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NICRA Project and Its Impact on Farmer's Practices – A Study in Cachar District of Assam

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Abstract – Climate change has become an important area of concern for India to ensure food and nutritional security for growing population. The impacts of climate change are global, but countries like India are more vulnerable in view of the high population depending on agriculture. In India, significant negative impacts have been implied with medium-term (2010-2039) climate change, predicted to reduce yields by 4.5 to 9 percent, depending on the magnitude and distribution of warming. Since agriculture makes up roughly 16 percent of India's GDP, a 4.5 to 9% negative impact on production implies a cost of climate change to be roughly up to 1.5 percent of GDP per year. The Government of India has accorded high priority on research and development to cope with climate change in agriculture sector. With this background, the ICAR has launched a major Project entitled, National Initiative on Climate Resilient Agriculture (NICRA) during 2010-11 with an outlay of Rs.350 crores for the XI Plan. The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management. The project consists of four components viz. Strategic Research, Technology Demonstration, Capacity Building and Sponsored/Competitive Grants. The project has made significant initial impact and was well received in most of the districts. Technologies such as on-farm water harvesting in ponds, supplemental irrigation, introduction of early maturing drought tolerant varieties, paddy varieties tolerant to sub-mergence in flood prone districts, improved drainage in water logged areas, recharging techniques for tube wells, site specific nutrient management and management of sodic soils, mulching, use of zero till drills were enthusiastically implemented by the farmers in NICRA villages across the country. The intervention which found tremendous support across the country was the custom hiring centres. The NICRA project has been implemented in the five districts of Assam namely Dhubri, Cachar, Sonitpur, Dibrugarh and Karbiyanglong. In Cachar NICRA project was implemented by the KVK in the year 2011-12 till 2016-17. Under NICRA project in Cachar district various technologies were demonstrated in the site such as varieties which are flood tolerant, short duration varieties to escape flood situations, generation of subsidiary income etc. Many technologies have been widely accepted by the farmers. Despite various constraints while implementation of the project it left a significant impact on farmer's practices.

Key Words: NICRA, Climate, Flood, Cachar

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NATIONAL INNOVATIONS ON CLIMATE RESILIENT AGRICULTURE:

The National Innovations on Climate Resilient Agriculture (NICRA) is a network project, launched in February, 2011 by the Indian Council of Agricultural Research (ICAR). It aims to enhance resilience of agriculture sector to climate change and vulnerability by the means of strategic research and technology demonstration. Various researchs on adaptation and mitigation includes crops, livestock, fisheries and natural resource management. It consists of four components which are Strategic Research, Technology Demonstration, Capacity Building and Sponsored/Competitive Grants.

On 2nd February 2011 the NICRA project was formally launched by the Hon'ble Union Minister for Agriculture & Food Processing Industries Shri Sharad Pawarji.

BACKGROUND

Significant negative impacts have been implied with medium-term (2010-2039) climate change, which has predicted reduction in yields by 4.5 to 9 percent, on the basis of magnitude and distribution of increase in temperature. As agriculture contributes 16 percent of India's GDP, a 4.5 to 9% loss in production leads to decline GDP up to 1.5 percent per year. The Government of India has

given high priority on research and development to deal with with climate change in agriculture sector. For this, the ICAR has launched a major Project entitled, **National Initiative on Climate Resilient Agriculture (NICRA)** in 2010-11 with an outlay of Rs.350 crores in the XI Plan.

OBJECTIVES OF NICRA:

- To improve the resilience of Indian agriculture covering different sectors like crops, livestock and fisheries to climatic variability and change by developing and application of improved production and risk management technologies
- To improve the capacity building of scientists and other stakeholders in climate resilient agricultural research and its application.
- To demonstrate location specific technology packages on farmers' fields for adapt to current climate risks

OBJECTIVES OF THE PRESENT STUDY:

1. Various strategies designed under the project for building climate resilience
2. Changes in agricultural practices after the implementation of NICRA project in Cachar district of Assam

1. Various strategies designed under the project for building climate resilience

Strategic Research

The strategic research has been planned at the research institutes of ICAR in a network approach covering crops, horticulture, livestock, and natural resource management and fisheries sectors. Initially the project is focusing on crops like wheat, rice, maize, pigeonpea, groundnut, tomato, mango and banana; among livestocks cattle, buffalo and small ruminants and both marine and freshwater fish species having economic significance.

The researches were initiated during the year 2011-12. The major stress given during the year was on building infrastructure like high throughput phenotyping platforms, the free air temperature elevation systems in open fields, environmental growth chambers having CO2 and temperature controls and the special caloric metric system to study livestock response to heat stress. For the first time in Asia these unique facilities were set up. In order to identify sources of tolerance to climatic stresses and related genes and traits in target crops like rice, wheat, maize, pigeonpea, tomato and mango, core sets of genetic resources were assembled and field phenotyped. Under this, all the germplasm of wheat with NBPGR has been multiplied for field phenotyping for the very first time and currently under evaluation. Also country wide studies have been initiated to understand the impact of temperature on flowering behaviour of mango. Moreover nationwide pest surveillance and monitoring system has been put in place for the target crops where major pests and diseases incidence is being monitored along with weather parameters in order to build pest warning models. Also the methods for measurement of greenhouse gas emissions in the marine ecosystem have been standardized and carbon sequestration potential through agro forestry systems in the country is being quantified. The monitoring of experiments on conservation agriculture in different production systems is started to assess the adaptation and mitigation potential of CA practices. In order to prepare a vulnerability atlas the vulnerability of all the rural districts in the country (about 540) is being quantified in terms of exposure, sensitivity and adaptive capacity.

TECHNOLOGY DEMONSTRATION

This component deals with demonstrating proven technologies for adaptation of crop and livestock production systems to climate variability.

It is implemented in selected susceptible districts of the country through location specific interventions by Krishi Vigyan Kendras in a participatory mode. NICRA project is implemented in 100 districts involving over one lakh farm families across the country.

The districts are selected based on the following criteria alongwith the strength of the KVKs:

- Drought proneness based on 30 years rainfall data (Source : IMD)
- Cyclone proneness based on frequency as recorded by IMD/State Disaster Management agencies.
- Flood proneness based on IMD data and NDMA maps.
- Vulnerability to heat wave and cold wave based on IMD grid data on temperatures.
- Actual incidence of floods and droughts as recorded by AICRPAM centers

After the PRA to assess the climate related problems in the village and baseline survey the interventions in the village panchayats are finalized following a participatory approach through the Village Climate Risk Management Committee (VCRMC). With the involvement of the state line department functionaries and leaders of the

panchayats the activities are implemented to ensure local ownership.

There are four types of interventions which are as follows :

1. **Natural resources management**

2. **Crop Production**.

3. **Livestock and Fisheries management**

4. **Institutional Interventions**

One of the unique quality of this project is setting up of custom hiring centers in all the 100 villages and formation of Village Climate Risk Management Committees (VCRMC). For every intervention, it is planned to work out the carbon, water and energy foot prints.

Sponsored and competitive grants

In this component, crucial researchable issues like impact on plant pollinators, fisheries in esturian habitats, hail storm management, hill and mountain eco-system, small ruminants and socio economic aspects of climate change etc. are provided with the research grants.

Capacity building

The capacity building of young scientists on simulation modeling, high through put phenotyping, greenhouse gasses measurement, etc. is being taken up through training programs organized in India and sponsoring scientists abroad. More than 100 training programs have been organized in the country covering 50000 farmers to create awareness on climate change and variability.

Capacity building programmes are planned for different stakeholders are as follows:

1. Scientists

2. Line department officers-

3. Farmers, NGOs, Self Help Groups (SHGs)

4. Development Banks, Co-operative Societies and Insurance Companies

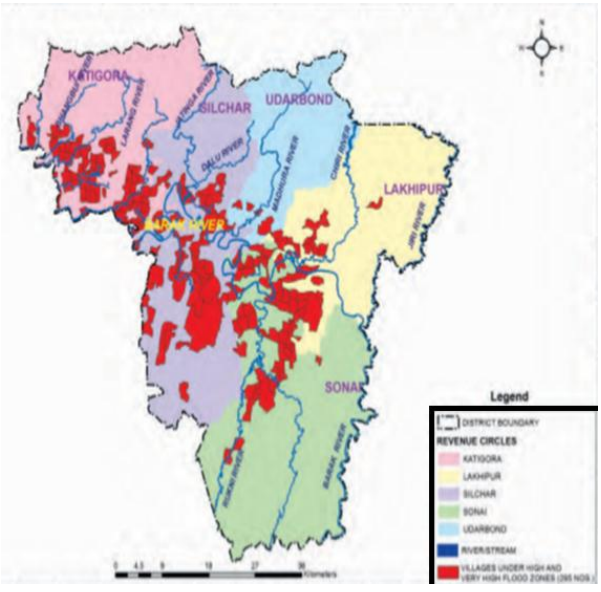
5. Policymakers

2. Changes in agricultural practices after the implementation of NICRA project in Cachar district of Assam

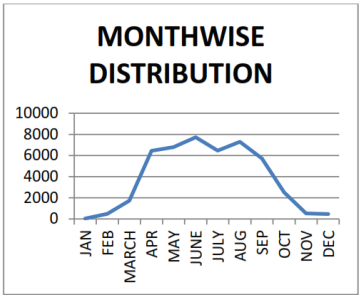
The NICRA project has been implemented in the five districts of Assam namely Dhubri, Cachar, Sonitpur, Dibrugarh and Karbiyaglong. Basically the village was selected based on vulnerability of agriculture to climate variability. The village which was relatively more vulnerable to climate like prolonged drought, dry spells, flood, extreme rainfall events, hailstorms, extreme temperature etc were selected. In the state of Assam the Barak valley zone is situated at the southern part and consists of three districts viz., Cachar, Karimganj and Hailakandi. it has an altitude of 16-17 m above MSL and falls under 24°8' and 25°8' N latitude and 92°15' and 93°15' East Longitude. Moreover the valley is characterized by excessive humidity and average rainfall of the zone is 3180 mm with average rainy days of 146 per annum (Bhattacharjee and Dutta, 2010). The flood is a recurrent natural calamity of Barak valley zone. Generally it occurs from the month of April – May. So farmers quite often loss their autumn rice during harvesting time, which are the major crop of the farmers of flood prone area. In order to reduce the losses incurred by farmers due to flood, the NICRA (National Initiative on Climate Resilient Agriculture) project is implemented in one of the village – Salchapra- I of Cachar district. An investigation was carried out to determine the impact of the implementation of climate resilient agricultural technologies on change in farming practices of the farmers of this village.

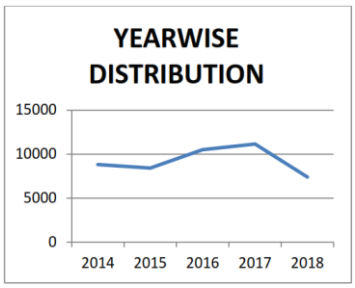
Cachar District

- Area - 3,786 Sq. Km
- Total Population (Census 2011) - 17,36,319
- Latitude - 240 22’ N & 2508’ E
- Longitude - 920 24’ E & 93015’ E
- Altitude - 36.5 MSL
- High and Very high flood prone area – 41.70%



R.F Data of Barak Valley (In mm)





YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2014	0	60.9	107.7	373.8	1682.5	1736.4	1766.3	1353.3	1470.7	259.9	2.8	0
2015	10.7	40.9	77.9	1465.5	1055	1243.7	1112.4	1938.7	1044.1	358.2	41.7	38.8
2016	20.4	186.2	244.6	2285.7	1796.9	1281.1	1308.6	974.1	1444.7	516.1	405.1	37
2017	0	160.8	959.1	1653	1139.9	1984.8	1313.5	1806.8	765.2	1002.9	46.5	311
2018	12	39.8	349.7	675.1	1125.5	1472.4	962.6	1224.5	1006.1	387.8	35.7	92.5

METHODOLOGY

- Secondary information's on NICRA were collected from the Krishi Vigyan Kendra, Cachar
- A total of 60 farmers were selected randomly from the NICRA project site who were beneficiary of the project
- The information was collected on the basis of personal interview to each of the surveyed farmers

DIFFERENT TECHNOLOGIES DEMONSTRATED UNDER MODULE NATURAL RESOURCE MANAGEMENT

- Mulching in potato for soil moisture conservation
- In-situ moisture conservation with green manuring crop Dhaincha, in rice–rice system
- Construction of vermicomposting unit
- Preparation of compost pit
- Soil health cards issued 250 nos.

DIFFERENT TECHNOLOGIES DEMONSTRATED UNDER MODULE CROP PRODUCTION

- Potato variety Kufri Jyoti
- HYV of Toria variety *TS-36*
- Sesame variety *ST-1683*
- Introduction of Summer Paddy var. Swarnabh and Dinanath
- Flood tolerant paddy variety Panindra
- Flood tolerant paddy var. Jalkuwari
- Demonstration on Blackgram
- Flood tolerant paddy variety Jalashree
- Mixed Cropping (Potato with Rajmah)
- Introduction of short duration rice variety Dishang in Ahu season
- Post flood Sali rice var. 'Dishang'
- Rajmah variety Phorash
- Glutinous rice variety *Aghuni Bora*
- Cultivation of Colocasia var. Ganga
- Protected Cultivation

DIFFERENT TECHNOLOGIES DEMONSTRATED UNDER MODULE LIVESTOCKS AND FISHERIES

- Improved annual fodder crops demonstrated (Hybrid Napier)
- Introduction of improved breed of goat (Crossbred Beetal)
- Introduction of Vanaraja breed for backyard Poultry farming
- Introduction of Kalinga Brown breed for backyard Poultry farming
- Integrated farming system (Fish cum Duckery)
- Composite Fish Farming
- Netting of Fish Ponds
- Animal health camp taken up

DIFFERENT TECHNOLOGIES DEMONSTRATED UNDER MODULE INSTITUTIONAL INTERVENTIONS

- Seed bank developed Paddy var. Gitesh

- Custom hiring centre
- Training programmes covering 1660 participants
- Other extension activities like Field Visit, Diagnostic visits, Agro advisory services, Group discussion, Exposure visits, Field Day, Method demonstration and Awareness Programme covering 1996 participants

SUCCESSFULL AND WELL ADOPTED INTERVENTIONS

Intervention		Yield (kg/ha)	Gross cost (Rs/ha)	Gross return (Rs/ha)	Net income (Rs/ha)	BCR
Potato variety kufri jyoti	Before	6,000	45,000/-	60,000/-	15,000/-	1.33
	After	9,450	55,000/-	94,500/-	39,500/-	1.72
Flood tolerant paddy var. Panindra	Before	2,600	16,000/-	20,800/-	4,800/-	1.30
	After	3,850	17,500/-	30,800/-	13,300/-	1.76
Flood tolerant paddy var. Jalkuwari	Before	2,600	16,000/-	20,800/-	4,800/-	1.30
Flood tolerant paddy variety jalashree	Before	2,600	16,000/-	20,800/-	4,800/-	1.30
	After	4,300	41,000-/	56,330/-	15,330/-	1.37
Short duration rice variety dishang (ahu and post flood)	Before	2,600	16,000/-	20,800/-	4,800/-	1.30
	After	3,850	18,000-/	30,800/-	12,800/-	1.71
Improved package of practice of the local rajmah var. Phorash	Before	1,200	20,000/-	36,000/-	16,000/-	1.80
	After	1,600	22,000-/	48,000/-	26,000/-	2.18

Intervention		Gross cost Rs./100 birds	Gross return Rs./100 birds	Net income Rs./100 Birds	BCR
Introduction of Vanaraja breed for backyard poultry farming	Before	10,100/-	6,000/-	4,100/-	2.16
	After	18,280/-	10,290/-	7,990/-	3.47
Introduction of Kalinga brown breed for backyard poultry farming	Before	10,100/-	6,000/-	4,100/-	2.16
	After	21,000/-	11,750/-	9,250/-	3.70

Composite fish farming	No./ha	Gross cost (Rs/ha)	Gross return (Rs/ha)	Net income (Rs/ha)	BCR
Before (Common Carps)	15,000	4,96,875/-	3,00,000/-	1,96,875/-	2.9
After (IMC and exotic carps)	10,000	7,74,623/-	4,40,223/-	3,34,400/-	3.16

SHIFTING OF FARMER'S PRACTICES

INTERVENTIONS	No. of farmers	Area (ha/nos.)
Potato variety Kufri Jyoti	16	2.26
Before NICRA	16	2.26
Flood tolerant Paddy var. Panindra	9	2
Before NICRA	42	27.30
Flood tolerant Paddy var. Jalkuwari	4	1.33
Short duration Paddy var. Dishang (Ahu and post flood)	30	13
Flood tolerant Paddy var. Jalashree	14	3.5
Before NICRA	30	2
Improved package of practice of the local Rajmah var. Phorash	15	3
Before NICRA	15	3
Cultivation with recommended package and practices Colocasia var Ganga	14	1.2
Before NICRA	25	1.3
Protected Cultivation	18	0.4
Before NICRA	-	-
Introduction of Vanaraja breed for backyard Poultry farming	28	500
Before NICRA	17	230
Backyard Poultry Farming (Kalinga Brown)	18	300
Before NICRA	17	230
Composite Fish Farming	12	1.5
Before NICRA	12	

OTHER INTERVENTIONS IN PRACTICE

Integrated farming - Fish cum duck

Mulching in potato

Zero tillage in rapeseed

Fodder production

SUMMARY OF IMPACT (NICRA PROJECT)

Knowledge about new varieties and POP

Popularization of flood situation varieties

Learning about improved practices

Establishment of CHC reduced cost of farm mechanization

Formation of VCRMC – systematic and planned approach of addressing farmers issues

Subsidiary income generated

CONSTRAINTS

Farmers were reluctant to new varieties and technology initially

Some practices could not be demonstrated due to social restrictions

Shifting of livelihood from farming to other means

Dependence for inputs

Misuse of inputs

CONCLUSION

NICRA – important project since specific to climate related problems

In Cachar- introduced new varieties and practices

Short duration variety Dishang highly adopted

Farmer's knowledge enhanced and subsidiary income generated

Social and psychological constraints are there

Success depends on cooperation of implementing agency and farmers

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