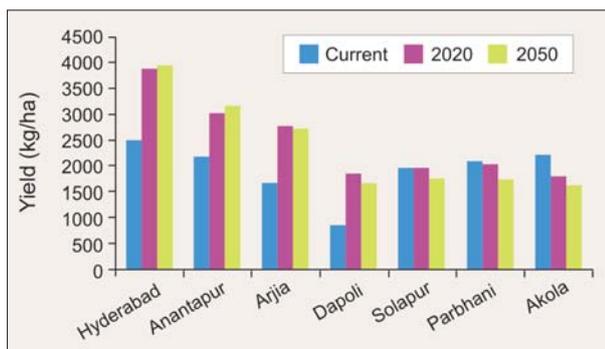


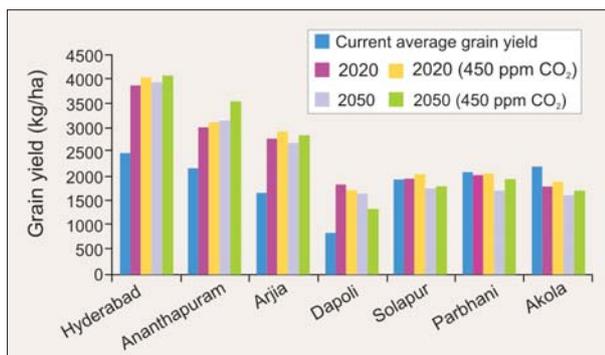
4. Climate Change

Climate variability in terms of uncertain or delayed rainfall, floods and changing temperature will have effects on crops, milk yields and fisheries, and it is an accepted reality. Therefore, planning and implementing mitigation and adaptive measures through systematic research are important to meet future challenges of food and livelihood security.

Climate change impacts on maize in the rainfed areas: Predictions on performance of maize (variety PB 8) under climate change scenarios using Had CM3: A2a Scenarios were made for 2020 and 2050, and the effects of enhanced CO₂ were tested for the current at 360 ppm and of the future at 450 ppm levels using the Decision Support-System for Agrotechnology Transfer (DSSAT) crop simulation model. Maize, being a C₄ plant, is expected to perform positively under changing temperature and rainfall conditions during 2020 and 2050. Simulations were made for representative locations at Hyderabad, Anantapur (Andhra Pradesh), Dapoli, Parbhani, Solapur and Akola



Simulated grain yield of rainfed maize (cv. PB 8) (current and future projections)



Rainfed maize (cv. PB 8) grain productivity under enhanced CO₂ (450 ppm) scenario at different dryland locations

(Maharashtra) under the peninsular region. Results revealed that the increase in maize yield would be about 23 and 18% during 2020 and 2050, respectively, compared to current yields. Similarly, simulation using CO₂ level of 450 ppm predicted gains in maize yield

Impact of climate change in Nicobar Islands

Since Nicobar Islands lie in the most severe seismic zone (Zone V), the adaptation strategies need to be evolved not only for gradual sea-level rise but also for storm surges, tsunamis and flooding due to land subduction. The estimation of extent of area likely to be affected with increase in sea-level, as estimation using Shuttle Radar Topography Mission (SRTM) digital elevation maps (DEM) shows that the loss of land would be maximum (13.3%) in Chowra where over 13% of island will be inundated with a 0-10 m high surge. The intensity of cyclones in a region has a direct correlation with the sea surface temperature (SST). For the satellite derived sea surface temperature data, the SST maps from the NASA JPL-PODAAC site with 4.63 km spatial resolution covering the area surrounding the A&N Islands were accessed and processed using ERDAS-IMAGINE and ARC-GIS software. The increase in SST (0.75-1.25°C) during April–July 2010 resulted in mass bleaching of corals in Nicobar district. Climate change-induced increase in rainfall or seawater ingress would lead to erosion, leaching of salts and salination of coastal lands, rendering the soil unproductive for agriculture. The coastal plains and hill slopes of Nicobar group of islands are highly vulnerable to such events. The southeast coast of the Great Nicobar Island is particularly vulnerable to sea-level rise and associated sea surges, which would affect the marine lives in general and giant leather back turtle in particular. The fishery in Nicobar Islands is entirely capture based. Though 14% of active fishers and fishing crafts of the Union Territory are in the Nicobar group of Islands, they constitute just 2% of the total catch.

to be 27 and 21% during 2020 and 2050 respectively.

Adaptation in camel: Based on temperature humidity index (THI), the camel adaptability was better during evening time compared to morning time.

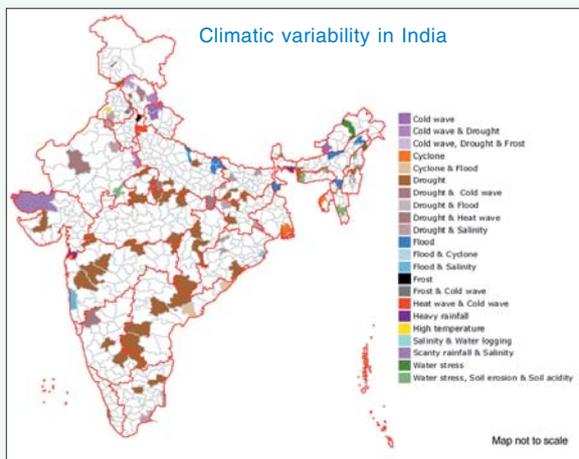
Impact on poultry production: The high ambient temperature during summer significantly decreased the fertility and hatchability in chickens. The immune response to Newcastle disease vaccine and sheep red blood cell antigen was significantly less during high (summer) and low (winter) ambient temperatures. Haemoglobin and total erythrocyte counts were low and heterophyll:lymphocyte (H:L ratio) lipid peroxidation level and serum calcium levels were higher during high ambient temperatures. High ambient temperature adversely affected the semen quality of broiler breeders. The body weight of normal broiler chicken was higher as compared to naked neck chickens in low ambient temperatures.

Impact of cyclone 'Laila' on shrimp aquaculture: To assess the impacts of extreme climatic events on shrimp farming, impact of cyclone 'Laila' was studied

National Initiative on Climate Resilient Agriculture

The ICAR has launched 'National Initiative on Climate Resilient Agriculture' (NICRA) with the objectives of undertaking strategic research on climate change adaptation and mitigation, technology demonstration on farmers' fields to cope with the current climate variability and capacity building of different stakeholders on climate change awareness. The scheme was launched during February 2011.

The project was implemented at all the participating Institutes during 2011-12. The key infrastructure facilities to be set-up include high throughput phenotyping platforms at the IARI, New Delhi; CRIDA, Hyderabad and IHR, Bengaluru, open air temperature and carbon dioxide elevation systems, animal calorie meter with waste disposal system, climate control walk-in plant-growth chambers and fully equipped research vessel for studying marine fisheries. Most of these equipment and facilities are under commissioning, and will be ready by March 2012. Under strategic research, large number of germplasm of major food crops are being phenotyped for multiple abiotic stresses like drought, heat and low



temperature during *khari* 2011-12 at different locations. Experiments on carbon sequestration and conservation agriculture have been initiated at several locations as a mitigation strategy. Real-time pest and disease surveillance studies were initiated at several locations in relation to weather factors. Likewise, studies on impact of climatic factors on both freshwater and marine fisheries were started both under controlled and field conditions. The complete life cycle analysis and carbon and energy foot-prints of coastal aquaculture are being worked out.

Demonstrations of the available technologies on farmers' fields with a participatory approach in 100 climatically vulnerable districts of the country to cope with the climate variability are being conducted. This programme has been launched in 60% of the districts involving local stakeholders at village, block and district levels. Simple interventions like supplemental irrigation through harvested rain water, planting of drought tolerant and short duration

varieties made significant difference to the production and income of the farmers in the villages exposed to drought and delays in monsoon. Automatic weather stations are being established in the KVK premises to enable subject-matter specialists in the KVKs to generate agro-advisories on the real-time basis. Block-level advisories are being pilot tested in a few districts.

Under the sponsored and competitive grants component, 31 projects were sanctioned with a total outlay of ₹ 24.2 crore, covering key areas like impact of climate change on pollinators, germplasm collection from climate hot-spots, hail-storm management, estuarine fisheries and socio-economic impacts on climate change.

in Prakasam district, Andhra Pradesh. Shrimp farming areas like Maddipadu, Ongole and Kothapatnam received the highest rainfall of 51, 32.3 and 25.8 cm, respectively, on a single day and rivulets Gundlakamma, Addavagu and Pothurajukalva were flooded. Heavy gusty winds with speed of 115–125 km/hr damaged the infrastructure in farms. Siltation to an extent of 15.1–30.3 cm (1–2 feet) was observed on the pond bottom and turbidity also increased. A sudden decrease in salinity of source waters from 48-50 ppt to 18-20 ppt was registered, and use of this water created stress to the shrimps in upland ponds that were not flooded. These outcomes indicated the need of planned adaptation measures by the Government to mitigate

severity of impact and provide relief measures on par with agriculture.

Resilience in shrimp: Culture trials of banana shrimp, *Fenneropenaeus merguensis*, as an alternate species to monoculture of tiger shrimp, *P. monodon*, was taken up during summer and winter crops in the brackishwater farm at Danti, to find climate resilient species for brackishwater aquaculture in different agro-climatic zones. Production of banana shrimp with biosecured aquaculture was more successful during winter crop for Gujarat region, and the culture was economical even at a low stocking density (10 post larvae/m²).