Newsletter

TOWARDS CLIMATE RESILIENT AGRICULTURE

NICRA NEWS

of ICAR-ATARI Kolkata

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Inside the Issue

Introduction

Climate change impacts on agriculture are being witnesses all over the world, but countries like India are more vulnerable in view of large population depending on agriculture and excessive pressure on natural resources. It has become an important area of concern for India to ensure food and nutritional security for growing population. Indian farmers have evolved various coping mechanisms over time, but these mechanisms are not enough to cope with the extreme weather aberrations witnessed in the recent years. Therefore, there is a need to use modern science combined with indigenous knowledge of farmers to enhance the resilience of Indian agriculture to climate change. In order to deal with climate change and its impacts, the Indian Council of Agricultural research (ICAR) initiated National Innovations in Climate Resilient Agriculture (NICRA), a multi-institutional, multi-disciplinary network project in 2011. The Project aims to enhance the resilience of Indian agriculture to climate change and climatic vulnerability through the components *viz*. strategic research on adaptation and mitigation, technology demonstration on farmers' fields to cope up with current climate variability, sponsored and competitive research grants to fill critical research gaps and capacity building of different stakeholders.

The rationale for Technology Demonstration Component (TDC) is based on the premise that an array of technologies is available to cope with different types of climate related vulnerabilities in National Agricultural Research System. The component TDC of the project has been implemented through Krishi Vigyan Kendras at district level regionally coordinated by ICAR-Agricultural Technology Application Research Institutes (ATARIs).
ICAR-Agricultural Technology Application Research Institute Kolkata having nine KVKs where different activities under Technology Demonstration Components of National Innovations in Climate Resilient Agriculture (NICRA) programme in various modules *viz*. Natural Resource management, Crop Production, Livestock & Fisheries and Institutional Interventions are carried out.

The overall focus of NICRA is on adaption to climate variability which entails appropriate response to contingency situations. The central objective of technology demonstrations in such regions is not on enhancing productivity but on interventions related to coping with vulnerability as well as improvement in natural resource use efficiency for sustaining the productivity gains.

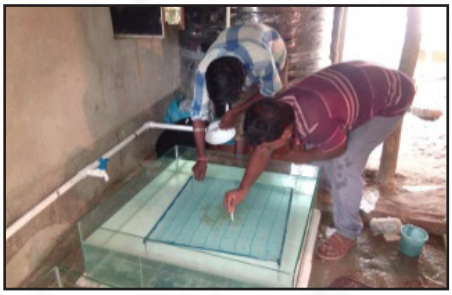
Enhancing the adaptive capacity and building resilience of the farming communities is important in the context of climate variability and to cope with these extreme events effectively. The NICRA village was selected based on vulnerability of agriculture to climatic variability. The multidisciplinary 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.

"If conservation of natural resources goes wrong, nothing else will go right." M. S. Swaminathan

Roof top rain water harvesting to support catfish hatchery and cooking in Bongheri village of South 24 Parganas

Sri Gouranga Naskar is an educated, young and energetic rural youth from Bongheri village of Sunderbans. He has witnessed the wrath of the nature in 2009 when his village succumbed to the fury of super cyclone "*Aila*". The heroics of Sri Naskar could ensure safe evacuation of his entire family but not the means of living and livelihood. All the villagers were strangled on an elevated strip of road for 14 days. As in other cases, the immediate impact of the cyclone was neutralized in a couple of months. But they were shocked to find that nothing would germinate on their field. The agricultural fields of the entire village turned into saline and unfit for cultivation. It took another two years to leach the excess salt from the top soil through natural precipitation, but the productivity never returned to their normal. By that time around 80% of the villagers resorted to seasonal migration for a daily earning, leaving agriculture standstill in the village!

However, Sri Naskar was one among the very few, determined not to leave his village without giving a last try. And he just found the apt support in



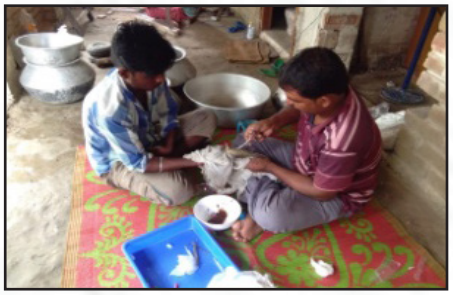
the form of arrays of climate resilient agro-technologies to revive his farm and fishery. The project, National Innovations in Climate Resilient Agriculture, implemented by the Ramkrishna Ashram KVK in his village, helped him to harvest rainwater in his field, grow flood tolerant paddy varieties and produce vegetables throughout the year.

With the passing years, Sri Naskar grew more in confidence and started taking greater responsibilities as a VCRMC member in collection and maintaining daily weather data and the custom hiring centre. He took extra interest in climate resilient fishery and found the importance of *Asian catfish* in combating the climatic vagaries unlike

the common carps. He motivated many others to cultivate *Asian catfish* in the shallow waters and paddy fields. This fish fetches better market price (Rs. 600/ kg) than common carps and tolerant to biotic and abiotic stresses, arising due to occasional brackish water ingress during cyclonic disturbances. However, as the supply of *Asian catfish* fry was very uncertain to this remotely located village, this endeavour soon started losing its familiarity. Sri Naskar was ready to establish a *catfish* hatchery to solve the short supply of catfish fry. But it was not possible to establish such hatchery with the available pond water in the village. It required clean, fresh groundwater for breeding and larval rearing of *Asian catfish*. But the village doesn't have a single bore well to serve the purpose. The only bore well of the village is a 1200 ft one, meant for drinking water for the entire village.

To ensure supply of clean and fresh water, roof top rainwater harvesting technology was utilized. The run off rainwater falling over the roof was diverted and collected in a 1500 L capacity storage tank. The same water was used for larval rearing of *Asian catfish* and *Koi* (*Climbing perch*). Before that, Sri Naskar went through necessary training in breeding of catfish, at the KVK. He was given necessary financial assistance through NICRA. The harvested rainwater was potable and measured 6.85 of pH and 0.05 of EC. It was perfectly suitable for breeding and larval rearing. The storage tank was filled for three times during the rainy season that supported 3 breeding cycles of *Asian catfish* and *Koi*. Sri Naskar produced 12000 *Asian catfish* and 12000 *Koi* fry and earned a net profit of Rs. 32050/- in four months in first year. Next year, the net profit will go up to Rs. 60550/- considering the recurring cost and depreciation value of the assets created.

The most astounding impact was witnessed by the women members of his family who reaped the benefit of the potable rain water for the cooking. The catfish breeding season was over in September. But the last harvest of rainwater was sufficient to support the kitchen up to the end of December, by 20 L per day. So from the start of the rainy season and upto December,



i.e. for six months period, the women members had to travel less to outside for collecting water for cooking.

(*Dr. N. J. Maitra and Dr. Prabir Garain*
RA Krishi Vigyan Kendra, Nimpith,
S 24 Pgs, WB)

Low-cost goatery shed showed disease resistant to goatery at Narayanpur village of Malda

Crop cultivation and livestock farming in NICRA adopted villages of Krishi Vigyan Kendra, Malda are the main source of income of the farming community in the flood prone area. But occurrence of flood is the main constraint for cultivation as well as for rearing of the livestock. As per PRA conducted in the NICRA adopted villages by Malda KVK it was visualized that most of the farm family are having six nos. of goat (average) and most of them are suffering from PPR resulting into immature death. Keeping this problem in mind Malda KVK took positive steps towards vaccination of PPR infected goats of that area and after the vaccination goats are reared in a low-cost goatery unit as demonstrated by Malda KVK before onset of monsoon and provided thorough training under NICRA project at Paschim Narayanpur, Brozolaltola, Meherchandtola, Joyramtola *etc.* which are flood prone area. Before establishment of such unit most of the goats of this area died (average 4 goats) due to heavy infestation of PPR. After establishment of this unit most of the goats are kept in dry from the moist soil reducing the outbreak of PPR and increase survivality rate upto 35% *i.e* average 4-5 goats are survived during rainy season. Therefore, farmers are getting more return from their goat farming *i.e* Rs 10000/- on an average and the farmers of Paschim Narayanpur village are very happy through this intervention.

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

Empowerment of farm women through food processing technique at Khagribari village of Coochbehar

A training programme was conducted on food processing techniques for self-empowerment of rural women at NICRA village, Khagribari during August, 2018. Twenty members of farm women were trained. A case study was conducted before organizing the training programme to know the socio-economic condition of the trainees. Majority of the trainees were from below poverty level. Educational status was primary and middle class level, scheduled caste, women headed family (due to occupational migration of the male members). The decision of the family was mostly taken by the female members. It was observed that financial support was lacking in case of children education. Considering the above situation, three days training programme was conducted on food processing techniques and its marketing for self-empowerment of the farm women. After completion of training programme several inputs were provided to the farm women for further monitoring and evaluation. Sixty percent (*i.e.* 12 no.) of the trainee is successfully producing pickle, squash, jam and jelly. On the basis of the post training evaluation 12 numbers of trainees were selected for market oriented training programme. All the trainees are now well trained and are marketing their produce to the local markets, hostels of Uttar Banga Krishi Viswavidyalaya *etc.*

Monthly income of the trainees increased up to 66.66 % from the Bench Mark. As per data collected, kowledge and skill level was also found to be increased up to 38.59 % and 87.50 %, respectively, from the Bench Mark. The major success points of the training programme are

1. Financial support towards children educational system has increased
2. Self-empowerment of the farm women
3. Building networking with line departments and KVK

(*Dr. Bikash Roy and Dr. Sujan Biswas*
Coochbehar Krishi Vigyan Kendra,
Coochbehar, WB)

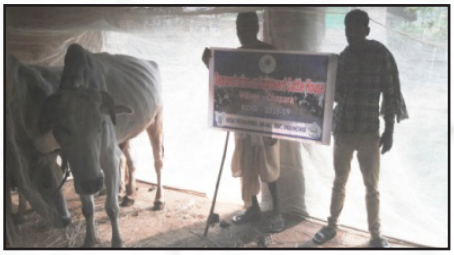
Seedling production in low cost poly house at Chopara village of Ganjam district, Odisha

During *Kharif* season vegetable is cultivated in an around 6250 ha area in Ganjam district. The predominant vegetables cultivated during the season are - brinjal, cauliflower, chilli, tomato. However, there is high mortality of seedlings during rainy season due to heavy rainfall of more than 60 cm. It affects the vegetable cultivators to a great extent. KVK Ganjam-1 has demonstrated low cost Poly house of dimension 20 ft x 12 ft under NICRA scheme in Chopara village of Jagannath Prasad block. The structure is erected with wood, bamboo and bamboo splits. The UV stabilized polythene of 200 micron size is covered on the top of structure and side of structure is covered with insect proof net .The cost of the structure is Rs.9000/- including the cost of polythene. Sri Majhi is a progressive vegetable grower of Chopara village and he came forward to adopt this technology. He invested Rs. 4000/- for purchase of vegetable seeds for raising in low cost poly house and also invested other expenditure except polythene. There was only 5% mortality of seedling in low cost poly house as compared to 30% mortality in open condition. He sold 42000 nos. seedlings in 02 batches @ Rs. 0.50/- each and earned a net profit of Rs. 8000/- from the low cost poly house in *Kharif* season. Other farmers of nearby villages are also interested to adopt the technology in coming season.

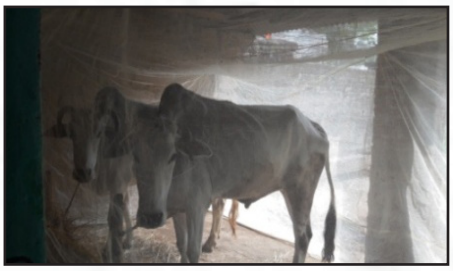
(Dr Swagatika Sahoo and Dr P K Panda
Ganjam-I Krishi Vigyan Kendra, Ganjam, Odisha)

Improved cattle housing at Chopara village of Ganjam district, Odisha

In Ganjam district the cattle population is nearly 9.8 lakhs and farmers mainly depend on cattle for Milk, compost and field ploughing.



However, the cattle housing condition is improper and unhygienic which impacts cattle health, milk production and working efficiency. KVK, Ganjam-1 has conducted a demonstration programme on improved housing in Chopara village of Jagannath Prasad block. The floors of cattle house of farmers were undulated without concrete flooring. In improved cattle house the floor was made elevated with sloppy condition for better drainage, roof was thatched with bamboo straw to cope up for high temperature and mosquito net for better hygienic condition. Sri Pradeep Pradhan is an advanced dairy farmer of Chopara village and he adopted this technology. The cost of improved housing is Rs.4000/-. By adopting this technology the milk yield increased from 900 L to 1020 L per annum and also the working efficiency of bullock increased by 25%. The disease incidence is also decreased by 20 %. He got a profit of Rs. 16600/- as compared to Rs. 14000/- from previous year. Other farmers of nearby villages are also interested to adopt the technology.



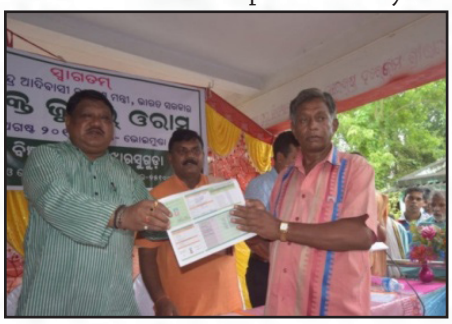
(*Dr Swagatika Sahoo and Dr P K Panda*
Ganjam-I Krishi Vigyan Kendra, Ganjam, Odisha)

Hon'ble Minister of Tribal affairs, Sri Jual Oram visited Jharsaguda KVK and NICRA adopted village *Bhoimunda*

Sri Jual Oram, Hon'ble Minister of Tribal affair, Govt. of India visited Krishi Vigyan Kendra, Jharsuguda on Aug 31, 2018; reviewed the on-going activities and chaired a stake holders meet with KVK scientists, district line department heads, NGOs, Progressive farmers, women producer groups, and bankers. The meet was attended by other important guests Smt. Radharani Panda, Hon'ble MLA, Brajarajnagar; Dr. Mahamaya Prasad Nayak, JDE, OUAT, Bhubaneswar; and Dr. Avijit Haldar, Principal Scientist, ICAR-ATARI, Kolkata. Dr. Jyotirmayee Udgata, Sr. Scientist and Head, KVK, presented the impact of the KVK and NICRA activities. The Hon'ble minister visited the exhibition stall, demonstration units and planted a mango plant in the KVK campus. Farmers of different

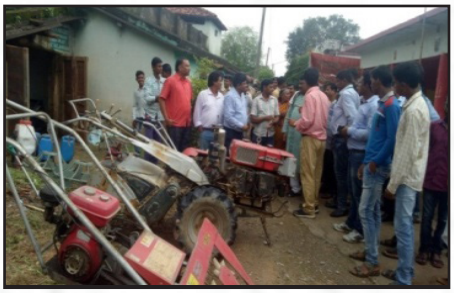
villages including NICRA adopted village expressed their happiness regarding realization of enhanced income by adopting improved climate resilient technologies.

The Hon'ble minister visited the NICRA adopted village *Bhoimunda* with a warm welcome and procession by the



farmers. A farmer fair was conducted in the village where farmers felicitated the Hon'ble Minister of Tribal Affairs, Sri Jual Oram and Hon'ble MLA of Brajarajnagar, Smt. Radharani Panda and eminent persons like Sj. Subash Chouhan with the line department officials and KVK Scientists. A gathering of 300 farmers from NICRA cluster villages and adjacent villages were participated in this programme . In the programme, farmers received

soil health cards, planting materials, vegetable seed kits from hon'ble minister and guest. Hon'ble Union Minister visited the demonstration field of hybrid maize, cauliflower, cabbage and the enterprises like *Black Bengal goat*, *Vanaraja* poultry farming and expressed his happiness and satisfaction on the efforts of the scientists of KVK, Jharsuguda. Also,



he visited the custom hiring centre of NICRA project, advised to take advantage of improved machineries in less price to minimise the cost of production and to get more profit.

(*Dr Jyotirmoyee Udgata and Dr Monoj Barik*
Jharsuguda Krishi Vigyan Kendra,
Jharsuguda, Odisha)

Hydroponic fodder and construction of low cost goat house – are the Climate Resilient Technologies in flood situation at Kendrapara

The live stock sector constitutes one of the important sources of income of the rural population of Kendrapara district during flood situation, when other crops and enterprises suffer. This sector needs special attention to enhance milk, meat and egg production thereby increasing household income and employment opportunities for the farming community during flood. Technological adaptations and strategies have been employed by KVK, Kendrapara to reduce the impact of flood on milch cows and goat *i.e.* production of hydroponic fodder – from "Seed to feed" for milch cow and low cost goat housing system for goat for decreasing the infectious diseases and mortality.

It is well known that the feeding of dairy animals is incomplete without including green fodder in their diet, which is the most viable method to enhance milk production as well as to bring about a qualitative change in the milk produced by enhancing the content of unsaturated fat, omega 3 fatty acids, vitamins, minerals and carotenoids.

Proper feeding and good balanced rations remains the cornerstone of a successful dairy operation. Milk yield per cow and the cost of feed to produce milk plays an important role in profitability of a dairy farmer. The scarcity in production of green fodder during floods resulted in feeding of unbalanced ration which led to less milk production. To overcome the situation farmers used more concentrated feed thereby increasing the feed cost and reducing profitability of the farmer. To meet this initiative KVK, Kendrapara introduced hydroponic fodder production technique for production of quality fodder during flood situation in the NICRA adopted village. The adoption of the technology enabled the farmers for production of fresh forage from locally available seed grains *i.e.* blackgram/greengram/maize *etc*. Hydroponics units developed is now capable of producing quality green fodder required for 20-25 milch cows per day in NICRA village increasing the milk yield by 15-20 %. Hydroponic fodder is economically more lucrative to farmers because of high productivity, non susceptibility to

diseases, infections and is nutritious. Now this practice of fodder production in adverse climatic condition is adopted by the farmers of nearby villages. Inadequate knowledge of housing and its seasonal management has hampered the productivity of the goats in the NICRA village due to rise in mortality and morbidity rate. Most of the goats in the district are kept outside and are tied to a stake with a long rope with improper roofing. The goats are exposed to strong winds, wet grounds and attacks by predatory animals. The place scarcely cleaned which led to diseases like toxaemia, pneumonia, PPR along with worm infestation. To overcome this, efforts on formulating low cost housing has been made by KVK, Kendrapara to check the morbidity and mortality rate of animals. The low cost housing provides conditions for good health and comfort of animal's high reproduction and more efficient management. Housing protected the animals from strong winds, heavy rains, wet grounds and attacks by predatory animals particularly in flood situation along with reducing the morbidity by 45 to 50 % and mortality rate by 75-80 %.

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

Cotton - Pigeon pea Intercropping proved remunerative at Kalahandi

Kalahandi is a tribal dominated district of Odisha and majority of the population depend on agriculture as their primary source of livelihood. NICRA adopted village Pipalpada is situated at 50 km away from Bhawanipatna. Paddy is the only crop was grown during *Kharif*. During a diagnostic visit the scientist encouraged the farmers to go for low value to high value crops and from high water requiring crops to low water requiring crops. Along with rice in *Kharif* some pulses, cotton and vegetables can also be grown which has higher profitability and production potentiality that can play a big role in changing their livelihood besides

providing nutritional security. Pigeon pea (var. *Asha*) was demonstrated in the farmer's field of that village as an intercrop with cotton (var. *Shalimar*). Sri Balaram Mishra, one of the farmers of the village was earning his livelihood from 8 acres of land. Due to traditional method of rice cultivation and poor crop productivity, he was not satisfied with the lower income. He used to cultivate only paddy both in the upland and low land. Sri Balaram Mishra, after consulting with the KVK Scientists, he was convinced to grow pigeon pea and cotton along with *Kharif* paddy. He grown cotton in 8 acre of upland. Pigeon pea was intercropped with cotton. Intercropping is the cultivation of two or more crops at the same time on the same field. The most common goal of intercropping is to produce a greater yield on a given piece of land by making use of resources that would otherwise not be utilized by a single crop. Cotton was grown with Pigeon pea in rows as 8:2 ratios. Proper package of practices of both the crops were followed. Adoption of improved technologies like proper planning, layout, planting, INM, IPM *etc*. in cotton cultivation was followed. Marketing information gave him a great support to sell the harvested produce, which earned him maximum rates and fetches good profits. Agricultural practices have been shifted from monoculture of rice cultivation to *arhar* and cotton intercropping.

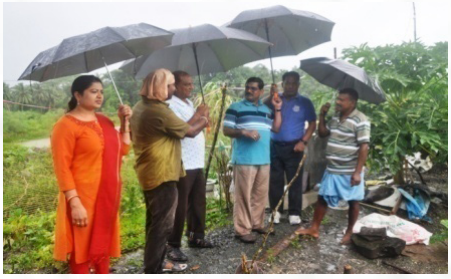
The income from the monoculture was very low and was not sufficient to fulfil the demands of family members of the farmers. Intervention of high value crops like Cotton and Pigeon pea has increased income. Overall cost of cultivation was low. From 8 acres of cotton Pigeon pea intercropping 85.2 quintal of seed cotton and 10.4 quintal of pigeon pea was produced. The gross return was Rs 403400 and net profit

was Rs. 237400 with B:C ratio of 1.69. Seeing this success, farmers are shifting from monoculture rice cultivation to pulse (*Arhar*) and cotton intercropping.

(*Dr Amitava Panda and Dr H N Mallick*
Kalahandi Krishi Vigyan Kendra, Kalahandi, Odisha)

Climate Resilient Integrated Farming System in NICRA villages of South Andaman District

On-farm farming System studies were undertaken in farmer's field at Port Mout and Badmashpahad village under NICRA villages of South Andaman district during 2018-19 to generate adequate income and employment opportunities round the year involving enterprises like field and horticultural crops, fishery, poultry, dairy and NRM. Results revealed that net returns of Rs.47, 825 could be obtained in the year with an investment of Rs. 18,515 (excluding family labour) from 0.4 ha area. In this study, employment generation was 248 man-days for the marginal farmer having underutilized family labourers (4 children and 2 adults). Income and employment generation were higher by 87% and 82%, respectively, due to adoption of integrated farming system in 2018-19 as compared to the previous year with crop components alone. The production of fish, eggs, milk, vegetables, fruits *etc.* within the farm helped in improving the standard of living and provided better nourishment to the family members.



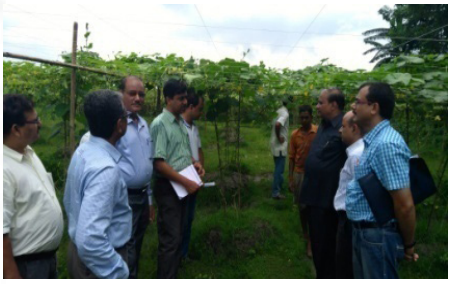
Zonal Monitoring Committee of NICRA-TDC for Zone V visited two KVKs of West Bengal

Zonal Monitoring Committee of NICRA-TDC for Zone V visited two KVKs of West Bengal State (Malda and Coochbehar) during August 28-29, 2018.

During the visit to KVKs, the Committee Members suggested to scale-up the climate resilient technologies for the benefit of farming community.

In Narayanpur, NICRA village of Malda the ZMC monitored various interventions implemented under NRM, Crop Production, Livestock and Institutional modules and interacted with farmers, farm women and VCRMC members.

At Khagribari, NICRA village of Coochbehar KVK the team gave valuable suggestions for further improvement and refinement of technologies as per the local needs in relation to climatic vulnerabilities.



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.

One Publication NICRA-TDC Newsletter, July 2018 of ICAR-ATARI Kolkata was released during the visit.

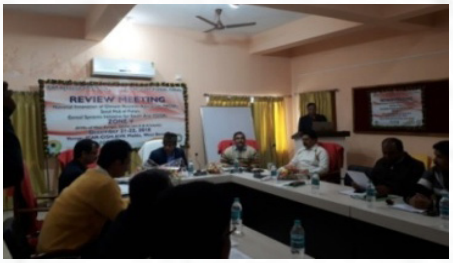
The ZMC consisted of Dr. H. K. Senapati, Former Dean, OUAT, Bhubaneswar as Chairman; Dr. S. S. Singh, Director, ICAR-ATARI Kolkata as Vice-Chairman, Dr. J V N S Prasad, Coordinator, NICRA-TDC as Nominee of Director, CRIDA, Hyderabad; Dr. Prabhat Pal, Director Extension UBKV as Member; Dr. F. H. Rahman, Pr Scientist/Nodal Officer, NICRA-TDC, ICAR-ATARI, Kolkata as Member Secretary.

Review Meeting of NICRA-TDC of ATARI Kolkata held at CISH-KVK Malda

The Review Meeting of NICRA of Zone V was held at CISH-KVK Malda during Dec 21-22, 2018. The programme was co-chaired by Dr. S. S. Singh, Director, ICAR-ATARI Kolkata and Dr. S. Rajan, Director, ICAR-CISH, Lucknow. The Programme was attended by Dr. S. K. Roy and Dr. F. H. Rahman Principal Scientists, ICAR-ATARI Kolkata; Prof P. Pal, DEE, UBKV and Dr. S. Mukherjee, Deputy DEE, UBKV and 8 KVKs from Odisha and West Bengal involved in the said projects.

Dr. S. S. Singh, Director, ICAR-ATARI Kolkata mentioned the purpose of NICRA and briefed the different components and interventions. Dr. S.

Rajan, Director, ICAR-CISH Lucknow asked the successful and scalable technologies of NICRA project may be replicated in nearby villages. Dr. S. K. Roy, Principal Scientist briefly spoken on the sucess of the projects as a whole. Dr. F. H. Rahman, NICRA Nodal Officer presented the highlights of the salient achievements carried out by the NICRA- KVKs of the zone V with fund utilization status.



In the technical session all the PIs of the KVKs have presented one by one their salient achievements of out scaled technologies during this year and also placed the next plan of work.

There was a field visit to NICRA village Narayanpur of district Malda and participants interacted with the VCRMC members regarding outscaling of various climate resilient technologies.

Field Visit for monitoring NICRA Activities

Ms. Ria Bhattacharya, SRF, NICRA-TDC and Mrs. Jhumur Basak, SRF, CFLD-Pulses ICAR-ATAR Kolkata visited NICRA Project sites *viz*. Chopara village of Ganjam I and Dasmankul village of Kendrapara KVKs during Nov 14-18, 2018 to collect data of ongoing activities carried out by the KVKs and also to interact with the farmers and VCRMC members. Various demonstrations like Ridge and Furrow cultivation of cowpeas (var. *Utkalmanika*); rain water harvesting structures; azolla cultivation pits; check dams; flood tolerant rice varieties (*Swarna sub 1* and *Bina 11*), drought tolerant rice variety (*Sahabhagidhan*) , Brown mannuring, mushroom cultivation, hydroponic fodder cultivation, low cost poultry and gotary house, bee keeping, vermicompost pits, custom hiring centres etc were visited. There was in-depth discussions with the farmers and VCRMC members at respective sites of both the KVKs.

Publications (July-December 2018)

Technical bulletins

Rahman F H, Bhattacharya R and Singh S S. 2018. NICRA Newsletter: Towards Climate Smart Agriculture, Pub. by ICAR-ATARI Kolkata, Vol. IV, No. 2, pp: 1- 8.

Abstracts presented in national/ international seminars etc.

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Garain P K, Maitra N J and Rahman F H. 2018. Bongheri – A Climate Resilient Village and its Adaptation Strategies. Abstract in the proceedings of 9th National Extension Education Congress of Society of Extension Education at CAPHET, Gangtok during Nov. 15-18, 2018.

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