

Newsletter



TOWARDS CLIMATE RESILIENT AGRICULTURE

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Introduction

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. Over the years, the National Agricultural Research System has developed an array of practices and technologies to foster stability in agriculture production against the onslaught of seasonal variations. A nation-wide project, National Innovations on Climate Resilient Agriculture (NICRA), has been working since 2011 to address this challenge by application of science and technology. This project of ICAR aims to enhance 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 9 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. 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 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.

Demonstration on System of Assured Rice Production (SARP) in Kharif at South 24 Parganas

The system of assured rice production (SARP) is an innovative technology of producing healthy seedlings in specially prepared seedbeds where seedlings can be retained up to 60 days in case of climatic hazards at the time of transplantation. Thus it reduces the anxiety of farmers during the delay in transplantation in the main field due to prolonged submergence of main field followed



by short intensive precipitation or due to long dry spells. In Bongheri, the paddy farmers frequently face the problem of either short intensive precipitation or long dry spell during paddy transplantation. This results in delay in transplantation. At that time the seedlings in the nursery bed

become aged, lean, weak and show multiple nutrient deficiencies. Such seedlings also become difficult to be uprooted. When transplanted, these seedlings result in poor growth and give 20-30% less yield than their potentiality. The SARP technology



can provide cushion to the farmers by providing a healthy growth of the seedlings in the modified, nutrient enriched seedbed for a prolonged period. SARP can be viewed as an ideal alternative for contingent cropping, combating changing climatic situation and restoring soil health. The basic principles include production of healthy seedlings using very low seeding density (10-15 g per sq. m) and adequate addition of

organic manure (2.5-5.0 kg per sq. m) and fertilizers in nursery. The seeds are treated with zinc sulphate and biocontrol agents. During this Kharif season, a demonstration on SARP has been taken up in Bongheri



village under the NICRA project. At first, training was organized at the KVK with the progressive paddy farmers. Then training was organized at the village with the interested farmers. Necessary inputs like seeds, micronutrients and biocontrol agents were distributed among 11 beneficiaries. Presently, seedbed preparation, seed treatment and sowing have been completed.

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

Azolla Cultivation – A rapidly spreading Climate Resilient Technology in flood situation at Malda

The livestock sector has an immense role in rural economy of Malda District particularly in our NICRA adopted villages. During rainy season, occurrence of flood is a regular phenomena and maximum crops fields are coming under water for a month or more than that. Therefore, green fodder is rarely available for livestock's and as a result milk production, meat and egg production decreases drastically and diseases like PPR and FMD occurs for Goat and Cattle respectively. Due to limited resources, farmers often struggle to produce sufficient feed

for their livestock. But Azolla is the right option in front of them which are rich in high proteins, amino acids, vitamins (vitamin A, vitamin B₁₂, Beta Carotene) and minerals, so it is an excellent nutrient feed for livestock. To mitigate the flood-like situation, Malda KVK has introduced Azolla as a green fodder for live-stocks particularly for milch cows. This technology has gained tremendous popularity at NICRA adopted villages and no. of units for Azolla production is increasing day by day. Azolla units are constructed mainly in shady areas nearby household with a pit of

2.0 X 2.0 X 0.2 m area with the help of polythene sheet. About 10 – 12 kg of fertile soil is uniformly spread over the sheet and water is poured upto 10-15 cm height. After that 2-3 kg cow dung and 50-100 gm of super phosphate mixed in along with water present in the pit and then 0.5 – 1 kg of Azolla is placed in the water. This will grow rapidly and will cover the pit within 10 – 15 days. From then on, 500 – 600 gm of Azolla can be harvested daily. A mixture of 50-100 gm of super phosphate and about 1-2 kg of cow dung should be added once in every 5-7 days intervals in order



to maintain rapid multiplication of the *Azolla* and to maintain the daily yield of 500 gm. After two months another new pit is constructed for fresh *Azolla* production. Using *Azolla* as green fodder for cattle and



poultry birds as protein supplements increase income by Rs. 3600 per animal /lactation. In case of milching animals productivity is obtained 3.6 L/ lactation/ animal/day whereas it is 2.75 L/ lactation/ animal/day incase

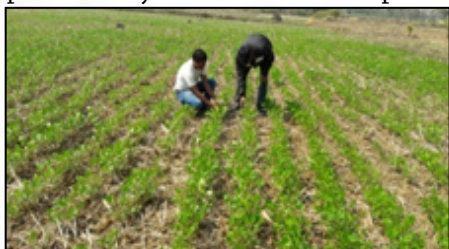


of dry fodder feeding only (i.e. 31% increase in milk productivity per lactation per animal).

(Drs. Bhabani Das and Adwaita Mondal
Malda Krishi Vigyan Kendra, WB)

Cultivation of Short duration YMV tolerant Green Gram var. *IPM- 02-03* at Ganjam

Greengram is an important Pulse crop in Odisha. It is cultivated in 1,50,000 ha area in *rabi* season in Ganjam district after Rice. However, the productivity is very low (4.8 q/ ha). The major Problems for low productivity are YMV susceptible



variety, existing low yielding variety, sucking pests and inappropriate nutrient management. To mitigate these problems KVK Ganjam-I had conducted a demonstration

programme on short duration yellow vein mosaic tolerant Greengram var. *IPM -02-03* in 25 ha. in "National Innovations on Climate Resilient



Agriculture cluster villages (NICRA) during the year 2018-19. Earlier farmers are cultivating YMV susceptible variety without pest and nutrient management. KVK Ganjam has provided Greengram seed - *IPM -02- 03*, farmers were trained on seed

treatment with Rhizobium @ 20g/ kg of seed 01 hour before sowing. Foliar nutrition of water soluble fertilizer-NPK (19:19:19) @ 10g/ ha. along with pesticide- Thiamethoxam @ 150 g/ha. were applied at 25 and 40 days after sowing. By cultivating Greengram variety *IPM 02-03* there was no YMV incidence as compared to 22 % in their variety and also the yield increased from 4.8 q/ha. to 6.2 q/ha (30%). It is also harvested 5 days earlier (65 days) to their existing variety Farmers were satisfied with the variety and technology. Nearby farmers purchased the seeds of *IPM 02-03* from NICRA villages.

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

Backyard poultry farming - an ideal to augment the income at Sonepur

Backyard poultry production is n age old practice in rural India. Most of the backyard poultry production comprises rearing of indigenous birds with poor production performances. The potentiality of indigenous birds in terms of egg production is very less i.e 70 to 80 eggs/ bird/ year and meat production is also very less. However backyard poultry production can be boost up with improved breeds and can easily boost up with improved varieties of chicken and can promise

a better production of meat and egg. To improve the socio economic status of the traditional farmers, backyard poultry is a handy enterprise with low-cost initial investment, but high economic return along with guarantee for improving protein deficiency among the poor. Intervention was taken up for backyard poultry at Badmal, Dipapali and Ganjathapar village of Ullinda block. *Kadakhnath* and *Vanaraja* chicks were distributed for dual purpose i.e both for meat and

egg production for higher income. It has the capacity to lay more eggs and gain higher body weight. Hatching of





chicks is being done at KVK, Sonepur and 21 days old chicks are being provided in the villages. 25 nos of farmers were selected and each farmer was provided with 10 nos. *Kadagnath* and 10 nos. of *banaraja* chicks. The selected farmers constructed the poultry house with locally available materials like bamboo, thatch etc. as per the guidance provided. A total of 250 nos of *Vanaraja* and 200 nos. of



Kadagnath chicks were distributed among the selected farmers for rearing under backyard farming system. Before starting the unit the farmers were also provided with information through training on site selection, construction of low cost poultry house, housing and feeding management, disease management etc. Monitoring was done at regular intervals. Farmers have shown high



acceptability for poultry birds after the demonstration. On seeing the performance of the birds the farmers could observe the advantages of rearing these birds due to high egg laying capacity and higher weight gain over the local birds. Even if in a high temperature the birds sustained very well, so the farmers were highly motivated with the performance of the birds.

Table: Performance of different poultry breeds -

Different Poultry Breeds	Body weight (Kg) in 4 month	No. of egg production/year	Cost of rearing/bird (Rs/bird)	Gross Income (Rs/bird)	Net Income (Rs./bird)	BC Ratio
<i>Vanaraja</i>	Male- 2.0 kg Female- 1.7 kg	160	525/-	2100/-	1575/-	4.0
<i>Kadagnath</i>	Male- 1.5 kg Female- 1.2 kg	80	535/-	2350/-	1815/-	4.4

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

Low Cost Goat Shed to Mitigate Heat Stress in the NICRA villages of Kalahandi

In Kalahandi district of Odisha, the maximum temperature rises above 47°C in summer and minimum temperature drops below 5°C. There is also intense heat wave during summer. Livestock suffer extreme heat stress which affects their level of performance during this period. KVK Kalahandi demonstrated climate resilient shelter management practice to mitigate the effect of heat stress in goat at village Pipalpada of Lanjigarh block under NICRA project. Construction of low cost double stored goat shed with only bamboo mattress and timber. Side wall of goat shed is made up of bamboo. Roof is made up of straw and local available low cost roofing materials. Goats are

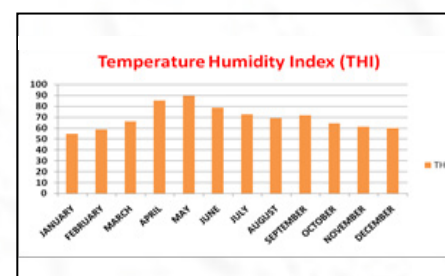
kept on bamboo mattress which is 2.5 ft above the floor. The discomfort or effect of heat stress on livestock is dependent on temperature humidity index (THI). $THI = T_{db} - (0.55 - (0.55 \times RH/100)) \times T_{db} - 58$ [T_{db} -Temp.⁰F in dry bulb thermometer, RH-Relative humidity]

Table 1: THI during different months of a year

Month	THI	Month	THI
April-2018	85.13	Oct -2018	64.30
May-2018	89.40	Nov-2018	61.20
June-2018	78.80	Dec-2018	59.86
July-2018	72.70	Jan-2019	54.38
Aug-2018	68.80	Feb-2019	58.64
Sep-2018	71.76	Mar-2019	56.80

Table 2 : Heat stress is dependent on THI

Sl. No.	CATEGORY	THI VALUES
1.	No stress	< 70
2.	Mild stress	70-75
3.	Semi moderate stress	76-80
4.	Moderate stress	81-85
5.	Severe stress	85-90





Bamboo matted goat house effectively mitigate the heat stress of animal during summer and performance of



goat improved during this period. It reduces the effect of heat stress to a substantial level (25-30%). Animals

feel comfort and performance remain unaffected. The cleaning is easy and goat shed remain hygienic and contamination free and Low occurrence of pathogenic infections (Low occurrence of pathogenic infections). The cost of intervention Rs. 8000/goat shed. Net return rise up to Rs. 4300 (67.6%). The Body weight of the animal also increases upto 20% per week. g/wk).

Table3 : Impact of Intervention on Animal performance

Farmer	Type of animal	No of animals	Type of housing	Type of material used (Locally available)	Cost of housing	Economic impact (% increase in milk production/weight gain)	
						With intervention	Without intervention
Chittaranjan Patra	Goat	10	Low cost goat shed	Bamboo stick, straw	8000/-	Body wt. gain- 54 g/day	Body wt. gain- 43 g/day

(Drs. Amitabh Panda and H N Malik Kishi Vigyan Kendra, Odisha)

Empowerment of farm women through Small scale goat farming at Jharsuguda

Apart from being engaged in vegetable cultivation Smt Susama Meher was interested in keeping of goat as a subsidiary source of income from 2015, she was involved in goat rearing. But initially she kept 2 bucks and 20 nos of does, all of which were nondescript animals of the area. Those goats showed slower gain in body weight, late sexual maturity, lower kidding per year. Under the NICRA programme of KVK, Jharsuguda, two numbers of *Black Bengal bucks* were introduced in the herd for breed upgradation. After the replacement of bucks the offspring produced from the upgradation have shown higher growth rate, which is reported to

the 13 kg at 6 month of age. However the upgraded goats attained sexual maturity at 8 months of age. Looking at the development programme of Smt Meher other goat keepers of the village were got interested and



started goat rearing by taking buck on rent. After introduction of *Black Bengal buck* the growth rate, age of sexual maturity, kidding interval, twinning percentage has improved. Three other herds of the village took



the *Black Bengal buck* on rental for upgradation purpose.

Treatment	Body wt (kg/6 months)	% change in body wt	Net Return (Rs/animal/6month)	B:C Ratio
T ₁ (Non descript goat)	16.0	-	6,400/-	3.4
T ₂ (Black Bengal Buck)	25.0	56.25	10,000/-	4.2

Even she was appreciated during the visit of Shri Jual Oram, Hon'ble minister of tribal affair for her initiation in the concerned field.

Breed up gradation of other heads with *Black Bengal buck* and buck exchange programme after 3 years to avoid inbreeding and

production depression.

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

Potato - a remunerative crop under post flood situation at Kendrapara

In the September-2018, severe flood occurred in NICRA adopted village- Dusmankul (Ratanpur), Marshaghai Block, Kendrapara. Due to heavy flood standing Rice crop got entirely damaged. After receding of flood water, land was laying fallow. Although under this post flood



situation the land was fertile due to deposition of alluvial soil. KVK Kendrapara under NICRA Project introduced potato cultivation. In this intervention, all the 71 household affected by flood were provided with QPM of Potato variety *Kufri-Sundari*. A Late variety of potato maturing in 4 months time. All the recommended cultural practices were followed,

starting from tuber treatment with carboxin 37.5%+ Thiram 37.5% WP @ 500gm/ha seed. Dipped for 20min in the solution drying under



for 5 min , before planting. As this variety moderately resistant early blight potato gave an yield of 304 / ha. As procurement price of potato



by the private retailers was very low during harvesting time . The growers

stored, the properly graded and sorted potato at Nischintakoili cold storage, for meeting their future seed demand. The rest potato for home consumption stored in thatched house, with false bamboo ceiling (Attughara) with windows remaining to avoid entry of direct sunlight. Those farmers having no Attughara, kept these harvested potato on



floor by putting 3"-4" thickness dry sand for soaking moisture by that increasing the shelf life of potato. Value addition of potato was done by preparation of potato chips.

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

Pond based integrated farming system –a sustainable livelihood of Tsunami affected areas in Port Blair

Shri Ashok kumar Roy, a progressive farmer blessed with an inquisitive mind belonged to Badmas Pahar Village, South Andaman district. He earned his livelihood by backyard poultry farming (desi poultry birds 20nos.), mud crab culture and cultivating traditional vegetables like amaranthus, nalibhaji, okra,brinjal, chilli, bitter gourd, pumpkin and bottle gourd on his leased land (1.5 ha) employing indigenous methods. With this merger income (Rs.80,000-1,20,000/- per anum) he used to sustain his family life (6 family members). From 2011 he used to have regular contact with the NICRA team of ICAR-KVK, Port Blair for development of his

agricultural land for maximum returns and has undergone many training programmes in the areas of poultry farming, pisciculture, crab fattening, vegetable cultivation etc. He meticulously began to put into practice the knowledge, skill in his farming. Initial orientation from the experts of KVK and their frequent visits set him on the path towards progress. Under the NICRA -TDC Project of ICAR-KVK, Port Blair he had established Pond based Integrated Farming System on his land. The major components are fish + poultry + vegetables and fruits. He adopted composite fish culture (*Catla, Rohu and Mrigal*) in his small pond of 0.5 acre and got an average

yield of 250kg fish per year. Besides, ICAR-KVK, Port Blair affords him all the inputs of high yielding and climate resilient vegetable seeds and seedlings [*Amaranthus (CARI Ama red and green)*, Indian Spinach (*CARI Poi-1*), Spinach (*cv. Jinta*) Sweet



potato (*CARI-SP 1*), French Bean (*IIHR-909*), Chilies (*LCA-353, KA-2*, Local varieties), Pumpkin (*Ardhaman red*), Cucumber (*Point set*) , Brinjal

(CARI Brinjal-1), Bitter gourd (Rakhushi), False coriander (CARI Broad Dhania), Okra (Arka Anamika), Bottle gourd (Tilalauki) etc.] Marigold (Pusanarangi), perennial fruit plants



such as papaya, lime, banana, amda, sapota, drumstick and curry leave. The yield of vegetables and fruits was 4.5 ton/year with this small area of land. He has also adopted backyard poultry (Nicobari fowl-50nos) and duckery (Khaki Campbell duck-50 nos) in his pond based Integrated Farming System model. The total cost of cultivation was Rs.1,50,000/- per annum. However, the gross return obtained was Rs. 3,50,000/- per year with net profit of Rs.2,00,000/- . He also made optimum use of all

the farm waste into organic manure and utilized in vegetable cultivation. An award-winning man received many awards from ICAR-KVK and ICAR-CIARI for his relentless efforts towards agriculture under the vulnerable Island ecosystem. He achieved his self-sustainability and livelihood in pond based integrated farmingsystem and also an inspiration for others in this Island.

(Dr. L. B. Singh

Port Blair Krishi Vigyan Kendra, A&N Islands)

Demonstration of farm implement at Cooch Behar



RCT in rice with Rice Transplanter using submergence tolerance rice var.



Swarna Sub-1 in the NICRA village amalgamated with exposure visit of

DAESI participants in the NICRA village Khagribari of Coochbehar KVK Distribution of agricultural implements like rotary tiller, mechanical weeder and bush cutter to the Custom Hiring Centre in the NICRA village- Khagribari of Coochbehar KVK.

Interaction of Director, CRIDA with VCRMC Members of Nimphit

Dr. G. Ravindra Chary, Director, CRIDA and Dr. K. V. Rao, Principal Scientist, CRIDA, Hyderabad, paid their august visit to Ramkrishna Ashram KVK at Nimpith, South 24 Parganas on 6th of July, 2019. At first, a thorough discussion was held with our



Revered Chairman Swami Sadanandaji Maharaj regarding the NICRA activities and then a field visit was organized at the NICRA village at Bongheri. During their visit to Bongheri, they observed various climate resilient Technology Demonstration Components (TDC),



implemented by our KVK and appreciated the effectiveness and



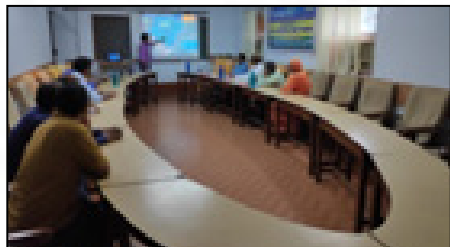
suitability of such technologies to mitigate the climate change related



vulnerabilities in the village. An interaction meeting was then organized with the villagers where various issues regarding the implementation and fruitfulness of the NICRA programme were discussed. All villagers equivocally agreed upon the fact that the NICRA programme has changed the fate of the Bongheri village, since the "Aila" (Super Cyclone) setback in 2009. Now, both the farmers and landless labourers have on-farm engagement in the village itself, throughout the year.

Zonal Monitoring Committee of NICRA-TDC visited South 24 Parganas KVK of West Bengal

On 10th of July, 2019, a high level Zonal Monitoring Committee, under the Chairmanship of Dr. H. K. Senapati, Former VC & Dean, OUAT, Bhubaneswar and Members - Dr. B. Kandpal, Joint Director, ICAR



Research Complex, Tripura as DDG (NRM) nominee and Dr. J. V. N. S. Prasad, NICRA Coordinator, CRIDA, Hyderabad as Director, CRIDA



nominee and Member Secretary - Dr. F. H. Rahman, Principal Scientist & NICRA Nodal Officer, ICAR-ATARI, Kolkata, visited Ramkrishna Ashram KVK, Nimpith, South 24 Parganas for monitoring the activities and

outcome of the project. The members visited the Resource Centre of the KVK where different technologies, promoted by the KVK, were displayed to them. The best performing climate resilient technology was found to be Land Shaping that supported integrated farming system. The other important technologies were Ail cultivation, Bund-cum-Trench system, rejuvenation of water bodies and drainage channel, plantation



of Mangrove, green manuring, vermicomposting, introduction of submergence and salinity tolerant rice varieties, organic mulching,

animal health care, stress tolerant poultry birds and fishes, fish hatchery, seed bank, custom hiring centre, weather observatory, etc. All the developmental work were organized through Village Climate Risk Management Committee, which is represented by 30% women members. The following suggestions came out after the visit-

- To take up these activities in a Farming System approach.
- Some latest and suitable varieties of oilseed crops that can be incorporated in the project.
- To take up more demonstration on Paddy cum fish cultivation for judicious utilization of land and water resources during kharif season.
- The NICRA interventions in the village were aimed at doubling of farmers' income
- To take up more income generating activities like mushroom cultivation, food processing, etc.

The committee appreciated the efforts of KVKs and active involvement of the partner farmers and suggested to scale-up the useable interventions in the adjoining villages.

Best NICRA-KVK Award

Cooch Behar KVK from West Bengal and Sonepur KVK from Odisha were awarded the Best Zonal NICRA KVK Award during Annual NICRA Workshop held at CRIDA during June 4-6, 2019.



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