



Newsletter



TOWARDS CLIMATE RESILIENT AGRICULTURE

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INTRODUCTION

National Innovations in Climate Resilient Agriculture (NICRA) is a network project aims at enhancing resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. Technology Demonstration Component is one of the programmes of this network project through which demonstrations are conducted with site specific technology packages on farmers' fields for adapting to current climate vulnerability. Both short and long term output is expected from the project pertaining to new and improved varieties of crops, livestock breeds, management practices that help in adaptation and mitigation and inputs for policy making to mainstream climate resilient agriculture in the developmental planning. Under Technology Demonstration Component, seven districts of Bihar, six of Jharkhand, three of West Bengal and one of A & N Islands were selected. Enhancing resilience

is the key to achieve sustainability in agriculture especially in the context of climate vulnerability. The NICRA-village was selected based on vulnerability of agriculture to climatic variability. The climatic vulnerability of the village (droughts, floods, heat wave, cold wave etc) represents that of the district. The multidisciplinary team of KVK analyzed the constraints related to climatic variability based on secondary weather data, resource situation, farming systems and agricultural yields in the past few years. The major constraints resulting from climatic variability includes; water scarcity, recurrent droughts, cold wave, heat wave, flood, pest and diseases of crop and livestock, fodder scarcity, poor access to appropriate seeds/planting material and critical inputs and farm machinery. Focus group interactions were organized with the community and finalized the interventions were implemented under four technological modules viz., Natural Resources, Crop Production, Livestock and Fisheries and institutional Interventions.

KVK PORT BLAIR

CARI-AMA-Green and CARI-AMA-Red drought tolerant leafy vegetables and CARI-Poi selection for saline soil

The Amaranthus has partial tolerance to drought, partial shade and problematic soils. The improved genotypes CARI AMA-Green

and CARI-AMA-Red which were bred for yield and dietary micronutrients also showed better performance for drought tolerance in field situation. These are promising genotypes and showed better performance in field condition. CARI-AMA-Green recorded yield of 7.2t/ha followed by CARI-AMA-Red 7.0t/ha which was 21%



higher yield as compared to local check, in the soil having EC 0.25 dSm⁻¹ with an average temperature 32-35°C and 72-75% Relative humidity during crop period. Poi (*Basella alba* L) variety - CARI-Poi Selection with high yield potential and is tolerant to diseases and pests. This variety showed better performance on raised beds in heavy rains conditions and also showed partial tolerance to drought situation in the field. This genotype has the potential to be grown in climate change affected regions for higher

primary productivity, field tolerance to abiotic stresses (water logging, drought, low level of salinity and acidic soils) and acceptance among the



local communities. CARI-Poi selection recorded yield of 5.4t/ha which was 32% higher yield as compared to local check (Green pole type)

KVK AURANGABAD

Chick birds rearing for livelihood for Maha Dalit

Harigoan village belonging to Goh block of Aurangabad district, Bihar is adopted under NICRA project entitled sustainable livelihood improvement through backyard poultry and livestock



development in Aurangabad. More than 80% of the population is backward cast and 10% having

other caste. Almost all families totally depend on monocropping system of rice and wheat. Whereas rice production is fully depend on onset and delaying of monsoon. There are no irrigation facility particularly ponds, well before launching NICRA project. The maximum family income never goes beyond Rs. 5,000/- per annum of individual family. Keeping in view the prevailing situation of poor village, 1500 chick birds are distributed among fifty farmers under NICRA project. The popular breed *Vanraja* and *Grampriya* obtained from poultry seed production (PSP) B.V. College, Patna-14 having 35 days were distributed to all the fifty farmers. The family members constructed small house by bamboo and mud. During first 10 days chicks were offered so feed and sufficient drinking water. Below Poverty Line (BPL) farmer got

30 chick birds in which 30% of chicks died after few days. Among which 21 chicks were left. Seventeen females and four males after six months



onward she collected at least 9 eggs per day. It was found the total number of eggs collected on 2642 out of 2100 eggs were sold in their own village @ Rs. 5 each after 8 months of laying. The total earning from chicks rearing during this period was Rs. 14,400/- including the sale of male birds.

KVK BANKA

Community lands for berseem as fodder production during droughts & floods

Berseem is an annual leguminous fodder crops. It is one of the most suitable fodder crops. It remains soft and succulent at all stages of growth. It can be grown



without irrigation in areas with high water table and under water-logged conditions. NICRA launched in Merha village of Banka district where KVK scientists introduced berseem cultivation in village. The farmers have shown berseem on 0.2 ha community land for fodder purpose and the farmers benefitted approx. Rs. 260/- per animal.

Expansion of irrigation area through retention wall cum drainage in Kukurah

KVK Buxar has made two retention walls cum drainage structure in adopted village Kukurah to check the surface run off of precipitation and canal water to the river Ganga. The retention wall has covered more than 133 ha area and benefitted 97 farmers. The farmers saved more than 800 litre diesel worth Rs. 41600/- and benefitted by permanent irrigation



water through precipitation as natural resources. This retention wall cum drainage structures strengthened



KVK BUXAR

water resources and extended rice area in drought situation at adopted village Kukurha. The structures were constructed on defunct water bodies before set of monsoon under, NICRA project to facilitate irrigation to the crop. The farmers produced average



44.60 q/ha and 41.75 q/ha of MTU 7029 & BPT 5204, respectively, as compared to 30-35 q/ha before construction of the structures.

KVK JEHANABAD

Integrated Farming - A livelihood of poor farmer

Before NICRA project, farmer did only traditional farming at Sakrorha of Jehanabad district, Bihar. In 2011 NICRA project was launched in this village through KVK, Jehanabad to face drought like situation. From that time farmers



is continuously in touch with KVK, motivated & inspired by KVK scientists. They started a goat farm in his village. The farm was established with six local goats reared under stall fed intensive management.

Initially faced number of problems like high cost of production, mortality & low price of produce but goatary has been the successful venture for farmers after the arrangement of one pair of goat (*Sirohi breed*) for breed up gradation by NICRA Project. Accordingly farmer introduced changes in his goat farm by receiving technical guidance from the scientists of KVK on health management of goat, consequently goat farming project become viable and profitable. A pond was renovated in the field of farmer under NICRA project as rain water harvesting structure after that he started integrated farming system based on the pond. Farmers have vermicompost unit, goat farm, duck farm, poultry farm, dairy farm, vegetable production near pond. Plantation around pond like teak wood, shisham, guava. They also uses following modern agricultural

implements for performing agricultural operations on time viz. i. Zero tillage machine to save agricultural inputs like seed, fertilizer and water. ii. Sprinkler system to irrigate wheat and pulses iii. Power reaper for harvesting of wheat, paddy and jai. iv. Rotavator for quality field preparation. After continuous touch with KVK, Jehanabad by attending almost all



training programme, they started involvement in Animal husbandry. Presently farmers have three buffalos, five cows, seventeen goats, eighteen ducks and culturing fish in the pond.

Right now his total annual income is Rs. 741255/-. Farmer is also running own milk society under name "Sakrorha Dugdh Utlpadak Sahyog Samity" and selling fodder seed to Magadh Dairy, Gaya.

Pond based farming system model

A pond of dimension 42m x 27m x 13m was excavated to farmer village of Gadi Manjhila, Block. Kawakol, Dist. Nawada in the year 2013-14 under the project. After excavation the rain water was harvested in the pond. In next year the stored water was utilized in the transplanting of the kharif paddy in one ha and for supplementary

irrigation in the dry spell. The fish keeping was started. The fruits and forest species are transplanted on the bank of pond. On the bund Pigeonpea



is shown and harvested. On the side strip of pond the vegetables



are grown in kharif rabi and zaid by utilizing the water from pond as per need. The water is available whole the year in this pond due to automatic recharging capability of the pond. The net profit earned Rs. 42,400/- in a year by adoption of this model.

KVK SARAN

Relay cropping of vegetable with Paddy

Farmers evolved relay cropping of vegetables with paddy [Brinjal-tomato-cucumber/long melon-paddy]. Sowing of brinjal in nursery was done by 15th August



and transplanting in the main field by 15th September at 6 feet x 3 feet distance on permanent beds. Seedlings of tomato were raised in a separate nursery in last week of November and transplanting was

done in between the rows of brinjal at a distance of 4 feet. The plant geometry was so maintained that there was no shading effect of brinjal on tomato. Now cucumber and long melon were sown directly in between the plants of tomato at a distance of 2 feet by 25th February or the atmospheric temperature was around 22-23°C. The creepers were allowed to grow on the ground and no staking was done. To prevent the fruit from soil contact natural mulch of grass, weeds and paddy straw was done.



For managing probable nocturnal insect pests inhabiting in the grass mulch, neem based insecticide was used prepared by the farmers himself. Sesbania was grown in the field by 25-30th May and was incorporated in the field at 45 days duration irrespective



of monsoon break with supplemental irrigation. Short duration paddy was then taken in the field after puddling. Thus farmers could get gross economic return of Rs. 60000/- from one ha of land.

KVK SUPAUL

Low cost bamboo boring for life saving irrigation

Water table being high in the project area, bamboo boring,

a low cost technology could be installed as source of water to provide lifesaving irrigation to cucurbits cultivated even in sandy soil requiring more water. The refined practice





in the NICRA village has been well adopted by the vegetable growers. Ten numbers of bamboo boring were installed in Sadanandpur and fifty numbers of farmers were benefitted.

Cultivation of Marigold replacing Posta (Opium poppy)

Cultivation of Posta (*Opium poppy*) a crop harmful for both the human being and environment was being cultivated in large area which an illegal practice due to restriction imposed by the Government in left wing extremism (LWE) in Chatra district of Jharkhand. The District administration tried to motivate the cultivators not to cultivate *Posta* but due to higher return compared to any field crops the cultivators did not heed and continued with the illegal cultivation. Considering the above facts under

consideration Krishi Vigyan Kendra Chatra, intervened as per initiative taken by the district administration and introduced an alternative crop Marigold to replace the cultivation of *Posta*. In order to understand the perspectives of the farmers, this attitude and linking, a meeting of



the farmers was convened in *Posta* cultivating dominated Gidhour block of the district. The farmers unhesitatingly accepted that they are cultivating *Posta* for higher income inspite of knowing about the harmful effects of this crop. The KVK scientists put forth so many options like vegetables, spices and flowers cultivation which could give about similar benefit as compare to *Posta* without harmful effects. Ultimately

KVK CHATRA

after rigorous discussion the farmers village became ready to cultivate Marigold in the place of *Posta*. In the first year 2011 KVK, Chatra conducted demonstration on Marigold variety (*Orange drop* and *lemon drop*) in one ha area. Net income of Rs.60,000/- per ha on an investment Rs. 8000/- per ha and the news flashed in all News Papers and also through TV Channels in the State as well as in the district. After observing the benefits from cultivation of Marigold neighboring farmers also contacted with KVK and approached for demonstration. Keeping in view the



demand of this Crop, KVK, Chatra conducted demonstration in ten ha area of 25 farmers during 2012 found appreciable results.

KVK EAST SINGHBHUM

Renovated check dam providing life saving irrigation for paddy

During 2015-16 monsoon onset was delayed by almost 10 days which affect nursery preparation and in the district. But in NICRA village especially Barunia and Pathergora near renovated old check dam, farmers prepared their nursery for rice before 15th June. As the capacity of 60000 cft and with its overflow water farmers of the nearby area where puddle (150-200 mm water) their land during 1st week of July. In this way they have

transplanted rice variety Naveen in time. Moreover within district, it was possible only after 18th of July. After 17th of August there more than 13 days of dry spell occurred, which affects tillering stage of rice



in the district except nearby area of renovated check dam. It automatically affects genetic potentiality of rice in other areas where it was grown as rainfed. Then 10th September onward rainfall occurred like showers and was favourable for insect pest specially leave hopper and stem borer and that situation prevailed upto 22nd of September. During panicle initiation and flowering time of rice there was also insufficient moisture in soil (rainfall ≤ 2.5 mm) in whole district except NICRA village where farmers of nearby check dam irrigated their land with stored water. During the month



of November, December & January totally dry period occurred which drastically reduced yield potential of mid and long duration varieties, but in NICRA village approximate 15 ha area were irrigated by stored water in renovated old check dam. The same variety Naveen yielded 40 q/ha in NICRA village as compare to 23 q/ha in other parts of the district.

KVK GODDA

Advancement of planting dates of rabi crops in areas with terminal heat stress

Advancement of planting dates increases the probability of escape from late-season dry period in rabi season and farmers save the water for irrigation and more



profit than other farmers. Farmers of Bhelwa and Gunghasa village of Godda district cultivated chick-pea, mustard, brinjal, cauliflower, cabbage, tomato in rabi season 15 days before the planting dates. These crops were cultivated in 20 ha area of 125 numbers of farmers fields and gave maximum return (avg. BC ratio 4.0).

KVK GUMLA

Micro irrigation system popularized in Gunia village of Gumla

A farmer of Gunia Village and drop out from the school at the age of 15 and use to migrate every rabi and summer season to other state for family food. His field is one km away from his house but it was uncultivated due to lack of irrigation facilities and due to financial problems, he was unable to invest on irrigation system, although there is small perennial river (Masaria). In 2013, KVK Gumla under NICRA project established a Micro lift irrigation system on Masaria river near by his field. In 2014 he took 3 acre land on lease and started cultivation of wheat

(1 acre), mustard (1 acre) and bottle gourd (1 acre). The farmer became



an example for others farmers in the village and inspired other farmers to start summer vegetables cultivation like bottle gourd, okra, cow pea, tomato and other vegetables. After establishment of Micro irrigation



lift system 12 ha of fallow land is converted in cultivable land during summer season. During scarcity of water (rainfall) about 25 ha of area is also irrigated through this lift irrigation system in kharif and rabi season. This intervention increased cropping intensity of village about 250%.

KVK KODERMA

Protective vegetable cultivation

Farmers of village Chopanadih have received very low rainfall year after year. Cropping intensity was 100-150%. After NICRA project launched KVK scientists helped farmers for profitable agriculture. Some farmers of this village make some low tunnel poly house and nursery raising in potray



and plastic mulching and poly mulching vegetables. This technology

saved the irrigation water, control the temperature and protection of pest and animals. Farmers used this poly house year after year. Yield percentage increase 57.4% more than local check.



KVK PALAMU

Fish farming popularized in Palamu

In spite of being a high rainfall district (1200 mm). The climate becomes hot and dry during the summer with serious water scarcity. The rainy season starts from mid – June and continues up to October. Usually the winter season lasts from October to February with maximum temperature of 30°C. Summer season starts from March and continues up to mid-June with temperature sometimes touching as high 48°C. Erratic rainfall at the onset and during crop growth period is a major issue resulting in periodic crop failures and drought impacting agriculture and livelihoods. However, the high rainfall



and frequent high intensity rain events are great opportunity to store water and use for critical life saving irrigation. Progressive farmers of Palamu district were doing work in the field of fish farming and got training from KVK, Palamu and other national organization (such as National Fishery Development Board Hyderabad) in the farming in a common pond of

village Murma. Seventy one farm families involved the fish farming and purchased spawn of fish such as *Katla*, *Rohu*, *Mrigal* and *Grass carp* from Ramsager, West Bengal and started cultivation. They got production of fish as about 15-20 q per season as a community approach.



KVK COOCHBEHAR

Amelioration of cultivated acidic soil

A study was conducted to find out the ameliorative measures taken by KVK to amend the acidic nature of soil since inception of NICRA activities in the village Khagribari. Average pH of 100 nos. of samples tested during 2011-12 indicated that average pH value was



5.34 being minimum of 4.92 and maximum of 6.04. During the year 2011-12 to 2014-15 liming was done once either during rabi before potato

or during pre-kharif before jute in each year. Subsequently soil samples were collected from same plots during 2015-16 and results of analysis further clearly indicated a rise in pH and gradual shifting of acidic nature towards neutral. pH of 100 samples tested during this year ranges from 5.4 to 6.31 with an average of 5.86.

KVK SOUTH 24 PARGANAS

Monocropped fallow lowlands converted to multiple cropping options

In prevalent practice, only traditional (local), long duration variety of paddy used to be grown in the low-lying land during kharif season. Second crop was not possible during rabi-summer season due to the late release of land as well as for scarcity of irrigation water. A farmer could earn a meager sum of Rs. 3100/- from a 0.266 ha of land. After intervention with land shaping, traditional variety of paddy is now replaced by HYV paddy during kharif season. The crop

is harvested earlier. In rabi-summer season, with the help of rain water so harvested in the dugout pond, the raised land is used for vegetable and oil seed cultivation. Pond and land embankment, are also used for



year round vegetable cultivation. At the same time, pisciculture with duck rearing in the pond is also practiced. Average net income from a 0.266 ha land is now about Rs. 47800/-.

KVK MALDA

Multi-tier vegetables production

In multi-tier cropping systems, the possibility of more efficient use of resources like sunlight, nutrient and water is higher leading to increased biological diversity and higher production stability. Thus, keeping

in view climatic vulnerability, market fluctuation and better resources use, vegetable based system with multi-tier cropping system is aimed at for increasing the yield in short place and it's very effective and profitable in flood situation.



VISIT OF NICRA-ZMC TO PORT BLAIR KVK ON 15-18 MARCH, 2016

The ZMC of NICRA team consisting of Dr. H. S. Sen (Chairman), former Director, ICAR-CRIJAF, Barrackpore, Dr. P. Nanda, Principal Scientist, ICAR-IIWM, Bhubaneswar as DDG(NRM) Nominee, Dr. B. Gangaiah, HOD (NRM) CIARI, Port Blair as CRIDA Director's Nominee and Dr. F. H. Rahman, Principal Scientist and NICRA Nodal Officer, ICAR-ATAR



Kolkata as Member Secretary visited Port Blair, KVK and NICRA project Sites, in order to develop an overall impression of the agro-climatic conditions of the Island ecosystem in the region, also went across a few surrounding islands during 15-18 March, 2016. The 'NICRA', hereafter referred to as 'project', sites were located in Port Blair, Badmaspahar and Port Mout villages. There are reasonings to believe that the island ecosystem is likely to be the most sensitive than any other ecosystem due to climate change phenomenon.

In a rare and all-time tragic incident the Andaman and Nicobar Islands had a devastating toll of 10,136 people dead and hundreds of thousands rendered homeless when the Indian Ocean-triggered earthquake Tsunami struck the islands on 26 December, 2004 with a rector scale of 9.3. The islands were just north of the earthquake epicentre, and the Tsunami reached a height of 15 metres (49 ft) in the southern Nicobar group of Islands. The A & N Islands ecosystems comprise of 572 Islands, of which 38 are inhabited by people from the mainland and indigenous tribes. The areas could be characterized as highly stressed due to drought/



cyclone/sea water inundation, and the crops susceptible to diseases and pests. The ZMC team during their visits to the sites were accompanied by the project personnel. Following the presentation made initially at the project for an overview of

the problems and the activities undertaken in-depth discussions took place with the farmers at individual



sites. Discussion was also held with the VCRM members and experienced farmers particularly the womenfolk



as well as the government officials in each area to share their experience.

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