Newsletter

TOWARDS CLIMATE RESILIENT AGRICULTURE

NICRA NEWS

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Introduction

India is more vulnerable in view of large population depending on agriculture and excessive pressure on natural resources. Indian farmers have evolved various coping mechanisms over time, but these mechanisms are not enough to cope with extreme weather aberrations witnessed in the recent years. In the context of climate variability, farmers need to adapt quickly to increasing frequency of drought, flood and other extreme events to stabilize crop yields and farm income. In order to deal with climate change and its impact, A Network Project entitled, 'National Innovations on Climate Resilient Agriculture (NICRA)' of Indian Council of Agricultural Research (ICAR) has been launched in February, 2011 aiming to enhance the resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. Technology Demonstration Component (TDC) of NICRA offers great opportunity to work with farmers and apply such technologies under field conditions to address current climate variability. This will enhance the pace of adoption of these resilient technologies. On-farm participatory demonstrations for climate resilience are being implemented in village clusters through KVKs in 151 climatically vulnerable districts across the country. The emphasis has been on capturing and improving the understanding on performance of technologies in different agro-ecologies and farming systems. This also facilitates identification of what constitutes climate resilience in different bio-physical and socio-economic contexts. NICRA KVKs prepared and implemented village level contingency crop plans and measures. Technology Demonstration Component (TDC) of NICRA offers a great opportunity to work with farmers to address current climate variability with matching responses. Getting existing technologies into the hands of small and marginal farmers and developing new technologies like drought or flood tolerant crops to meet the demands of a changing climate also come under the purview of NICRA programme. Climatic vulnerability of selected nine KVK districts of West Bengal, Odisha and Union Territory of A & N Islands at district level regionally coordinated by ICAR-Agricultural Technology Application Research Institutes (ATARIs) forward definite requirement in terms of technological support, human resource development and overall empowerment of farming community to enable them to cope up with climate vulnerabilities like droughts, erratic rainfall, heat wave, flood, cyclonic storm. Enhancing the adaptive capacity and building resilience of the farming communities is important in the context of climate variability and to cope with these extreme events effectively

Climatic vulnerability of selected nine KVK districts of West Bengal, Odisha and Union Territory of A & N Islands at district level regionally coordinated by ICAR-Agricultural Technology Application Research Institute Kolkata (ATARIs) forward definite requirement in terms of technological support, human resource development and overall empowerment of farming community to enable them to cope up with climate vulnerabilities like droughts, erratic rainfall, heat wave, flood, cyclonic storm. Enhancing the adaptive capacity and building resilience of the farming communities is important in the context of climate variability and to cope with these extreme events effectively. The NICRA village was selected based on vulnerability of agriculture to climatic variability. 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. Thus the interventions executed in NICRA villages by the NICRA-KVKs through the intervention like Natural Resource Management, Crop Production, Livestock, Institutional Intervention, Capacity Building and Extension Activities have not only enabled the farmers to cope up climatic vulnerability as well as it plays a key role in farmers' adaptive capacity along with sustainable agricultural production.

"By polluting the oceans, not mitigating CO_2 emissions and destroying our biodiversity, we are killing our planet. Let us face it, there is no planet B." -Emmanuel Macron, President of France

Biotic and abiotic stress tolerance in the bio-fortified (high protein content) rice *CR Dhan 310* in Sundarbans of South 24 Parganas

A bio-fortified rice variety *CR Dhan 310*, having higher protein content (10.3%), was demonstrated in the NICRA village during Kharif 2020, for the second consecutive year. It is a short duration rice variety (110-115 days), suitable for growing in the highland situation. The medium-bold grains remain firm and dry after cooking unlike other

traditional varietiesand were found to have a typical flavour and taste that was well accepted by the community for consumption. The productivity of rice, in the area, was much lower during this year due to less rainfall and high incidence of bacterial leaf blight (10-25% PDI). The yield, economics and disease incidence parameters observed during 2020 are compared below.

Yield and economics of bio-fortified variety compared to farmers practice (Kharif 2020)

Intervention		Yield (q/ha)	Gross return/ (Rs./ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	B:C Ratio	Bacterial leaf blight (PDI%)
Demonstration	Bio-fortified HYV rice: *CR Dhan 310*	39.64	69370	39600	29770	1.75	2.4
Farmers Practice	HYV rice: *Santoshi*	35.6	62300	42900	19400	1.45	16.8

The yield and net profit during 2019 (normal rainfall) and 2020 (54% deficient rainfall + BLB infestation) are compared below. The *CR Dhan 310* variety recorded 6.73% less yield compared to 15.24% yield reduction in the farmers practice, in 2020, due to the abiotic and biotic stresses. Similarly there was only 4.35% less profit in CR Dhan 310, compared to 21.40% reduction in net profit, during 2020, in the farmers practice.

Intervention	Yield (q/ha)		% change	Net profit (Rs./ha)		Change (%)
	2019	2020*		2019	2020	
CR Dhan 310	42.5	39.6	-6.7	31125	29770	-4.35
Santoshi	42.0	35.6	-15.2	28500	22400	-21.40

*54% deficient rainfall + BLB infestation

(Drs. P. Chatterjee and Prabir Garain
RA Krishi Vigyan Kendra, Nimpith, S 24 Pgs, WB)

Varietal improvement of sugarcane cultivation in NICRA villages of Malda

Sugarcane is a most important cash crop in India. In West Bengal sugarcane is the second most important commercial crop after jute. Farmers in this state have been cultivating sugarcane for many centuries for making gur and many sweets. Before introduction of NICRA project at Village(s) of *Brozolaltola, Meherchandtola, Jairamtola* and *Mahendratola* under Panchayat of Dakshin Chandipur, Manikchak Block of Malda District, The peoples used to cultivate indigenous varieties of sugarcane which are native to this place. The farmers also not aware about scientific cultivation and improve varieties of crop. The adopted villages under NICRA project are situated in flood prone area and nearest to the river The

Ganges. Recurring incidence of severe flood and incoming of huge water in crop land damaged the standing crop of sugarcane.

The major problem of NICRA villages is the severe flood in this situation to cultivate indigenous varieties of sugarcane which are not tolerant to waterlogged condition and insect pests as well as crop yield also damaged. As a result the family incomes of farmers were very low.

For overcome this major problem of adopted villages under NICRA project the Malda KVK to introduce two improve sugarcane varieties (*Swapan* and *Birendra*) which are moderately resistant to red rot, wilt and smut and also tolerant to common borer insect pests and tolerant to both water submergence and drought. As the results the family incomes of farmers were high. The villagers were also happy and they thanks to Malda KVK for introduced to improve varieties and also do aware about scientific cultivation. This two varieties covered 5.0 hectare land and benefited 50 farmers. The average yield of these two varieties of sugarcane is (80-88 tons) per hectare and average sugar content in juice is about (16.8-17.5) percent. Average cost of cultivation of sugarcane in farmers field is Rs.10,000 to Rs.12,000 per bigha (0.33 acre) and average profit per bigha is Rs. 20,000/- for a good sugarcane crop.

(Drs. Rakesh Roy and Adwaita Mondal
Malda Krishi Vigyan Kendra, WB)

Zero tillage in Maize - *DKC 9081* and Paira Cropping of Lentil - *PL-8* demonstrated in NICRA village of Coochbehar

Demonstration conducted on *Khagribari* and *Singimari* village. Total numbers of farmers are 20. Innovative intercessions like demonstration of maize cultivation noted drastic improvement in the cropping pattern by zero tillage maize production in paddy fallows in Rabi season. The consistent cultivation of maize indicated better creation, profitability and farm income also increased. Farmer attitude was changed. The trend may be followed in future.

Demonstration conducted on Khagribari village. Total numbers of farmers are 20. Crop cultivated in lowland areas where moisture

remains in soil for a long period. The same piece of land is used for the cultivation of two crops. Generally, farmers cultivated single crop in low land areas. In this system crops are grown in the same piece of land just after the harvesting of first crop.Selected pulse crop can be grown along with rice in lowland areas. As a result farmers benefitted in terms of cost of cultivation, time saving and water use.

(Drs. Bikash Roy and Ganesh Das
Coochbehar Krishi Vigyan Kendra,
Coochbehar, WB)

Rice-Blackgram Paira cropping: Converting rice-fallow to rice-pulse system in Kendrapara

Rice is grown as a main crop in the rainfed areas of the NICRA adopted village during kharif and the land remains fallow during Rabi season. There is little possibility to grow any crop in Rabi season under residual soil moisture condition. To address the rice fallow areas under NICRA program. Rice-blackgram- paira cropping system is demonstrated in the rainfed situation of NICRA adopted village. Previously the farmers used to grow long duration rice varieties which restrict the possibility of second crop under

residual soil moisture. The long duration rice variety (145-160 days duration) was replaced with an short duration (110-120 days duration) rice varieties like *Swarna shreya* and *Sahabhagi Dhan* which was grown with recommended package of practices. The blackgram variety PU 31 was sown before 10 days harvest of the rice crop. As a result the second crop got an extra period of 25-30 days to utilize the residual soil moisture in rice field. Two foliar spray of water soluble fertilizer NPK 18:18:18 @1.5% spray was given at pre-flowering and pod development stage in blackgram. The system yield is 5.8t/ha (REY) as compared to 3.9t/ha of sole rice yield in the system. This successful intervention helps in converting the rice- fallow to rice-pulse area.

(Drs. S.N. Mishra and Namita Mahapatra
Kendrapara Krishi Vigyan Kendra, Odisha)

Cultivation of short duration drought tolerant rice *Swarna* shreya at Sonepur

Rice is the main food crop, especially in Saharanpur district of Odisha. *Badmal*, *Dipapali* and *Ganjathapar* villages of Sonepur was experiencing less scope for rice cultivation due to low and uneven distribution of rainfall in kharif. About 60 % of area under rice in the district is drought prone rain fed, but it has not been exploited to full potential due to lack of suitable drought tolerant varieties. There is hardly any scope to replace the rice crop considering the precipitation of less than 1500 mm rainfall during the monsoon season. Therefore, introducing drought tolerant rice cultivars is considered to be one of the most effective and economic approaches for ensuring food security particularly in drought prone areas of the district. To mitigate these problems KVK, Sonepur had conducted a demonstration programme on short duration drought tolerant rice variety *Swarna Shreya* in "National Innovations on Climate Resilient Agriculture villages (NICRA)" during the year 2020-21. The cultivation of rice variety *Swarna Shreya* was found to be more productive and can replace the local check since it fits to the existing farming situation for higher productivity and income and also it had been appreciated by the farmers due to its drought tolerance and higher tillering capacity. *Swarna shreya* recorded higher grain yield (44.58 q/ha) in comparison to *Sahabhagi* dhan (41.23 q/ha) and farmers practice *Khandagiri* (29.56 q/ha).Water productivity was also higher (2.78 kg grain per mm of rain water received) in as comparison to farmers practice Khandagiri (1.80) and *Sahabhagi* dhan(2.16) owing to its higher grain yield probably due to more drought tolerance capacity. An economic analysis of the data revealed that *Swarna shreya* produced an extra grain yield of 15.02 q/ha which is 50.8 % higher yield than *Khandagiri*. The productivity gain under demonstration over farmer's practices created awareness and motivated the other farmers to adopt improved production technology of rice in the district. Favourable benefit cost ratio (2.92) Is self explanatory of economic viability of the demonstration and convinced the farmers for adoption of intervention imparted. Both from the view point of crop intensification drive as well as climate change, it has satisfied the need of the farmer. Growing short duration varieties of rice has other

advantages like fitting other crops in between like green gram, black gram, tuber crops. By the end of the intervention the farmers was able to harvest their kharif rice 25-30 days earlier than usual harvesting time, they could be able to sow their next crop in time during rabi. The new improved technologies have eventually led the farmers to discontinue the old varieties and to adopt new variety.

(Drs. Jibanjit Sen and Geetanjali Pradhan
Sonepur Krishi Vigyan Kendra, Odisha)

Low cost poly house for off season vegetable cultivation in Kalahandi

Low cost poly house was demonstrated in Vill- Pipalpada, Block- Lanjigarh, Dist- Kalahandi under NICRA Project. The poly house was constructed using locally available bamboo and metallic wire for developing the frame. UV stabilized film of 200µ (800 gauge) was used as cladding material for covering the roof and side wall. The estimated cost of construction of a 50m^2 size low cost poly house varied between Rs. 13000 to 15000. Proper drainage channels were developed around the poly house to avoid water stagnation. Raised beds of 1 m wide and 15 cm height and of convenient length were prepared inside the poly house by thoroughly mixing soil: FYM in 2:1 ratio. The poly houses are being used for raising of vegetable seedlings as well as off-season vegetable cultivation. Production of offseason vegetable nurseries under protected structure is a profitable business. (Higher profit and disease free seedlings are found in off season to raise early crop in protected condition). The low cost polyhouses were found economical for small and marginal farmers, who cannot afford huge cost of high-tech poly house.

The nursery of vegetables like tomato, chilli, capsicum, cole crops etc. can be raised and sold to get higher profit. The nursery is raised during *kharif* and *rabi* season under this structure; however, The same structure can be used for round the years by applying other types of cladding materials, such as Shadenet.

Seasonal Activity

Kharif- Brinjal, Tomato, Chilli

Rabi- Cauliflower, Cabbage, Knol khol

Economics of raising nursery under poly house

Size of structure (10m x 5m x 2m) = 100m3

Investment cost (polyhouse, polybags, protrays) = Rs. 20,500/-

Selling of seedling @ Rs.2/- = Rs. 30,000/-

Net profit 1st year (30,000 – 20,500) = Rs.9500/-

Net profit 2nd year (30,000 – 5000) = Rs.25000/-

Net profit 3rd year (30,000 – 6000) = Rs.24, 000/-

(Drs. A. Panda and H. N. Malik
Kalahandi Krishi Vigyan Kendra, Odisha)

Drought tolerant rice *Swarna Shreya*- A ray of hope in drought prone areas in Ganjam I

Moisture stress and drought are considered to be major abiotic stress in rainfed area of Ganjam district. To reduce the adverse impact of climate change in medium land condition it is pertinent to popularise newly developed stress tolerant rice varieties. Krishi Vigyan Kendra, Ganjam-I carried out a demonstration programme on stress tolerant rice variety- *Swarna Shreya* in NICRA cluster villages- Lepa, Chikili and Chopara villages in 6 ha area involving 15 famers during *kharif*- 2020. *Swarna Shreya* is a medium duration (120-125 days) rice variety developed by ICAR Research Complex for Eastern Region. It has capacity to withstand moisture stress for 10-

12 days with average productivity of 4.0 to 4.5 tonnes/ha. Traditionally farmers were growing *Lalat* which is a medium duration (125 days) rice variety with average productivity of 30 q/ha. Nursery raising was done during 1st week of July and transplanting was done during 1st week of August. All the package of practices of rice were followed and harvested during 2nd week of November. A significantly higher production of 16% (35 q/ha) was achieved by growing *Swarna Shreya* as compared to traditional rice var. *Lalat*. Farmers were satisfied with the new var. and farmers of nearby villages are procuring the seeds from the farmers. It is really a ray of hope in drought prone medium land condition for enhancing Rice production.

(Drs. Swagatika Sahoo and Prasant Panda
Ganjam I Krishi Vigyan Kendra, Odisha)

Azolla Supplementary feed for enhancing income of stress tolerant Poultry breed - A success case at Jharsuguda

Background Information of successful farmer

Farmers' Name	**Sri Saroj Sahu**
Farmers address	Village-Tharkaspur , GP-Loisingh, Block-Jharsuguda, Dist-Jharsuguda Mob No-: 7683967227
Income Source	Rice, Cabbage, Cauliflower, Brinjal, Tomato, Chilli, Cowpea, Bottle gourd, Farming- Dairy & poultry
Land holding	Upland- 0.5 acre, Medium land-2.5 acre
Supports from KVK	Technical Support- 1. Demonstration on azolla cultivation for poultry feeding 2. Capacity building through training & awareness programme 3. Establishment of demo unit (Azolla) in backyard.

Sri Saroj Sahu is an enthusiastic farmer in the NICRA adopted village, Tharkaspur. He is of 41 year old and always open to accept a new technology to enhance income. Under NICRA project, backyard poultry rearing with stress tolerant poultry breed *Kadaknath* and *Vanaraja* has been demonstrated. To supplement scavenging with azolla feed, azolla cultivation was also demonstrated. Sri Saroj Sahu is cultivating azolla in poly tank provided under NICRA project. Now he is having 5 no of poly tanks of dimension (6'×3'×1') each and feeding azolla as a supplementary feeding to the poultry birds and dairy animals.

Details of Technology demonstrated-

Technology demonstrated: Demonstration of azolla cultivation for poultry feeding

Problem identified:	Scavenging in birds, lower growth rate and egg production due to inadequate nutrition
Description of technology:	In poultry production the feed cost account for 60% of total cost involved. Provision of commercial feed increases the cost of production and subsequently lowers the profit margin. Replacement of costly commercial feed with easily available nonconventional feed would be an option for reducing the production cost. Azolla, an aquatic fern, have higher biomass and protein content .The water fern Azolla, which grows in association with the blue-green alga Anabaena azollae, is the most promising plant for poultry feeding. Letting birds to scavange in backyard lowers their body weight gain and egg production due to inadequate nutrition.

Impact of intervention:	Higher body weight gain along with better laying performance was recorded in birds supplemented with azolla
How the interventions minimized the impact of climate variability	Gap between demand and supply of feed was minimized. Uninterrupted supply of feed to birds irrespective of inclement weather was ensured. Birds possessed better livability due to better nutritional status.
Yield and Economics:	Birds supplemented with azolla gained 2.2 kg compared to birds let out for scavenging only who gained 1.2 kg body weight in a period of 4 months. The supplemented birds layed 52 eggs up to 28th week of age, where as group let out for scavenging only produced no of eggs during the same period of time. B:C ratio was 4.4 in supplemented group compared to 3.02 in non-supplemented group



(Drs. Jyotirmoyee Udgata and Monoj Barik
Jharsuguda Krishi Vigyan Kendra, Odisha)

Piglets distribution among the farmers NICRA Village of Port Blair

The ICAR-Krishi Vigyan Kendra in collaboration with Division of Animal Science, Central Island Agricultural Research Institute (CIARI), Port Blair organized one awareness-cum-critical inputs distribution programme on Pig farming at the AICRP on Pig unit of CIARI, Port Blair, under TDC-National Initiative on Climate Resilient Agriculture (NICRA) Project of ICAR. Dr. B.A. Jerard, Director, ICAR-CIARI, Port Blair was the Chief Guest on this programme and encouraged the farmers to adopt pig farming for income generation and nutritional security and also briefed about the scope and importance of pig farming in this NICRA village. Dr. Debasis Bhattacharya, HoD and PI, AICRP on Pig highlighted the scientific package and practices of pig farming. Dr. L. B. Singh, PI NICRA emphasized about the various climate resilient technologies promoted by ICAR-KVK, South Andaman to the farmers under TDC-NICRA project of ICAR for their income enhancement, food and nutritional security and sustainable livelihood. In this Programme Dr. B.A. Jerard, Director, CAR-CIARI, Port Blair distributed 10 piglets (Male -5 and Female - 5, 6 months old), mineral mixture and medicines to five farmers Shri. B.D. Mazumder , Shri. Rakesh, Smt. Kalidashi Mondal, Smti Krishnakumari and Shri Arief of NICRA adopted village (Port Mout, Creekabad and Lalpahar) under Chouldari Gram Panchayat of South Andaman to promote pig farming under TDC-NICRA Project of ICAR.

(Drs. L. B. Singh and B. K. Nanda
Port Blair Krishi Vigyan Kendra, A & N Islands)

Publications (July-December 2020)

Research Papers

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2. S. K. Joshi, J. Udgata, L. M. Garnayak, F. H. Rahman, A. Phonglosa and D. Parida (2020). Azolla as Feed Supplementation on Growth Performance and Economics of Vanaraja Birds in Backyard System of North Western Odisha. Journal of Experimental Agriculture International, 2020;42(7): 61-65
3. Samima Sultana, Ganesh Das, F.H. Rahman and Rakesh Roy (2000). Effect of Arka Mango Special on inflorescence, fruit setting and fruit quality of mango. Journal of Horticulture, 7(3): 2020
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5. Udgata, M. Barik, A. Phonglosa, S. K. Joshi, P. J. Mishra, F. H. Rahman, L. M. Garnayak and D. Parida. (2020). Assessment of Balance Nutrition (N, P, K, Zn and B) and Green Manuring on Yield, Nutrient Uptake, Economics and Soil Fertility of Rainfed Rice (Oryza sativa L.) in Drought Prone Areas of Odisha. Current Journal of Applied Science and Technology, 2020, 39(27): 10-19
6. N. Mahapatra, F. H. Rahman, P. Mishra, T. R. Sahoo, P. K. Sahoo and S. N. Mishra. (2020). Assessment of Scope and Efficiency of Off-Season Rice Straw Mushroom (Volvariella volvacea L.) Cultivation in Coastal Odisha. Current Journal of Applied Science and Technology, 2020, 39(27): 28-34
7. P. Mishra, T. R. Sahoo, F. H. Rahman, L. M. Garnayak, A. Phonglosa, N. Mohapatra, R. Bhattacharya and S. N. Mishra. (2020). Yield and Economics of Brinjal (Solanum melongena) as Affected by Different Mulching Types and Its Effect on Soil Moisture Content and Weed Dynamics in Post Flood Situation of Coastal Odisha, India International Journal of Environment and Climate Change 10(12): 264-270, 2020
8. Das, Ganesh. (2020). Impact of COVID-19 in Agricultural System, Value Chain, and Food Security. Agricultural Extension Journal 10.22377/aextj.v4i2.220.

Technical bulletins

1. Rahman F H, Bhattacharya R. and Roy. S K. 2020. NICRA Annual Report 2019-20, Pub. by Director ICAR-ATARI Kolkata, pp: 1-54
2. Final Report of Technology Demonstration Component of NICRA (2011-2019). Pub. by Cooch Behar KVK, UBKV Cooch Behar. p.80

Paper presented in national/ international seminars etc.

Bhattacharya R. and Rahman F. H. (2020). In-situ moisture conservation to cope up the moisture stress condition for different crops grown in Eastern India' in the National Webinar on "Agrochemicals for Upkeeping Environment" organized by the Society for Fertilizers and Environment in collaboration with Bidhan Chandra Krishi Viswavidyalaya, Aug 27-29, 2020.

A PDF version of the Newsletter is also available at: http://www.atarikolkata.org/publications

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