

# AICRPAM

## At a Glance



**All India Coordinated Research Project on Agrometeorology**

**ICAR-Central Research Institute for Dryland Agriculture**

**Santoshnagar, Hyderabad - 500 059**



## Genesis

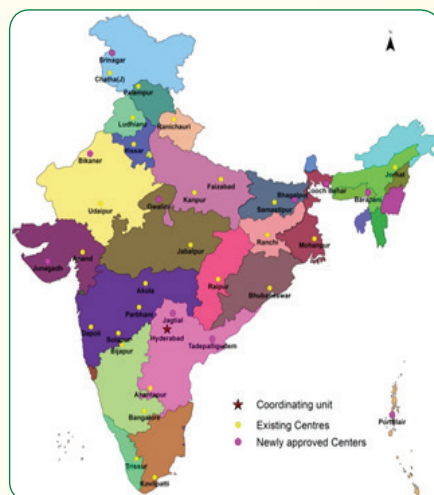
The fruits of tremendous progress made by ICAR and SAUs in agricultural and allied sectors, are unable to perform to their potential due to the often erratic monsoon and frequent extreme weather. Tailoring the Indian agriculture to cope with these weather abnormalities meets augmentation of the future food and nutritional security. This calls for a greater role for discipline of Agricultural Meteorology. Realizing its importance, the National Commission on Agriculture (NCA) in 1976 recommended establishment of Department of Agricultural Meteorology in all SAUs. Consequently, AICRPAM was commissioned at CRIDA, Hyderabad in 1983.

## Mandate

AICRPAM conducts both basic and operational research covering all agro-ecologies. Each centre has one or two mandate crops besides climatic characterization and studies on climate variability/change. Bi-weekly Agromet Advisory Service (AAS) bulletins are issued based on research output from long-term experimentation and are disseminated to farming community through different communication media. Farmer awareness programs on climate change and related issues are conducted regularly. The project consists of 111 staff that includes 37 scientific, 62 technical and 12 administrative.

## Milestones

- Launch of coordinating unit at CRIDA, Hyderabad with 10 cooperating centers - 1983.
- Addition of two more centers - 1989.
- Implementation of Indo-US Sub-project - Infrastructure and capacity building of scientists - 1988.
- Addition of 13 new centers - 1995-96.
- Joint issue of weather-based agro-advisories with NCMRWF - 1990.
- Establishment of national level Agromet Databank - 1998.
- Launch of [www.cropweatheroutlook.in](http://www.cropweatheroutlook.in) website - 2003.
- Network of 100 Automatic Weather Stations (AWS) - 2011.
- Addition of 10 new centers (Provisional) - 2015.



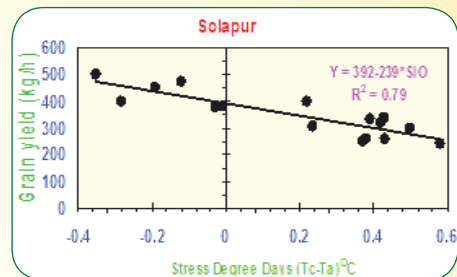
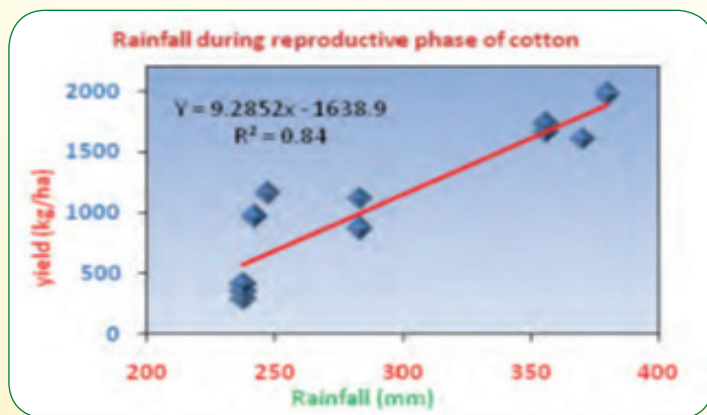
## Objectives

- To study the agricultural climate in relation to crop planning and assessment of crop production potentials in different agroclimatic regions
- To establish crop-weather relationships for all the major rainfed and irrigated crops in different agroclimatic regions
- To evaluate different techniques of modification of crop micro-climate for improving the water use efficiency and productivity of the crops
- To study the influence of weather on the incidence and spread of pests and diseases of field crops

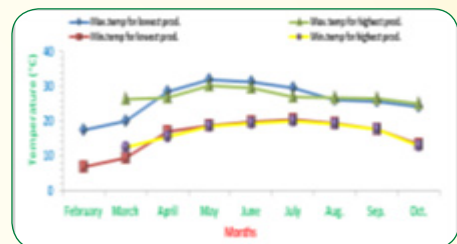
Trends in a) annual and b) kharif season minimum temperature (1971-2009)

## Crop-Weather Relationships

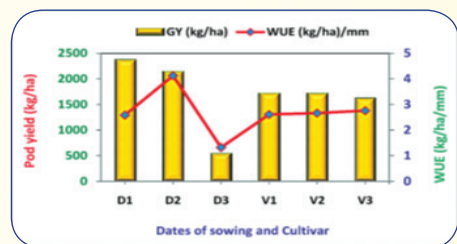
- Phenophase specific critical weather elements were identified for major field and orchard crops spread over various agroclimatic zones. These form basis in designing the location specific agromet advisories.
- Sowing windows were identified using long-term crop weather data for principal crops and agro-climatic zones.
- In eastern India, using block-level daily rainfall, crop statistics and soil information, climatic constraints for low productivity of rice were identified.
- Thematic maps of weekly rainfall and temperature departures as well as soil moisture index (SMI) maps were prepared for contingent crop plans in undivided A.P.
- A dry spell of more than 15 days duration during pod filling stage was identified as climatic risk in rainfed groundnut as it reduced yield by 60-75 per cent.
- Seasonal and stage specific crop water requirement were worked out for important crops, viz., rice (725 mm), wheat (274-467 mm), maize (491-561 mm), sorghum (380 mm), pearl millet (250 mm), finger millet (280 mm), soybean (667 mm), groundnut (494 mm), mustard (301 mm), cotton (310 mm) and chickpea (210 mm).
- Dependence of cardamom productivity in Kerala on water deficit during summer was assessed.
- At Ludhiana, water production functions were developed for wheat, raya, gram, sunflower, soybean, groundnut and greengram.



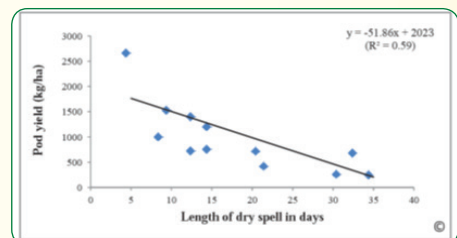
*Stress degree days based relation for optimizing pearl millet grain yield*



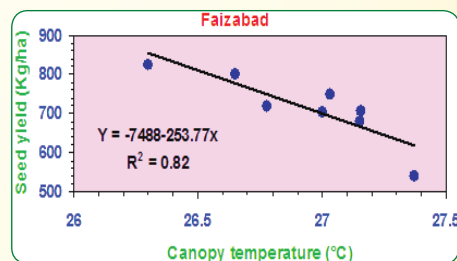
*Critical temperature for tea leaves production at Palampur*



*Relationship between water use efficiency and groundnut pod yields at Anand*

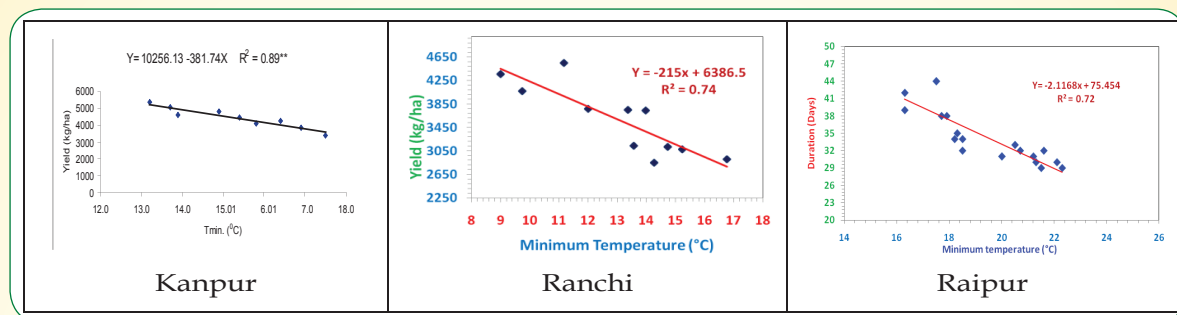


*Influence of length of dry spell during 51-80 ± 5 DAS on groundnut yields at Anantapur*



*Relationship of canopy temperature and yield in mustard at Faizabad*

- Weather based thumb rules during different phenophases of rice and wheat to predict yields were generated.

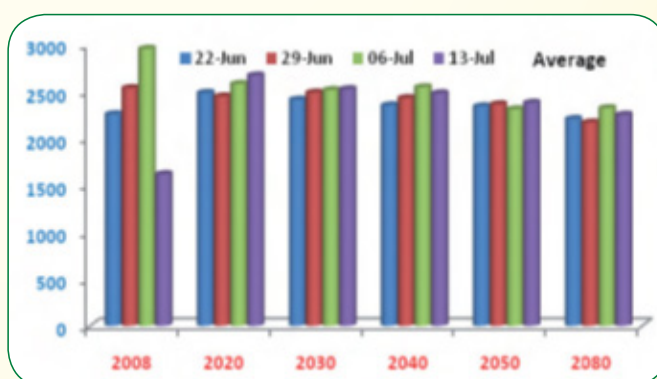


*Effect of minimum temperature during reproductive period on wheat yield*

- Weather indices in wheat, groundnut and cotton required for weather based crop insurance were developed based on long-term experimental data at some centres.

## Crop Growth Modeling

- Process-based crop simulation models, viz., DSSAT, PNUTGRO, BRASSICA, CERES, INFOCROP, WHEATGRO and RODMOD, for major crops like rice, wheat, sorghum, groundnut, soybean and mustard were validated and customized for different agro-ecologies.
- Database on phenology, dry matter partitioning and GDD requirement of crops viz., rice, wheat, maize, sorghum, pearl millet, finger millet, pigeonpea, chickpea, soybean, cotton, groundnut, green gram, mustard, sunflower, safflower and amaranthus was created.
- Formats for collection of minimum data set (MDS) for 16 major crops was initiated. The MDS format facilitates data usage in crop weather relations, crop simulation modeling and development of insurance products.
- Annual rainfall data of 1140 stations in rainfed districts of the country were analyzed and regions vulnerable to climate change were identified. The impacts of climate change on crop water requirement and length of growing season of wheat in Indo-Gangetic Plains and on yield of major crops in other regions were studied.
- Climate change impact on rice and wheat crops were studied for several locations using DSSAT 4.5 model. A 2 °C increase resulted in 15-17 per cent decrease in grain yield of both crops but beyond that limit the decrease was very high in wheat in Punjab. Management options like adjusting planting time to minimize yield losses were assessed for different crops and locations through modeling.

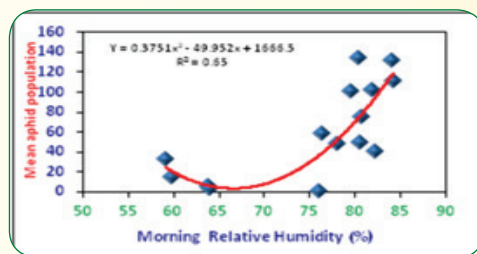
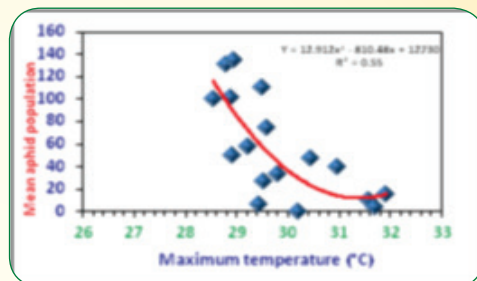


*DSSAT-rice predicted yields for different planting conditions at Ranchi*

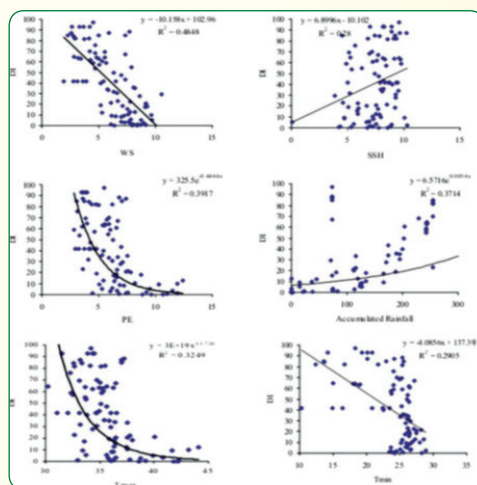


## Weather Effects on Pests and Diseases

- Using long-term experimental data, relations were developed for forewarning the incidence of various insect pests and diseases. For example, DSS for management of bacterial leaf spot in grapes, powdery mildew incidence in ber were developed for Bijapur and, for aphid incidence in sunflower at Akola. Location specific critical weather parameters favouring several diseases in different crops were identified.
- Crop specific pest-disease-weather relationships were developed for 14 targeted insect pests and 12 diseases in six crops. A decision support model for leaf spot in groundnut, a degree-day model for aphids in mustard and neural network model for yellow stem borer in rice and American boll worm in cotton were developed.
- The hotspot areas of tea mosquito bug across the cashew cultivated regions of the country were demarcated considering optimum night temperatures during flushing and flowering stage by Thrissur centre.
- RH of about 90 per cent, night temperature less than 20 °C and cloudy conditions favoured the development of blast disease in rice at Palampur.
- Maximum temperature in the range of 30 to 31 °C, minimum temperature 23 to 24 °C, morning relative humidity of 91 to 92% and evening relative humidity of 62 to 63% were found congenial for peak semi loopers population in soybean at Akola.



*Relationship of Tmax and morning RH with sunflower aphid incidence at Akola*



*Leaf curl disease incidence in cotton in relation to meteorological parameters at Hisar*

## Agromet Advisories

- All centers issue Agromet Advisory Services twice a week, regularly.
- Issue of micro-level (block level) agromet advisories has been initiated at six centers viz. Bijapur, Bhubaneswar, Udaipur, Raipur, Kovilpatti and Jammu.
- National Agromet Advisory Service bulletins are issued in collaboration with IMD during southwest monsoon since 2014.
- Bulletins on status of monsoon and contingency plans for rainfall deficit/excess areas during southwest monsoon season are issued.
- About 370 farmers' awareness programs were conducted to educate on the ill-effects of climate change and management practices to mitigate their adverse effects. All put together, 55912 farmers (Male-44246, Female-11666) were benefitted.
- Economic impact of Agromet Advisory Services are monitored regularly.

- A comprehensive study on hailstorms was made by analyzing long-term hailstorm data of different states of the country.
- A comprehensive bulletin on district-level crop weather calendars of major crops in India was prepared.
- Bulletins on agrometeorology of important crops in different states/agro-climatic regions were prepared by analyzing long-term experimental data of individual AICRPAM centers. These include - soybean (Vidarbha, Maharashtra); wheat (Southern region of Rajasthan and Eastern and Chhattisgarh); mustard (Haryana and W.Bengal); finger millet (Southern Karnataka (Tamil Nadu) and *rabi* sorghum (western and northern region of Karnataka).



- During 1972-2011, highest frequency (>30) hail events are noticed in: Nagpur (MH), Shimla (HP) & Kamrup (Assam)
- Hailstorm can occur sporadically in India as a local phenomenon or even cover large geographical areas as it happened during 2014



- A website [www.cropweatheroutlook.in](http://www.cropweatheroutlook.in) is in operation at AICRPAM Coordinating Unit (CRIDA) for better dissemination of weather-based agro-advisories prepared at Cooperating Centres of Project. In this website, weekly crop contingency plans for rainfed regions at the country level are provided and the website has been hyperlinked to ICAR website at Headquarters.
- Another website [www.aicrpam-nicra-aws.in](http://www.aicrpam-nicra-aws.in) displays real time and past 24 hours weather data from 100 locations of the country.



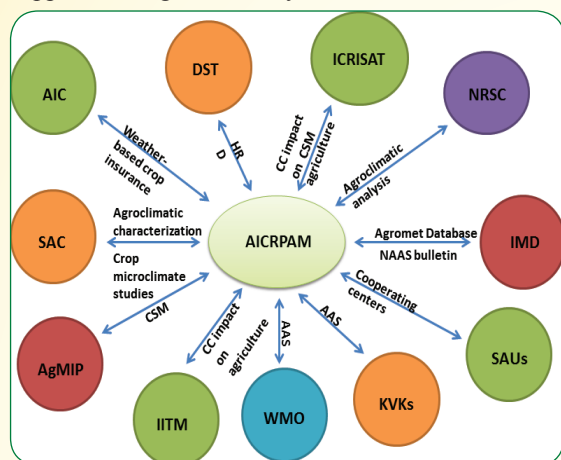
- About 53 training programs were conducted for scientists in the project as well as the scientists from other agricultural institutions and universities.
- To enhance the skills of the project scientists, recently three ‘output oriented capacity enhancement programs’ were conducted.

- WeatherCock v1.0 - to analyze climatic data for characterizing crop growing environments.
- PET Calculator v3.0 - to estimate the potential evapotranspiration demands by using appropriate approach depending on the data availability of a given location.
- Relator v1.0 - to estimate the reliability of estimated/derived dataset by comparing with original/observed dataset using 16 statistical tools.



## Linkages

Over the past 30 years, AICRPAM developed linkages with various State, National and International Institutions, Agencies for improving research, infrastructure development, technical support and Agro Advisory Services.



## Publications

Type of Publications	Cooperating Centres	Coordinating Unit
Books	50	11
Book Chapters	148	51
Bulletins / Manuals	257	40
Research Papers	2987	235

## Awards

For outstanding work on climatic variability and development of real-time contingency plans, AICRP on Agrometeorology was awarded Chaudhary Devilal outstanding All India Coordinated Research Project award-2013 by ICAR.



## Future Plans

- Strengthening of agromet databases at individual centres for improving regional / micro-level planning.
- Preparation of State-wise Agroclimatic Atlas for all the states and weather-based DSS for major crops in different seasons.
- Studies on climate extremes and their probabilities, delineation of hotspots and regions vulnerable to climate change and their impact on agricultural crops.
- Value addition to agromet information for improving the efficiency of agromet advisories and its dissemination in local languages using latest ICTs.
- Development of drought monitoring indicators by combining the climate and remote sensing information and preparation of drought vulnerability maps.
- Development of simple crop-weather relationships for use in AAS.
- Studies on dynamics of pests and diseases in a cropping system mode as influenced by weather for development of thumb rules for forewarning models and Decision Support Systems, which are farmer-friendly and economically viable.
- Development of weather based insurance products for different crops.
- Modeling impacts of climate change / variability on agricultural systems.
- Agrometeorological studies in horticulture, livestock and agriculture in hill (northeast) and island regions.

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