaffarpur	Saraiya	1. Ballisaraiya 2. Bhagwatpur
Solapur	KVK, Baramati	Pune	Baramati	1. Jalgaon 2. Loni
Thrissur	KVK, Malappuram	Malappuram	Malappuram	1. Thavanur 2. Angadippuram
Udaipur	KVK, Rajsamand	Rajasamand	Rajasamand	1. Nakli 2. Bhagwanda

7.2 Staff position during 2014-15

Centre	Agrometeorologist / Jr. Agronomist	Research Associate	Senior Research Fellow
Akola	Dr. Anil Karunakar	Dr. Pradeep Damre	Sri. Vishal Chavan
Anantapur	Dr. S.N. Malleswari	Miss. P. Swathi	Sri. B. Ramamohan
Anand	Dr. H. R. Patel, Dr. N. J. Chaudhary	Mss. Bharat. N. Suthar	Sri. Dhamresh Prajapati
Bangalore	Dr. H.S. Shivaramu	Dr. D. Sridhar	Ms. C. M. Munirathnamma
Bhubaneswar	Dr. S. Pasupalak	Sri. Sanak Mahapatra.B/ Sri. Gourisankar Panigrahi	—
Bijapur	Dr. H. Venkatesh	Sri. Jagdeesh R. H	Miss. Rajani B. Rajput
Chatha	Dr. B. C. Sharma/ Dr. Meenaxi Gupta, Dr. Vivak M. Arya	Dr. Charu Sharma	Sri. Rajeev Sharma
Dapoli	Prof. V. G. Chavan	Dr. Shinde P. S.	Mr. Naik M. M.
Faizabad	Dr. Padmakar Tripathi/ Dr. A. K. Singh	—	Sri. Arvind Kumar Verma
Hisar	Dr. Diwan Singh, Dr. Mahender Singh	Sri. Naresh Kumar. S	Mrs. Mehnaj Tharranum A.
Jabalpur	Dr. Manish Bhan	Sri. Rakesh Sahu,	Sri. Abhishek Sharma
Jorhat	Dr. R. Hussain/ Dr. B. Goswami	Sri. Kalyan Kumar. Dutta	Sri. Dhrubajyuti Ozah

Kanpur	Dr. A. P Dubey	—	Sri. Ajay Kumar Mishra
Kovilpatti	Dr. A. Solaimalai, Dr. S. Subbulakshmi	Dr. N. Arun Kumar	—
Ludhiana	Dr. Prabhjyot K. Sidhu	Sri. Sunwinder Singh	Sri. Amandeep Kaur
Mohanpur	Dr. Saon Banerjee Dr. Asis Mukherjee	Sri. Agniswar Jha Chakraborty	Sri. Monotosh Das Bairagya
Palampur	Dr. Rajendra Prasad	Dr. Anupam Sharma	Miss. Sweta Sehgal Dr. Nisha Thakur
Parbhani	Mr. Aasman. M. Khobragade	Mr. A. U. Ade	Mr. Vassem M Gouse
Ranchi	Dr. Ramesh Kumar, Dr. Pragyan Kumari	Dr. Bably	Sri. Deepak Anuranjan Tirkey
Ranichauri	Dr. R. G. Upadhyay	-	Sri. Mr. Anil Kala, Sri. Devanand Giri
Raipur	Dr. J. L. Chaudhary	Dr. Praveen Kumar. V	Sri. Sandeep Kumar Chandrawanshi
Samastipur	Dr. I. B. Pandey	Sri. Manish Kumar	Dr. Chandra Mohan Singh
Solapur	Dr. J. D. Jadhav	Shri. B. T. Jadhav	Shri. Ganesh. G. Gadhari
Thrissur	Dr. B. Ajith Kumar	Miss. Sreekala P. P	Miss. Nimi K. M
Udaipur	Dr. N. S. Solanki	—	Sri. Gopal Nai, Ms. Santosh Devi Samota

7.3 Budget allocated for AICRPAM-NICRA during 2014-15

S. No.	Name of the centre	Contingency	TA	Total
1.	Akola	800000	30000	830000
2.	Anand	950000	40000	990000
3.	Anantapur	930000	30000	960000
4.	Bangalore	1000000	30000	1030000
5.	Bhubhaneswar	1405247	40000	1445247
6.	Bijapur	1030000	30000	1060000
7.	Chatha	1006000	30000	1036000
8.	Dapoli	750000	30000	780000
9.	Faizabad	680000	24000	704000
10.	Hisar	700000	25000	725000
11.	Jabalpur	830000	30000	860000
12.	Jorhat	1210000	40000	1250000

13.	Kanpur	1150000	25000	1175000
14.	Kovilpatti	1230000	55000	1285000
15.	Ludhiana	1109000	21000	1130000
16.	Mohanpur	720000	30000	750000
17.	Palampur	1250000	30000	1280000
18.	Parbhani	830000	10000	840000
19.	Raipur	950000	35000	985000
20.	Ranchi	730173	30000	760173
21.	Ranichauri	800000	25000	825000
22.	Samastipur	839580	25000	864580
23.	Solapur	1200000	40000	1240000
24.	Thrissur	1000000	50000	1050000
25.	Udaipur	900000	45000	945000
	Total	**24000000**	**800000**	**24800000**

7.4 Publications

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Glimpses of climate change awareness programs

Solapur

Raipur

Chatha

Bangalore

Bangalore

Dapoli

Hisar

Thrissur

Methods adopted by different centres in AAS dissemination

Ranichauri

Parbhani

Dapoli

Akola

Udaipur

Kanpur

Faizabad

Udaipur

Field demonstrations

Palampur

Kovilpatti

Udaipur

Jabalpur

Jorhat

Raipur

Parbhani

Raipur

Mohanpur

Dapli

Bijapur

Anantapur

Ranichauri

Anantapur


AICRPAM-NICRA
Annual workshop
26-27 August 2014
AICRP on Agrometeorology
Central Research Institute for Dryland Agriculture, Hyderabad, India


AICRPAM-NICRA,
Annual workshop


AICRPAM-NICRA,
Annual workshop
26-27 August 2014


AICRPAM-NICRA,
CRIDA