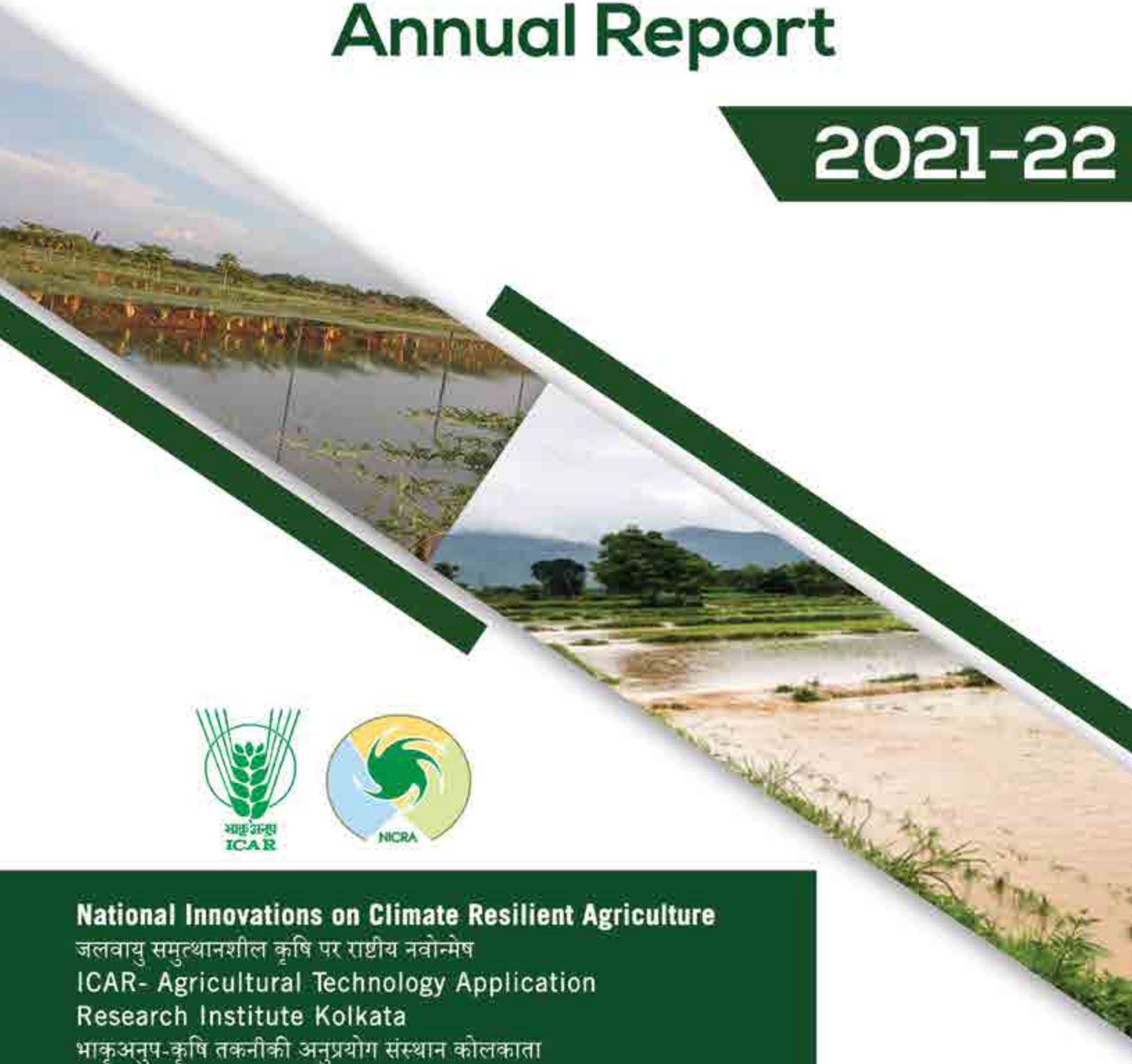
आज़ादी का अमृत महोत्सव

वार्षिक प्रतिवेदन
Annual Report

2021-22



National Innovations on Climate Resilient Agriculture
जलवायु समुत्थानशील कृषि पर राष्ट्रीय नवोन्मेष
ICAR- Agricultural Technology Application Research Institute Kolkata
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Annual Report 2021-22

National Innovations on Climate Resilient Agriculture

Technology Demonstration Component

NICRA

National Innovations on Climate Resilient Agriculture

ICAR-Agricultural Technology Application Research Institute Kolkata

Indian Council of Agricultural Research
Salt Lake City, Kolkata-700 097

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Preface

National Innovations on Climate Resilient Agriculture(NICRA) - A National Network Project of Indian Council of Agricultural Research (ICAR) with the objectives 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 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. 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 are carried out.

Technology Demonstration Component (TDC) under NICRA (National Innovations on Climate Resilient Agriculture) project is in operational in nine climatic vulnerable districts in the state of West Bengal (7), Odisha (9) and A & N Islands (1) of the Zone V. Location specific best innovative practices to address major climatic vulnerabilities such as drought, flood, heat stress and other extreme weather events were demonstrated during 2020-21 in farmers' field in NICRA adopted villages. The overall focus of technology demonstration under NICRA is to enhance resilience of farms and the farming community to climate risks so as to ensure sustainability over a period of time. The emphasis has been on capturing and improving the understanding on performances of technologies in different agro-ecologies and farming systems.

The NICRA Annual Report 2021-22 includes all the relevant and required information of ICAR-ATARI Kolkata and achievements of selected NICRA-KVKs coping with the challenges of climate vulnerabilities in farming practices as well as livelihood pattern for the empowerment of farming community. Compilation of NICRA Annual Report of ICAR-ATARI Kolkata for 2021-22 depicts a close assessment of endeavour of selected NICRA-KVKs in climatically vulnerable zones under supervision and guidance of ICAR-ATARI Kolkata and simultaneous attainment in the area of technology demonstrations, VCRMC, institutional interventions, seed production, capacity building, extension activities, review workshops *etc*. were also noted.

I wish to express my sincere gratitude to Secretary, DARE and Director General, ICAR, Deputy Director General (Agricultural Extension), Director, Coordinator (NICRA-TDC), ICAR-CRIDA Hyderabad and other officials of Division of Agricultural Extension, ICAR for providing guidance and help in compiling the Annual Progress Report 2021-22. I acknowledge the assistance received from the Directors of Extension Education of State Agricultural Universities of this zone and cooperation of all the selected NICRA implementing KVKs in providing information in time. The support and help rendered by all the staff of ICAR-ATARI Kolkata are duly acknowledged.

(S. K. Roy)
Director

Contents

कार्यकारी सारांश

बढ़ती वैश्विक जनसंख्या और बदलते आहार भोजन की मांग को बढ़ा रहे हैं। उत्पादन को बनाए रखने के लिए संघर्ष करना पड़ रहा है क्योंकि दुनिया के कई हिस्सों में फसल की पैदावार का स्तर कम हो रहा है, समुद्र के स्वास्थ्य में गिरावट आ रही है, और मिट्टी, पानी और जैव विविधता सहित प्राकृतिक संसाधन खतरनाक रूप से पतले हैं। 2020 की एक रिपोर्ट में पाया गया कि लगभग 690 मिलियन लोग —या वैश्विक जनसंख्या का 8.9 प्रतिशत—भूखे हैं, पाँच वर्षों में लगभग 60 मिलियन बढ़ गए हैं। खाद्य सुरक्षा चुनौती केवल और अधिक कठिन हो जाएगी, क्योंकि अनुमानित 9 अरब लोगों को खिलाने के लिए दुनिया को 2050 तक लगभग 70 प्रतिशत अधिक भोजन का उत्पादन करने की आवश्यकता होगी।

जलवायु परिवर्तन के लिए कृषि की अत्यधिक भेद्यता से चुनौती तेज हो गई है। जलवायु परिवर्तन के नकारात्मक प्रभावों को पहले से ही महसूस किया जा रहा है, बढ़ते तापमान, मौसम की परिवर्तनशीलता, कृषि पारिस्थितिकी तंत्र की सीमाओं में बदलाव, आक्रामक फसलों और कीटों, और अधिक लगातार चरम मौसम की घटनाओं के रूप में। खेतों पर, जलवायु परिवर्तन फसल की पैदावार, प्रमुख अनाजों की पोषण गुणवत्ता और पशुधन उत्पादकता को कम कर रहा है। वर्तमान पैदावार को बनाए रखने और मांग को पूरा करने के लिए उत्पादन और खाद्य गुणवत्ता में वृद्धि हासिल करने के लिए अनुकूलन में पर्याप्त निवेश की आवश्यकता होगी।

भारतीय कृषि अनुसंधान परिषद ने फरवरी 2011 में ग्यारहवीं योजना के दौरान एक फ्लैगशिप नेटवर्क परियोजना ‹नेशनल इनिशिएटिव ऑन क्लाइमेट रेजिलिएंट एग्रीकल्चर› (एनआईसीआरए) लॉन्च की और बारहवीं योजना के दौरान इसे ‹नेशनल इनोवेशन इन क्लाइमेट रेजिलिएंट एग्रीकल्चर› (एनआईसीआरए) कहा गया। यह देखते हुए कि जलवायु परिवर्तन एक निरंतर चुनौती है, इस महत्वपूर्ण क्षेत्र पर अधिक जोर देने के साथ ध्यान केंद्रित करने की आवश्यकता है। इस दृष्टि से एक योजना को सुदृढ़ किया गया है और बारहवीं पंचवर्षीय योजना के दौरान की गई पहल को आगे बढ़ाने का प्रयास किया गया है। इस प्रकार जलवायु अनुकूल कृषि में राष्ट्रीय नवाचार (एनआईसीआरए) इन उद्देश्यों के साथ जारी रहा है 1. बेहतर उत्पादन और जोखिम प्रबंधन प्रौद्योगिकियों के विकास और अनुप्रयोग के माध्यम से जलवायु परिवर्तनशीलता और जलवायु परिवर्तन के लिए फसलों, पशुधन और मत्स्य पालन को कवर करने वाली भारतीय कृषि की लचीलापन बढ़ाने के लिए, 2. वर्तमान जलवायु जोखिमों को अपनाने के लिए किसानों के खेतों पर साइट विशिष्ट प्रौद्योगिकी पैकेज प्रदर्शित करना, 3. जलवायु अनुकूल कृषि अनुसंधान और इसके अनुप्रयोग में वैज्ञानिकों और अन्य हितधारकों की क्षमता निर्माण को बढ़ाना और 4. व्यापक पैमाने पर अपनाने के लिए नीतिगत दिशानिर्देश तैयार करना लचीलापन बढ़ाने वाली तकनीकों और विकल्पों की

समग्र अपेक्षित परिणाम कमजोर क्षेत्रों में जलवायु परिवर्तनशीलता के लिए कृषि उत्पादन की लचीलापन में वृद्धि है। प्रारंभ में, पूरे भारत में 100 केवीके को परियोजना के कार्यान्वयन के लिए चुना गया था। इसके अलावा पूरे देश में 21 और केवीके को अनुमोदित बारहवीं योजना के अनुसार परियोजना को पूरा करने के लिए शामिल किया गया है। अनुकूलन और शमन पर अनुसंधान में फसलें, पशुधन, मत्स्य पालन और प्राकृतिक संसाधन प्रबंधन शामिल हैं।

एनआईसीआरए का प्रौद्योगिकी प्रदर्शन घटक (टीडीसी) किसानों के साथ काम करने और वर्तमान जलवायु परिवर्तनशीलता को दूर करने के लिए क्षेत्र की परिस्थितियों में ऐसी तकनीकों को लागू करने का शानदार अवसर प्रदान करता है। यह इन लचीली प्रौद्योगिकियों को अपनाने की गति को बढ़ाएगा। देश भर के 121 जलवायु रूप से संवेदनशील जिलों में केवीके के माध्यम से और आईसीएआर के 7 प्रमुख अनुसंधान संस्थानों द्वारा जलवायु लचीलेपन के लिए ऑन-फार्म भागीदारी प्रदर्शनों को ग्रामीण समूहों में लागू किया जा रहा है । विभिन्न कृषि-पारिस्थितिकी और कृषि प्रणालियों में प्रौद्योगिकियों के प्रदर्शन पर समझ को पकड़ने और सुधारने पर जोर दिया गया है। यह विभिन्न जैव-भौतिक और सामाजिक-आर्थिक संदर्भों में जलवायु लचीलापन का गठन करने की पहचान की सुविधा भी देता है। निक्रा केवीके ने ग्रामीण स्तर की आकस्मिक फसल योजनाओं और उपायों को तैयार और कार्यान्वित किया। ओडिशा (9), पश्चिम बंगाल (7) और अंडमान और निकोबार द्वीपसमूह (1) के केंद्र शासित प्रदेशों (1) के चयनित सत्रह केवीके जिलों की जलवायु भेद्यता का मूल्यांकन एनआईसीआरए कार्यक्रम के कार्यान्वयन के दौरान तकनीकी सहायता, मानव संसाधन विकास और समग्र रूप से निश्चित आवश्यकता को आगे लाया। कृषक समुदाय का सशक्तिकरण ताकि वे सूखा, अनियमित वर्षा, गर्मी की लहर, बाढ़, चक्रवाती तूफान जैसी जलवायु कमजोरियों से निपटने में सक्षम हो सकें। तदनुसार, केवीके जिलों के कमजोर गांवों में फसल उत्पादन, संसाधन संरक्षण, पशुधन और मछली पालन, जल संचयन आदि शुरू करने के लिए तकनीकी हस्तक्षेपों को क्रियान्वित करने के माध्यम से इसके कार्यान्वयन के लिए कार्य योजना तैयार की गई थी।

आईसीएआर- कृषि प्रौद्योगिकी अनुप्रयोग अनुसंधान संस्थान कोलकाता में नौ एनआईसीआरए कार्यान्वयन केवीके हैं जो प्रौद्योगिकी प्रदर्शन के तहत विभिन्न गतिविधियों को अंजाम देते हैं।

30064 किसानों (एनआरएम1977-, फसल उत्पादन3190-, पशुधन और मत्स्य2057-, संस्थागत हस्तक्षेप- 4050, क्षमता निर्माण- 5316 और विस्तार गतिविधियाँ- 13474) को लाभान्वित करने वाले विभिन्न मॉड्यूल में जलवायु अनुकूल कृषि कार्यक्रम पर राष्ट्रीय नवाचारों के घटक ।

प्राकृतिक संसाधन प्रबंधन मॉड्यूल में बाढ़ प्रवण क्षेत्रों में बेहतर जल निकासी, इन -सीटू नमी संरक्षण, नए जल संचयन और पुनर्चक्रण का निर्माण/नवीकरण, संरचनाएं/खेत तालाब/चेक डैम/टैंक छत जल संचयन टैंक, भूमि को आकार देने और वर्षा जल संचयन संरचनाएं शामिल हैं। बाढ़ प्रवण क्षेत्रों में जल निकासी में सुधार, संरक्षण जुताई जहां उपयुक्त हो, कृत्रिम भूजल पुनर्भरण और पानी की बचत सिंचाई के तरीके, हरी खाद , फसल अवशेष प्रबंधन, खेत की मेड़बंदी , ब्रॉड बेड फरो, मृदा परीक्षण आधारित पोषक तत्व अनुप्रयोग, सूक्ष्म सिंचाई तकनीक, खाद गड्ढे आदि । 797 हेक्टेयर क्षेत्र को कवर किया, जिससे 1977 क्षेत्र में कार्यरत किसानों को लाभ हुआ।

फसल उत्पादन मॉड्यूल के तहत *निक्रा* -केवीके द्वारा विभिन्न क्षेत्र विशिष्ट हस्तक्षेप किए गए ; सूखा, नमक और बाढ़ सहिष्णु / प्रतिरोधी किस्मों का परिचय, टर्मिनल हीट स्ट्रेस वाले क्षेत्रों में रबी फसलों की बुवाई की तारीखों की उन्नति, पानी की बचत धान की खेती के तरीके (एसआरआई, एरोबिक, डायरेक्ट सीडलिंग), विलंबित मानसून के लिए सामुदायिक नर्सरी, स्थान विशिष्ट इंटरक्रॉपिंग सिस्टम के साथ उच्च टिकाऊ उपज सूचकांक, नई फसलों की शुरूआत/फसल विविधीकरण, समय पर रोपण के लिए कस्टम हायरिंग सेंटर , कम तापमान सहनशीलता, मानसून के बाद की वर्षा का उपयोग करके दालों को बढ़ावा देना, एकीकृत फसल/कीट/रोग प्रबंधन, आकस्मिक फसल के रूप में सब्जियां उगाना, एकीकृत फसल प्रबंधन एकीकृत रोग प्रबंधन, आकस्मिक फसल, जिसमें 663.7 हेक्टेयर क्षेत्र शामिल है, जिससे 3190 किसान लाभान्वित हुए।

इसी तरह **पशुधन और मत्स्य पालन** मॉड्यूल के तहत सूखे/बाढ़ के दौरान चारा उत्पादन के लिए सामुदायिक भूमि का उपयोग, बेहतर चारा/चारा भंडारण विधियों, पशुधन में गर्मी के तनाव को कम करने के लिए बेहतर आश्रयों, पानी के दौरान मछली तालाबों/टैंकों के प्रबंधन सहित विभिन्न पशुधन केंद्रित हस्तक्षेप किए गए । पानी की कमी और अधिकता, नस्ल उन्नयन, खनिज मिश्रण के माध्यम से संतुलित चारा और चारा प्रबंधन, फीड ब्लॉक और साइलेज बनाना, अजोला खिलाना, कृमिनाशक और टीकाकरण के माध्यम से नस्ल पशु स्वास्थ्य प्रबंधन, मछली तालाब की सफाई और मछली पालन, स्वच्छ दूध और चारा उत्पादन *आदि* । कवर किए गए जिससे 2057 पशुपालक लाभान्वित हुए ।

संस्थागत हस्तक्षेप बीज बैंक, चारा बैंक, कमोडिटी समूह, समय पर संचालन के लिए कस्टम हायरिंग, सामुदायिक नर्सरी स्थापना, सिंचाई, सामूहिक विपणन जलवायु साक्षरता, एक ग्रामीण स्तर के मौसम केंद्र के माध्यम से और लगभग सभी निक्रा गांवों में जागरूकता विकसित करना शामिल है। 4050 किसानों के 175.3 हेक्टेयर क्षेत्र को कवर करते हुए कुल 162 इकाइयां विकसित की गई हैं। मिनी स्वचालित मौसम स्टेशन (एडब्ल्यूएस) का प्रावधान है जिसके माध्यम से किसानों को मौसम पूर्वानुमान डेटा प्रदान किया जाता है।

ग्राम जलवायु जोखिम प्रबंधन समिति (वीसीआरएमसी) का गठन ग्रामीणों के साथ गहन चर्चा के बाद किया गया था, जिसमें गांवों की जलवायु संबंधी कमजोरियों को कम करने और इस कार्यक्रम के तहत अपनाई जाने वाली रणनीतियों के बारे में बताया गया था। वीसीआरएमसी के अध्यक्ष और संबंधित केवीके के प्रमुख द्वारा संयुक्त रूप से संचालित किए जाने वाले उनके नाम पर एक बैंक खाता खोलने के साथ वीसीआरएमसी चालू हो गया। केवीके के परामर्श से गाँव में लागू किए जाने वाले तकनीकी हस्तक्षेपों पर महत्वपूर्ण निर्णय लेने के अलावा, वीसीआरएमसी द्वारा विभिन्न कृषि उपकरणों और उपकरणों को किराए पर लेने की निगरानी की जा रही थी। कस्टम हायरिंग सेंटर में पावर टिलर, थ्रेशर, रीपर, वाटर पंप, जीरो-टिल ड्रिल, रेज्ड बेड प्लांटर, स्प्रेयर, वीडर *आदि* जैसे विभिन्न कृषि उपकरणों का प्रावधान है।

वीसीआरएमसी की देखरेख में एनआईसीआरए द्वारा गोद लिए गए गांव में शुरू किए गए **कस्टम हायरिंग सेंटर** किसानों के बीच बेहद लोकप्रिय हो गए हैं और इससे अच्छी खासी रकम भी सृजित हुई है। सभी निक्रा केवीकेएस के वीसीआरएमसी ने कस्टम हायरिंग सेंटर्स के माध्यम से 2021-22 के दौरान 636937 रुपये और इनमें से 131096 रुपये की राशि उत्पन्न की।

विभिन्न विषयगत क्षेत्रों पर **क्षमता निर्माण** के तहत कुल 241 पाठ्यक्रम आयोजित किए गए, जिससे 5316 महिला सैनिक और कृषक (2952 पुरुष और 2364 महिलाएं) लाभान्वित हुए। विषयगत क्षेत्र फसल प्रबंधन, प्राकृतिक संसाधन प्रबंधन, पोषक तत्व प्रबंधन, एकीकृत फसल प्रबंधन, फसल विविधीकरण, संसाधन संरक्षण प्रौद्योगिकी, कीट और रोग प्रबंधन, पशुधन और मत्स्य प्रबंधन, नर्सरी स्थापना, रोजगार सृजन, पोषक उद्यान, कृषि मशीनरी की मरम्मत और रखरखाव पर कवर करते हैं। और उपकरण, एकीकृत कृषि प्रणाली, चारा और चारा प्रबंधन, महिलाओं के लिए कृषि उपकरणों के साथ लाख की खेती में कमी, मूल्यवर्धन, मानव पोषण और बच्चे की देखभाल, कृंतक नियंत्रण *आदि* ।

समीक्षाधीन अवधि के दौरान विभिन्न विषयगत क्षेत्रों पर कुल 413 **विस्तार गतिविधियों** से 13474 कार्यरत किसानों (8257 पुरुष और 5217 महिलाएं) को लाभ हुआ। विस्तार गतिविधियों का आयोजन पद्धति प्रदर्शनों, कृषि सलाहकार सेवाओं, जागरूकता पशु स्वास्थ्य शिविर, किशन पर किया गया चौपाल , किशन गोष्ठी , संसाधन संरक्षण प्रौद्योगिकियां, उत्सव क्षेत्र और किसान दिवस, नैदानिक दौरे, समूह चर्चा, विश्व पृथ्वी दिवस, प्रौद्योगिकी सप्ताह, किशन मेले *आदि* । सभी नौ निक्रा-केवीके ने संबंधित केवीके में 5 दिसंबर, 2022 को कार्यशाला, संगोष्ठी, संगोष्ठी, जागरूकता शिविर आयोजित करके विश्व मृदा दिवस मनाया और निक्रा गांवों के 1753 किसानों के बीच 1367 मृदा स्वास्थ्य कार्ड वितरित किए।

विकास एजेंसियों के साथ **अभिसरण कार्यक्रमों** में कई हस्तक्षेप किए गए जो एनआईसीआरए द्वारा गोद लिए गए गांवों में चल रहे हैं। इन विकासात्मक कार्यक्रमों के समर्थन का उपयोग गाँव में सिद्ध हस्तक्षेपों को बढ़ाने के लिए किया गया था। 22-2021 के दौरान चल रहे विकास कार्यक्रमों या योजनाओं के साथ केवीके को लागू करने वाले एनआईसीआरए द्वारा बड़ी संख्या में अभिसरण कार्यक्रम चलाए गए। प्रमुख विकास योजनाएं एससीएसपी, मनरेगा, सुंदरबन विकास बोर्ड, वन विभाग, सिंचाई विभाग , आईसीएआर संस्थान, संबंधित राज्यों के विभिन्न विभाग *आदि हैं । वर्ष के दौरान इस कार्यक्रम के माध्यम से 38.47 लाख रुपये की राशि उत्पन्न की गई है।*

Executive Summary

A growing global population and changing diets are driving up the demand for food. Production is struggling to keep up as crop yields level off in many parts of the world, ocean health declines, and natural resources—including soils, water, and biodiversity—are stretched dangerously thin. A 2020 report found that nearly 690 million people—or 8.9 percent of the global population—are hungry, up by nearly 60 million in five years. The food security challenge will only become more difficult, as the world will need to produce about 70 percent more food by 2050 to feed an estimated 9 billion people.

The challenge is intensified by agriculture's extreme vulnerability to climate change. Climate change's negative impacts are already being felt, in the form of increasing temperatures, weather variability, shifting agro ecosystem boundaries, invasive crops and pests, and more frequent extreme weather events. On farms, climate change is reducing crop yields, the nutritional quality of major cereals, and lowering livestock productivity. Substantial investments in adaptation will be required to maintain current yields and to achieve production and food quality increases to meet demand.

The Indian Council of Agricultural Research launched - A Flagship Network Project 'National Initiative on Climate Resilient Agriculture' (NICRA) during XI Plan in February 2011, and during XII Plan it is referred as 'National Innovations in Climate Resilient Agriculture' (NICRA). Considering that the climate change is a continued challenge, the focus on this critical area needs to be continued with greater emphasis. Keeping this view, one scheme has been strengthened and efforts were made to build on the initiative taken during XII five year plan. Thus National Innovations in Climate Resilient Agriculture' (NICRA) has been continuing with these objectives 1. To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies, 2. To demonstrate site specific technology packages on farmers' fields for adapting to current climate risks, 3. To enhance the capacity building of scientists and other stakeholders in climate resilient agricultural research and its application and 4.To draw policy guidelines for wider scale adoption of resilience-enhancing technologies and options

The overall expected outcome is enhanced resilience of agricultural production to climate variability in vulnerable regions. Initially, 100 KVKs all over India were selected for implementation of the project. In addition to that 21 more KVKs throughout the country have been included for carrying out the project as per approved XII Plan. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management.

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 121 climatically vulnerable districts across the country and by 7 core research institutes of ICAR. 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. Climatic vulnerability of selected Seventeen KVK districts of Odisha (9), West Bengal (7) and union Territory of A & N Islands (1) assessed during implementation of NICRA programme brought 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. Plan of action, accordingly, was prepared for its implementation through executing technological interventions to initiate crop production, resource conservation, livestock and fish rearing, water harvesting *etc*. in the vulnerable villages of KVK districts.

ICAR- Agricultural Technology Application Research Institute Kolkata having nine NICRA implementing KVKs which carried out different activities under Technology Demonstration

Components of National Innovations on Climate Resilient Agriculture Programme in various module benefitting 30064 farmers (NRM- 1977, Crop Production-3190, Livestock and Fisheries- 2057, Institutional Interventions- 4050, Capacity Building- 5316 and Extension Activities- 13474).

Natural Resource Management module covered improved drainage in flood prone areas, in-situ moisture conservation, construction/renovation of new water harvesting and recycling, structures/farm ponds/ checks dams/tank roof water harvesting tank, land shaping & rainwater harvesting structures, improved drainage in flood prone areas, conservation tillage where appropriate, artificial ground water recharge and water saving irrigation methods, green manuring, crop residue

management, bunding of field, Broad Bed Furrow, soil test based nutrient application, micro irrigation techniques, compost pits etc. covered 797 ha area which benefitted 1977 practicing farmers in the zone.

Under **Crop Production** module different area specific intervention were taken by the NICRA-KVKs *viz*; Introducing drought, salt and flood tolerant/ resistant varieties, advancement of planting dates of rabi crops in areas with terminal heat stress, water saving paddy cultivation methods (SRI, aerobic, direct seedling), community nurseries for delayed monsoon, location specific intercropping systems with high sustainable yield index, introduction of new crops/ crop diversification, custom hiring centres for timely planting, low temperature tolerance, promotion of pulses utilizing post-monsoon rainfall, integrated crop/pest/ disease management, growing vegetables as contingency crop, integrated crop management, integrated disease management, contingency crop, covering 663.7 ha area which benefitted 3190 farmers.

Similarly under **Livestock and Fisheries** module various livestock centric interventions were carried out including Use of community lands for fodder production during drought/flood, improved fodder/feed storage methods, improved shelters for reducing heat stress in livestock, management of fish ponds/tanks during water scarcity and excess water, breed up-gradation, balanced feed & fodder management through mineral mixture, feed blocks & silage making, azolla feeding, breed animal health management through deworming and vaccination, fish pond cleaning and fish farming, clean milk & fodder production *etc.* were covered which benefitted 2057 livestock owner.

Institutional Interventions including seed bank, fodder bank, commodity groups, custom hiring for timely operations, community nursery raising, irrigation, collective marketing climate literacy through a village level weather station and awareness developed in almost all NICRA villages. A total of 162 units have been developed covering of 175.3 ha area of 4050 number of farmers. There is a provision of Mini Automatic Weather Station (AWS) through which farmers are provided weather forecasting data.

Village Climate Risk Management Committee (VCRMC) was constituted after in-depth discussion with the villagers about the mitigation of the climatic vulnerabilities of the villages and the strategies to be adopted under this programme. VCRMC became operational with opening of a bank account in their name being jointly handled by the President of VCRMC and the Head of the KVK concerned. The custom hiring of various farm tools and implements was being supervised by VCRMC apart from taking important decisions on the technological interventions to be implemented at the village in consultation with the KVK. Custom Hiring Centre has the provision of various farm implements like Power tiller, Thresher, Reaper, Water pump, Zero- till Drill, Raised bed planter, Sprayer, Weeder *etc*.

Custom Hiring Centers initiated in the NICRA adopted village under the supervision of VCRMC has become immensely popular among the farmers and substantial amount has also been generated. VCRMC of all NICRA KVKS generated an amount of Rs. 636937 and out of these Rs. 131096 during 2021-22 through Custom Hiring Centers.

A total 241 courses were conducted under **Capacity Building** on various thematic areas benefitting 5316 farmers and farmwomen (2952 males and 2364 females) during 2021-22. Thematic areas cover on crop management, natural resource management, nutrient management, integrated crop management, crop diversification, resource conservation technology, pest and disease management, livestock and fishery management, nursery raising, employment generation, nutrient garden, repair and maintenance of farm machineries and implements, integrated farming system, fodder and feed management, lac cultivation drudgery reduction with farm implements for woman, value addition, human nutrition and child care, rodent control *etc*.

A total of 413 **Extension Activities** on various thematic areas benefiting 13474 practicing farmers (8257 males and 5217 females) during the reporting period. The extension activities were conducted on method demonstrations, agro advisory services, awareness animal health camp, Kishan Chaupal, Kishan Gosthi, resource conservation technologies, celebration field and farmers' days, diagnostic visits, group discussion, World Earth Day, technology week, kishan mela *etc*. All the nine NICRA-KVKs have celebrated World Soil Day through conducting workshop, seminar, symposia, awareness camp on December 5, 2022 in the respective KVK and distributed 1367 Soil Health Cards distributed among 1753 farmers of NICRA villages.

A number of interventions were taken up by NICRA KVKs during the year in **Convergence Programmes** with developmental agencies which are operational in the NICRA adopted villages. Support from these developmental programmes was used for scaling up of proven interventions in the village. Huge number of convergence programmes was carried out by the NICRA implementing KVK with ongoing development programmes or schemes during 2021-22. The prominent development schemes are SCSP, MGNREGA, Sunderban Development Board, Forest Department, Irrigation Department, ICAR Institutes, different Departments of the concerned states *etc.* An amount of Rs.38.47 lakhs has been generated through this programme during the year

1. INTRODUCTION

India's population touched more than 1.38 billion in 2021 which is 17.7 per cent of the world's population - according to global population data. India accounts for only 2.4 per cent of the global land. The average size of landholding per state is 1.08 hectares, according to the latest agricultural census. Farmers in half the Indian states are marginal (with land less than 1 ha); the remaining are small farmers (land holdings of 1-2 ha).

Most of them have been facing several major constraints such as input supply, credit availability, proper transport, and market facility, etc. Their share nearly 60 per cent in total food grain production: approx. 49 per cent rice, approx. 40 per cent wheat, approx. 29 per cent coarse cereals and approx. 27 per cent pulses as well as over half of the country's fruits and vegetable production, according to Agricultural Census.

Agriculture is the primary source of livelihood for about 58 per cent of India's population. Other natural resource-based enterprises are also the foundation for the country's economic growth. Its related sectors, including field crops, horticulture, livestock, fishery and poultry are strongly associated with several United Nations Sustainable Development Goals (SDG) such as zero hunger, nutrition, and climate action, among others.

According to Union government estimates, India's food production was 291.95 MT in 2019-20; for 2020-21, the government had set the target up to 298.3 MT, which was two per cent from the previous year's output.

Food production must double by 2050 to match the country's population and income growth. The small and marginal farmers, therefore, have a major role in the country's food security and meeting the SDG goals.

Nearly 14 per cent of the population (189.2 million) is still undernourished in India, according to State of Food Security and Nutrition in the World, 2020 report. The Global Hunger Index 2020 placed India at the 94th position among 107 countries. Achieving 'zero hunger' by 2030 is a humungous challenge, and needs an integrated and multi-dimensional approach for overall sustainable agriculture and food systems in the country.

One of the critical challenges for food security is climate change and its impact in form of extreme weather events. The predicted 1-2.5 degrees Celsius temperature rise by 2030 is likely to show serious effects on crop yields. High temperatures may reduce crop duration, permit changes in photosynthesis, escalate crop respiration rates and influence pest population.

Climate change accelerates nutrient mineralisation, hampers fertilizer use efficiency (FUE) and hastens the evapotranspiration in soil.

The impact of climate change is directly or indirectly related to crop, water and soil as it influences the water availability, changes the intensity and frequencies of drought, effects microbial population, soil organic matter reduction, yield reduction, depletion of soil fertility as driven by soil erosion, etc.

Climate-resilient agriculture (CRA) is an approach that includes sustainbly using existing natural resources through crop and livestock production systems to achieve long-term higher productivity and farm incomes under climate variabilities.

Climate change can reduce agricultural income by 15-25 per cent; it is high time that rationale of climate-resilient agriculture (CRA) is valued and implemented more rigorously.

Following are crucial to address the climate change and achieve sustainable development goals (SDG) in India:

- Adaptation of appropriate mitigation technologies such as the cultivation of tolerant breeds to overcome the climate stress
- Water and nutrient management for efficient productivity and resource utilisation
- Agro-advisories for timely crop monitoring
- Conservation agricultural practices to build soil organic carbon and to build congenial environment for plant growth, manure management

Keeping these challenges in view, the Government of India, Ministry of Agriculture, and Farmers Welfare and Indian Council of Agricultural Research (ICAR) has taken several proactive policies that are being implemented at the village level.

National Innovations on Climate Resilient Agriculture (NICRA), was launched in 2011 to address the challenges of climate variability and climate change along with farmers need to adopt quickly increasing frequency of drought, flood and other extreme events by application of science and technology. Technology Demonstration Component (TDC) of NICRA offers great opportunity to work with farmers and apply such technology under field conditions with the background of current climate hostility. The emphasis has been capturing and improving the understanding on performance of technologies in different agro-ecologies and farming systems. This also facilitates quantification of various components of

climate resiliency in different biophysical and socio-economic context.

The objectives of this network project are:

- To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies
- To demonstrate site specific technology packages on farmers' fields for adapting to current climate risks
- To enhance the capacity building of scientists and other stakeholders in climate resilient agricultural research and its application

The overall expected outcome is enhanced resilience of agricultural production to climate variability in vulnerable regions. Initially, 100 KVKs all over India were selected for implementation of the project. In addition to that 21 more KVKs throughout the country have been included for carrying out the project as per approved XII Plan. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management. The project is comprised of four components.

- 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
- Capacity building of different stakeholders

Technology Demonstration Component is one of the most important components of this project through which demonstrations are conducted with site specific technology packages on farmers' fields, encouraging the farmers to adopt new technologies to cope with the emerging threat of climate change as well as current climate vulnerability. Both short and long term output are expected from the project pertaining to new and improved varieties of crops, livestock breeds, management practices that help in the development of policy making to mainstream climate resilient agriculture in the path of developmental planning.

The project was formulated and addressed based on the following steps:

- Analysis of climate constraints of the village based on long term data
- Assessment of natural resources status of the village
- Identification of major production systems
- Studying of existing institutional structures and identifying the gaps
- Focus group discussion with the community to finalize the interventions

The interventions being implemented are based on four modules, *i.e.* (1) Natural resources management, (2) Crop production, (3) Livestock and fisheries and (4) Institutional interventions.

Enhancing resilience is one of the important keys to achieve sustainability in agriculture especially in the background of climate vulnerability and climate change. The vulnerabilities of the respective KVK districts are mentioned here under:

The vulnerabilities of the respective KVK districts are mentioned hereunder:

List of districts and KVKs with Climate vulnerability

S. N.	State	NARP Zone	Districts	Climate vulnerability
1	A&N Islands	Coastal Zone	Port Blair	Cyclone
2	Odisha	North-Eastern Ghat	Ganjam 1	Drought
3	Odisha	Western Central Table	Bolangir	Drought
4	Odisha	Western Undulating zone	Kalahandi	Drought
5	Odisha	East & South Eastern Coastal Plain	Kendrapara	Flood / Cyclone
6	Odisha	North Central Plateau	Keojhar	Drought / Flood
7	Odisha	East & South Eastern Coastal Plain	Puri	Heavy rainfall with irregular distribution, flood
8	Odisha	East & South Eastern Coastal Plain	Jagatsinghpur	Flood/Cyclone
9	Odisha	North Eastern Coastal Plain	Bhadrak	Flood, eratic distribution of rain, thunderstorm in summer
10	Odisha	Mid Central Table Land	Dhenkanal	Erratic, unseasonal rainfall with irregular distribution
11	West Bengal	Terai Zone (WB-2)	Coochbehar	Heavy rainfall
12	West Bengal	Old Alluvial Zone (WB-3)	Malda	Flood
13	West Bengal	Coastal Saline Zone (WB-6)	South 24 Parganas	Cyclonic storm/heavy rainfall within short period

S. N.	State	NARP Zone	Districts	Climate vulnerability
14	West Bengal	Coastal Saline	North 24 Parganas	Cyclone and Flood prone with soil salinity during Rabi-Summer
15	West Bengal	Red Lateritic	Purulia	Intermediate drought, Heat wave
16	West Bengal	Old Alluvial	Mursidabad	Drought
17	West Bengal	Hill	Kalimpong	Cold and foggy

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. Climatic vulnerability of selected seventeen KVK districts of Odisha, West Bengal and union Territory of A & N Islands assessed during implementation of NICRA programme brought 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. Plan of action, accordingly, was prepared for its implementation through executing technological interventions to initiate crop production, resource conservation, livestock and fish rearing, water harvesting *etc*. in the vulnerable villages of KVK districts. Demonstration of appropriate practices and technologies with a climate focus is taken up in farmer participatory mode in NICRA villages. The NICRA villages have become hubs of learning on climate resilient agriculture in the other parts of the districts.

Villages adopted by NICRA implementing KVKs of Zone-V where the various technologies have been demonstrated are mentioned here under:

Sl. No.	Name of KVK	Name of village	Sl. No.	Name of KVK	Name of village
1	Ganjam 1	Chopara	10	Cooch Behar	Khagribari
2	Bhadrak	Fatepur	11	Malda	Brozolaltola, Meherchandtola, Jayramtola and Mahendrotola
3	Kalahandi	Pipalpada, Maskaguda, kamardha	12	South 24 Parganas	Bongheri and Kaikhali - 2
4	Kendrapara	Dasmankul	13	North 24 Parganas	Samsernagar
5	Keonjhar	Denua	14	Mursidabad Addln.	Sujapur-Banomalipur
6	Puri	Jatipura	15	Purulia	Haramjanga
7	Bolangir	Odiapali	16	Kalimpong	Paiyong Khasmahal
8	Jagatsinghpur	Achyutadaspur	17	Port Blair	Badmaspahad and Port Mount
9	Dhenkanal	Arachua			

2. INTERVENTIONS WITH MODULES

Module I: Natural Resource Management

In-situ moisture conservation, water harvesting and recycling for supplemental irrigation, improved drainage in flood prone areas, conservation tillage where appropriate, artificial ground water recharge and water saving irrigation methods and rainwater harvesting structure development.

Module II: Crop Production

Introducing drought, salt and flood tolerant/ resistant varieties, advancement of planting dates of rabi crops in areas with terminal heat stress, water saving paddy cultivation methods (SRI, aerobic, direct seedling), community nurseries for delayed monsoon, location specific intercropping systems with high sustainable yield index, introduction of new crops/ crop diversification, custom hiring centres for timely planting.

Module III: Livestock and Fisheries

Use of community lands for fodder production during drought/flood, improved fodder/feed storage methods, preventive vaccination, improved livestock demonstration, improved shelters for reducing heat stress in livestock, management of fish ponds/tanks during water scarcity and excess water.

Module IV: Institutional Interventions

Strengthening the existing institutional interventions or initiating new ones relating to seed bank, fodder bank, commodity groups, custom hiring centre, collective marketing group, introduction of weather index based insurance and climate literacy through a village weather station are part of this module.

2.1 Module I: NATURAL RESOURCE MANAGEMENT

The major emphases of the intervention were on augmenting rainwater availability through its efficient use by adopting site-specific rainwater harvesting strategies. Major interventions under this theme included in-situ moisture conservation; construction/renovation of new water harvesting and recycling structures/farm ponds/checks dams/tank roof water harvesting tank; land shaping and RWH structure; improved drainage in flood prone areas; conservation tillage where appropriate; artificial ground water recharge and water saving irrigation methods; green manuring; 5% model of irrigation; crop residue management; bunding of field; broad bed furrow; soil test based nutrient application; micro irrigation techniques; compost pits; participatory soil health management through identification and correction of major and micro nutrients. The impact of interventions aimed and enhancing rainwater harvesting and utilization capacity was very significant across the clusters. The efforts in this area resulted in the creation of an additional rainwater harvesting capacity of over 17.3 lakh cu m leading to increase cropping intensity by bringing around 1250 ha of area under protective irrigation regime since the inception of the project.

2.1.1 In-situ Moisture Conservation - Resource Conservation Technology:

In-situ rainwater management through ridge and furrow method and broad bed furrow practice conserves rainwater at field level and also drains out excess water into community drainage channels. This water can also be utilized for recharging ground water to provide supplemental irrigation to post-rainy season crops, which is otherwise not possible with flat bed planting. Through these methods, soil moisture is managed by maximizing the use of rainfall through increased infiltration and moisture retention and reducing runoff and soil erosion. The performance of high yielding improved varieties is optimized by *in situ* moisture management. Surface runoff and deep drainage water is exploited as supplemental irrigation to post-rainy season crops like wheat and chickpea. These conservation technologies have been demonstrated in NICRA adopted villages covering 806 farmers in 231.7 ha area. The performance of different technologies by the various KVKs is presented in the following table.

Table: Performances of demonstration of in-situ moisture conservation technologies

Technology demonstrated	No. of farmers	Area (ha)	Yield (q/ha)	Economics of demonstration (Rs/ha)		
				Gross Cost	Net Return	BCR
Use of rice straw mulch in Cucumber (Local variety: Jampur) and Poi (Basella) var: Panchsira	150	20.0	256.0	134350	140000	2.04
Zero Tillage in wheat; Var. *DBW39 / HD 2967/DBW 187*	66	45.0	30.4	28950	48705	2.08
Zero tillage Maize (Var. *DKC 9081)*	28	4.6	58.5	40380	91260	2.26
Organic mulching in vegetables (Tomato, brinjal); Var. Hybrid	80	12.0	282.5	140000	140800	2.30
Vegetables Poly-mulching in winter cucumber, Okra	22	9.2	51.6	27500	25550	1.93
Summer Ploughing in Rice	14	4.0	42.2	37000	41070	2.11
Green manuaring (dhaincha) in Rice	09	3.0	35.6	33000	32860	1.99
Ridge and furrow method of brinjal, cow pea (var. *Kashikanchan*) and radish cultivation	139	16.0	35.3	22575	34000	2.51
Green manuaring (dhaincha) in Rice	40	0.6	340.0	134350	140000	2.04
Moisture conservation in Rice – Summer ploughing by MB plough	17	2.0	306.0	65000	114000	2.75
Sowing of Summer maize *(F1 Hybrid P3535)* in Ridge & furrow method in upland	24	25.0	34.0	23000	33098	2.50
Green manuring by Sunhemp. (Sunhemp-Rice)	22	18.0	40.2	24100	26000	2.08
Introducing pulse crop in paddy system (Lentil- Paira cropping) var. PL-8	35	6.4	10.5	22350	28050	2.26
Crop diversification through promotion of Mustard (var. YSH0401, Pusa Bold)	25	4.0	10.8	23480	22960	1.98
Promotion of paddy transplanter (var. DRR-44, Puspa)	20	4.0	46.5	34800	41925	2.21
Organic (Rice straw) mulching in vegetables (Pointed Gourd)	18	3.0	116.3	93500	197125	3.11
Organic (Rice straw) mulching in vegetables (Tomato)	12	1.6	191.3	66750	143625	3.15
Mulching (Poly) in vegetables (Cucumber)	15	1.8	291.0	72600	160200	3.21
Shredding of crop residue	52	34.6				
Vermi-composting	37	20.0	2660.0	2650	4820	2.82
Land embankment development	05	0.8	90.1*	58092	125366	3.15
Broad Bed cum trench system	04	0.6	280.0*	216795	303413	2.45
Total	**806**	**231.7**				

*Crop equivalent yield (rice) of rice bittergourd, Chilli

2.1.2 Water harvesting and recycling for supplemental irrigation:

Water harvesting and recycling for supplemental irrigation were demonstrated in NICRA adopted villages by the different KVKs involving 385 numbers of farmers in 50.4 ha. The performances of different indicators in the demonstrations are presented in following table.

Table: Performances of water harvesting and recycling for supplemental irrigation

Technology demonstrated	No. of farmers	Area (ha)/ Unit	Output (cu.m)	Economics of demonstration (Rs/ha)		
				Gross Cost	Net Return	BCR
Repairing of Check Dam	14	5.6	1300	30100	27377	1.91
Renovation of pond (for fish Production and irrigation)	255	16.8	17945	85000	11500	2.35
Enlargement of existing freshwater pond	8	2.0	1235	46000	51250	2.11
Brackish water pond	2	0.3	801	130280	145875	2.12
Renovation of old water harvesting structure in rice field	4	9.9	3404	35600	23500	1.66
Raising of land embankment	6	4.2	1245	43120	145990	4.39
Dug out pond	30	5.6	1259	64800	62450	1.96
Renovation of canal	34	0.1	16880	41030	112500	3.74
Renovation of Defunct Well-03 nos.	17	2.5	1154	66500	82530	2.24
Construction of deep open well	15	3.4	1498	250000	345000	2.38
Total	**385**	**50.4**				

2.1.3 Conservation tillage:

Sowing of *rabi* crops depends on the harvesting time of the preceding crop in *kharif* and also soil moisture status for undertaking land preparation for sowing. In case of wheat, this involves 2 to 3 or even more tillage operations for obtaining appropriate tilth before planting of wheat. In addition to the costs incurred and energy required, this causes delay in planting of wheat which often results in coincidence of vulnerable stage with high temperature stress during February/ March. This often leads to reduction in grain yield and loss to farmer. Zero till technology offers a viable and practical solution by avoiding repeated tillage for land preparation and sowing, reducing cost of cultivation and also permits planting early by 10-15 days. Advancement in sowing date is an adaptation to avoid terminal heat stress. Zero-tillage refers to direct drilling of wheat in unploughed paddy fields immediately after rice harvest using zero till drill or happy seeder. Conservation tillage in wheat, rice, lentil, pea and chickpea demonstrated in NICRA villages in an area of 69.8 ha in 131 numbers of farmers. The technologies followed mainly by zero tillage operation. The results of the ZTD in various crops are presented in below table.

Table: Performance of ZTD in various crops

Technology demonstrated	No. of farmers	Area (ha)	Output (q/ha)	Economics of demonstration (Rs./ha)		
				Gross Cost	Net Return	BCR
Promotion of improved variety of wheat + Zero tillage technology	32	26.0	39.6	25550	23350	1.91
Promotion of improved variety of maize + Zero tillage technology	29	15.0	53.1	35000	39870	2.14
Surface seeding and mulching in lentil	15	8.5	17.7	21150	36000	2.70
Surface seeding and mulching in mustard	20	9.5	14.9	16450	17500	2.06
Sowing of rice with power tiller	35	10.8	18.1	21500	22040	2.03
Total	**131**	**69.8**				

2.1.4 Artificial ground water recharge:

Artificial ground water recharge done by field bunding, water management and through SRI by sub-soiler in paddy in villages covering 70.3 ha area in 137 farmers fields. Ground water recharge through SRI by sub-soiler recorded highest rice yield (53.0 q/ha) and benefit: cost ratio (2.24).

Table: Performance of artificial ground water recharge technologies demonstrated

Technology demonstrated	No. of farmers	Area (ha)	Output (q/ha)	Economics of demonstration (Rs./ha)		
				Gross Cost	Net Return	BCR
Water management through bunding of rice fields	101	50.1	47.0	24700	20800	1.92
Ground water recharge through SRI by sub-soiler	36	20.2	53.0	39550	45500	2.24
Total	**137**	**70.3**				

2.1.5 Water saving irrigation methods:

Water saving irrigation methods like sprinkler irrigation, LEWA in rice, RBF in brinjal, micro-lift irrigation in paddy demonstrated in NICRA adopted villages covering an area of 57.7 ha in 248 farmers' fields.

Table: Performance of different water saving irrigation methods

Technology demonstrated	No. of farmers	Area (ha)	Output (q/ha)	Economics of demonstration (Rs./ha)		
				Gross Cost	Net Return	BCR
Irrigation system (micro lift Irrigation system) for rice	15	6.5	32	27500	22000	1.80
Application of biofertilizer in rice (var. *MTU 7029*)	42	6.9	54	38000	50000	2.32
Vermi-compost from biodegradable wastes	41	2.9	14	4500	3990	1.89
RBF in Brinjal and cucumber (var. *Malini*)	15	2.2	11	51150	31550	1.62
Sprinkler irrigation in green gram (Var. *HUM-16*)	18	3.8	15	16200	25450	2.57
Sprinkler irrigation in chickpea (var. *PG-186*)	25	5.5	16	13000	18550	2.43
Vermi-compost from biodegradable wastes	13	9.1	49	21550	60050	3.79

Technology demonstrated	No. of farmers	Area (ha)	Output (q/ha)	Economics of demonstration (Rs./ha)		
				Gross Cost	Net Return	BCR
Sprinkler irrigation in green gram	10	7.2	13	20150	15850	1.79
Sprinkler irrigation in Brinjal (*MuktaKeshi*)	10	1.2	464	148500	565500	4.81
Sprinkler irrigation in Chilli(Tejaswini)	20	2.4	239	175000	800500	5.57
Sprinkler irrigation in Greengram (PDM-84-139)	9	3.5	10	7500	23600	4.15
Sprinkler irrigation in Poi (Basella)	6	0.7	263	45900	159000	4.46
Sprinkler irrigation in Okra	6	3.3	186	54000	105500	2.95
Sprinkler irrigation in Cucumber	8	1.7	139	53000	160000	4.02
Sprinkler irrigation in Pumpkin	10	0.8	179	55000	104600	2.90
Total	**248**	**57.7**				



2.1.6 Other Demonstrations:

Demonstrations like in-situ vermicomposting in orchards, soil test based nutrient application, planting forest trees, plant for biodiversity, forestation, bio pesticides in tomato, were carried out in 270 farmers' fields with an area of 48.2 ha of land. Out of these demonstrations on in-situ vermicomposting in orchards showed highest economic return.

Table: Performance of other demonstrations

Technology demonstrated	No. of farmers	Area (ha)	Output (q/ha)	Economics of demonstration (Rs./ha)		
				Gross Cost	Net Return	BCR
Soil test based nutrient application in horticulture crops	64	27.0	282	56000	166600	3.98
Solid waste management (Compost and Vermi-compost production unit)	43	43 unit	Production (7.5 q/chamber), pH 7.02, OC 17.73%, N 1.25%, P 0.63%, K 0.77%	2500	4500	2.80
In-situ vermicomposting in orchards	34	5.2	24.8	35010	170500	5.87
Bio pesticides in Vegetables	24	3.6	149	48000	120000	3.50
Use of IPM in Chilli leaf curl management	21	3.4	113	175820	396180	3.25
Use of IDM in Bittergourd bacterial wilt management	15	3.5	130	225585	509615	3.26

Technology demonstrated	No. of farmers	Area (ha)	Output (q/ha)	Economics of demonstration (Rs./ha)		
				Gross Cost	Net Return	BCR
Shed net house for mushroom cultivation	9	-	2.4 kg per bed	40/- per bed	160/-per bed	5.00
Land Shaping technology & RWH	3	0.6	252.6	166875	223785	2.34
Establishment of Agro forestry nursery for development of Silvi-pastoral system for restoration of highly degraded uplands	25	4.8				
Cage Culture near to bank of Bhagirathi river	12	0.01 sqm				
Production of Vermicompost	10	0.02 sqm				
Production of compost	10	0.02 sqm				
Total	**270**	**48.2ha + 43 unit**				

2.1.7 Rainwater harvesting structures developed:

Rainwater harvesting (*ex-situ*) and efficient use to enhance resilience of farms, farm ponds brought about a perceptible change in crop production during *Kharif and rabi s*eason. Though the rainfall was less during the months of June and early part of July, the intense storms with rains which generated run-off and was stored in farm ponds created in farmers' field. The harvested water was used for critical irrigations to wheat, vegetables, fodder etc. Farmers realized an additional yield and income from these crops. There were 68 number of rainwater harvesting structures have been developed which could store 1.3 million cu m of water which could provide irrigation to 269 ha of land. This intervention increased the cropping intensity to the maximum extent up to 260%. Storage capacity and increase in cropping intensity through the rain water harvesting structures are given in the following table.

Table: KVK wise rainwater harvesting structures developed during 2020-21

New (Nos.)	Renovated (Nos.)	Total	Storage capacity (cu m)	Protective irrigation potential (ha)	Cropping Intensity (%) increase
38	30	68	1.3	269 ha	135-260



2.2 MODULE II: CROP PRODUCTION

Monsoon contingency action plans were prepared and implemented in NICRA KVKs which experienced delayed onset/ deficit rainfall conditions during 2021-22. Contingency crop plans for late planting (after midJuly) involving appropriate crop, soil moisture, nutrient management measures, crop diversification *etc.* were taken up in NICRA villages. The impact of resilient practices and technologies is highlighted through different intervention mentioned below.

2.2.1 Introducing drought resistant varieties:

During the current year (2021) delayed onset of monsoon was experienced in several districts of Odisha and a number of short duration and drought tolerant varieties were demonstrated to make effective use of the remaining growing season. Iintroductions of drought resistant varieties of rice, brinjal, tomato, black gram, arhar *etc* were demonstrated in NICRA adopted villages involving 637 number of farmers in 169.8 ha area. Performance of the different drought resistant varieties of various crops is presented in the following table.

Table: Performance of different drought tolerant varieties

Technology demonstrated	No. of farmers	Area (ha)	Yield(q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Drought tolerant Rice (*Jogesh, MTU-1156*)	53	28.8	33.8	30.1	12.2	31000	31530	2.02
Drought tolerant Rice (var. *Sahabhagidha*n)	52	28.0	25.6	21.4	19.6	25000	22360	1.89
Red gram (bund planting)	17	1.4	15.0	12.0	25.0	27750	45500	2.64
Drought resistant brinjal (VNR- 218)	30	6.0	594.0	422.0	40.8	75000	190000	3.53
Tomato (*Utkal Kumari*)	21	2.2	160.0	110.0	45.0	53000	165000	4.11
Black gram (*PU 31*)	28	5.3	14.0	10.0	40.0	21500	39660	2.84
Cotton (*Shalimar*)	35	18.3	25.0	15.0	66.7	38000	82000	3.16
Arhar (*PRG 176*)	17	9.0	13.0	9.0	44.4	15500	39850	3.57
Weed and INM in Rice-Swarna shreeya	20	11.0	45.8	31.0	47.7	20000	43500	2.17
Brinjal (VNR-212)	48	5.3	242.0	174.0	39.1	68000	210400	3.09
Tomato, (Shaksham)	56	6.8	96.0	58.0	65.5	96600	143400	2.48
Chilli (VNR-315)	33	5.0	50.2	41.0	22.4	78800	190200	2.41
Cultivation of Green gram (IPM 2-14) in rice fallow areas with all package of practices	60	8.7	6.4	4.3	48.8	22200	58000	2.61
Arhar (PRG-176)	44	17.2	13.9	9.2	33.8	32000	80000	2.50
Maize (CO-4)	32	5.2	92.5	70.5	31.2	83000	202300	2.43
Sunflower (Swathi)	30	3.5	84.5	68.9	22.6	42000	92600	2.20
Demonstration of dragon fruit	30	0.7	Ongoing	-		25000	-	-
Establishment of low cost vermicompost structure	15	0.04	16.0			22000	47000	2.13
Demonstration of osmoprotectants like salicylic acid, proline, betaine to ameliorate drought stress	25	2.1	5.8	3.2	81.3	29500	61000	2.06
Pigeon Pea PRG-176	15	5.0	10.2	8.4	21.4	32000	29200	1.91
Cauliflower (CFL-1522)	06	0.3	62.0	-	100.0	126500	183500	2.45
Total	**637**	**169.8**						

2.2.2 Introducing salt tolerant rice varieties:

Salt tolerant varieties of rice like *CARI Dhan,Usar Dhan-5*, *Jarava*, *Geetanjali*, *SR-26B*, *Amalmona* were introduced in 17.1 ha area in 86 farmers' fields. Variety CARI Dhan-5 and Jarava proved maximum salt tolerant potential by giving highest yield of 50.0 and 45.5 q/ha respectively and more economic return in SR-26B and CSR-36 (BC ratios 2.14 and 2.04 respectively)

Table: Performance of different salt tolerant rice varieties

Technology demonstrated (Salt tolerant varieties)	No. of farmers	Area (ha)	Yield (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Salt tolerant Rice Variety: Luna Suwarna	12	3.1	36.7	33.9	8.1	34288.00	28091.00	1.82
Salt tolerant Rice *var. Jarava*	10	3.0	45.5	25.0	80.0	41250	26000	1.72
CARI Dhan-5	18	3.2	50.0	36.7	36.8	29750	23700	1.81
SR-26B	22	2.9	43.0	34.0	26.5	27500	29000	2.14
Usar Dhan-3	9	2.4	35.5	30.2	15.9	33650	16800	1.52
Rice *CSR-36*	15	2.4	44.0	33.6	31.0	29650	28200	2.04
Total	**86**	**17.1**						

2.2.3 Introducing flood tolerant varieties:

Flood tolerant varieties of rice like *Swarna sub 1*, Pratiksha and CR 500 were introduced through demonstration in 34.3 ha area in 129 farmers' fields.

Table: Performance of different flood tolerant varieties

Technology demonstrated	No. of farmers	Area (ha)	Yield (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Temporary submergence tolerant rice variety Swarna Sub-1	59	19.0	44.5	37.6	18.4	33850	44266	2.31
Promotion of submergence tolerance rice Pratiksha	53	10.5	43.5	30.0	44.3	21250	34600	2.72
Rice CR500	7	3.4	42.5	30.1	40.8	27500	19000	1.69
Submergence tolerant Rice Variety: CR1009 sub1	10	1.4	38.6	34.6	11.6	35250.00	30438	1.86
Total	**129**	**34.3**						








2.2.4 Advancement of planting dates of *rabi* crops in areas with terminal heat:

To avoid terminal heat stress in crops like rice, wheat, lentil, mustard, potato, *etc.* were sown in 12 days advance (avg.) during rabi season. These demonstrations were carried out in seven NICRA adopted villages involving 241 number of farmers' fields with an area of 47.2 ha land.

Table: Performance of advancement of planting dates in different crops

Technology demonstrated	No. of farmers	Area (ha)	Yield(q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Lentil var. *Moitree*	78	13.0	12.5	8.0	56.5	21250	27125	2.28
Green Gram, *var. PDM139*	57	9.5	7.2	5.8	24.1	17000	19100	2.12
Promotion of short duration rice (*GB-1/ Panth-18/ Sahabhagi*)	49	6.8	35.0	26.0	34.6	22060	34640	2.57
Short duration rice (*Jogesh*)	10	7.5	22.0	14.6	50.6	18200	15316	1.84
Rice-Greengram *(Swarna Sub-1& IPM 02-14)*	12	4.0	44.2	40.1	10.2	38000	43770	2.15
Introductior pulse crop in rice System (Paira Cropping) *Var-PL-8*	35	6.4	10.5	8.0	32	22350	28050	2.26
Total	**241**	**47.2**						

2.2.5 Water saving rice cultivation methods:

Water saving paddy cultivation through SRI, short duration varieties, direct seeded rice*etc.*have been demonstrated in 72.0 ha area of 220 number of farmers' fields. These interventions were carried out in seven NICRA adopted villages.

Table: Performances of water saving technologies for rice cultivation

Technology demonstrated	No. of farmers	Area (ha)	Yield (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Line sowing by paddy drum seeder	38	15.5	38.0	29.0	31.3	14580	35720	3.44
Direct seeded brown manured rice	40	10.2	45.5	35.0	30.5	32900	36100	2.12
Water saving technology through SRI	10	10.0	53.5	39.0	35.9	14850	19300	2.34
DSR (var. *Anjali*)	59	25.5	23.5	19.2	21.8	23000	20290	1.88
SRI/Use of trans-planter	14	2.0	45.2	32.2	32.5	22500	33300	2.45
Conservation furrow in chilli cultivation	6	0.4	186	168.0	10.7	110250	29890	3.71
Sowing of wheat with ZTD machine	10	2.0	28.6	27.0	5.9	28950	48705	1.68
Sowing of maize with ZTD machine	28	4.6	58.5	52.5	11.4	40380	91260	2.26
Polymulching in Cucumber	15	1.8	291	261.0	11.5	72600	160200	3.21
Total	**220**	**72.0**						



2.2.6 Community nurseries for delayed monsoon:

Seedlings of 25-30 days age are transplanted in July so as to complete flowering of photosensitive varieties before October and harvesting by mid-November to facilitate taking up of timely sowing of *rabi* crops. Such a practice ensures optimum performance of both kharif and rabi crops. It appeared that failure of rain in July is responsible as transplanting of paddy is delayed with resultant adverse effect on productivity and a cascading negative impact on rabi crops. Delay in transplanting of paddy affects productivity as over aged seedlings suffer from low tillering ability various crops of different crop duration and varieties has been promoted. Besides paddy other crops like of cauliflower, brinjal, and tomato are followed for staggered nursery development. These intervention were demonstrated in 19.5 ha area of 98 numbers of farmers. These interventions were carried out in five NICRA adopted villages.


Table: Performance of Community nurseries

Technology demonstrated	No. of farmers	Area (ha)	Yield (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Community nursery of tomato	27	3.5	325	248	31.1	131250	142875	2.08
Community nursery of brinjal	22	5.6	560	420	33.3	75000	205000	3.70
Community nursery of onion	18	4.4	230	185	24.3	145000	12000	1.80
Community nursery of Chilli (Tejaswini)	31	5.5	112	75	49.3	177500	362500	3.04
Total	**98**	**19.5**						

2.2.7 Location specific intercropping systems with high sustainable yield index:

Various intercropping systems were demonstrated in regions which are prone to drought. Intercropping systems are considered as one of the important adaptation mechanism for variable rainfall situations. Intervention on location specific intercropping was demonstrated in few NICRA adopted villages. The demonstrations were carried out in 36 ha area of 90 number of farmers' fields. Of all these intercropping of maize + ladies finger was found most popular, although maximum return (B: C: 3.02) was found in Cucurbits / Gourd + solanaceous vegetables intercropping.

Performance of different location specific intercropping systems

Technology demonstrated	No. of farmers	Area (ha)	Yield (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Cauliflower + Ridge gourd	8	1.5	750	560	27.5	163800	224800	2.37
Brinjal + Coriander	7	1.0	650	502	21.5	145700	272600	2.87
Cucurbits / Gourd + solanaceous vegetables	22	1.5	Gourd : 63 Veg : 272	-	-	217500	64500	3.02
Maize+Ladies finger	18	0.5	Maize: 87	Maize: 75	11.6	63750	138750	2.21
Others if any Chilli + Tomato	10	1.0	320	260	24.8	241200	113700	1.89
Maize+ Cowpea intercroping	5	0.5	Maize: 38 Cowpea: 28	42	58.2	46000	57200	2.24
Jute (JRO-204)+ T. Viride @ 7.5kg/ha + amaranthus	20	30.0	Jute: 34 Amaranthus: 16	30	14.2	77428	153722	2.99
Total	**90**	**36**						

2.2.8 Introduction of new crops/ crop diversification:

Crop diversification through introducing new crops in prevailing cropping pattern was demonstrated in the different NICRA adopted villages. These demonstration were carried out in 148.3 ha area of 934 number of farmers' fields. Introduction of *ol* (var. *Gajendra*) in the cropping pattern is the most promising one which gave maximum economic return (B:C:: 7.38).

Table: Performance of different crop diversification in NICRA villages

Technology demonstrated	No. of farmers	Area (ha)	Yield (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Rice to Hybrid Maize var. Kaveri	37	8.7	129q/ha (green cob)	71 q/ha (greencob)	81.7	46000	72000	2.57
Maize to Sweet corn variety-Sugar-75	35	4.6	120q/ha (green cob)	93(q/ha) Green cob	29.0	80000	95000	2.19
Onion (var. *N-53*)	40	7.0	299	190	57.4	68300	300050	5.39
Mustard (var. *Pusa bold*)	42	19.0	11	9	20.0	23480	22960	1.98
Chilli (var. *Surajmukhi*)	53	8.3	92	58	58.6	66000	173000	3.62
Gram (var. *Pusa 362*)	63	15.2	17	10	70.0	26650	48400	2.82
Tomato (var. *Param F1*)	54	8.5	200	153	30.7	75600	150200	2.99
Cabbage (var. *OM-3*)	60	9.4	360	260	38.5	75000	215500	3.87
Radish (var. *Suhra -32*)	45	5.4	159	97	63.9	71100	86000	2.21
Brinjal (var. *F1-Hybride Long*)	46	7.0	218	165	32.1	78500	156100	2.99
Cauliflower (var. *MSN-16*)	55	6.5	229	129	77.5	78800	184000	3.34
French Bean (var. *FE-51 ANUPMA*)	45	3.5	69	42.4	62.3	80900	112000	2.38
Turmeric (var. *Rajendrasoniya*)	40	7.0	260	170	52.9	90000	300000	4.33
Ginger (var. *Nadiya*)	35	3.6	206	158	30.4	110000	550000	6.00
Lentil (Short duration var. *PL 406*), PL-8	39	6.4	13.1	7.7	87.1	22350	28050	2.26
Linseed (Short duration var. *T 397*)	25	6.5	8	5	50.0	11000	18750	2.70
Ol (var. *HYV Gajendra*)	42	3.9	550	290	89.7	87000	555000	7.38
Nutritional garden- veg. seed Seem (*dolicus lablab)*	78	4.8	20	13	53.9	9000	17000	2.89
Tomato under mulching	65	7.0	81	40	102.5	10000	29400	3.94
Jute (JRO-204)	35	6.0	24	21	14.3	51300	54300	2.06
Total	**934**	**148.3**						

2.2.9 Other Demonstrations:

There are some other demonstrations in various aspects mentioned in the following table which was carried out in different NICRA adopted villages involving 755 numbers of farmers. Among all the demonstration cultivating contingency crops like brinjal, cauliflower and short duration tomato and banana bunch cover, integrated fish farming were remunerative.

Table: Performance of other demonstration

Technology demonstrated	No. of farmers	Area (ha)	Yield(q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Demonstration on disease & pest resistant rice variety Pratikshya	23	5.0	40.0	35.0	14.3	30000	35000	2.17
Short duration Greengram cultivation (Var. IPM 205-7)	10	2.6	10.5	7.1	47.7	34904	27916.00	1.80
System of Assured Rice Production (SARP) in kharif	10	1.3	37.9	31.8	19.1	33866	30564.00	1.90
Cultivation of disease resistant Tomato var. ArkaRakshyak	25	10.0	246.4	218.6	12.9	106000	93120	1.86
Cultivation of short duration green gram var. IPM 02-3	10	3.7	7.1	4.9	44.9	15510	22490	2.45
Income generation activities (Marigold cultivation by women SHGs)	10	-	125 q/ ha flower yield	85 q/ha		78000	301000	4.86
Vermicomposting	7	7 unit	5q/pit	4q/pit		1500	3500	3.33
Oyster mushroom cultivation by WSHGs	15	-	2.2 kg	1.8 kg/ bed		40/- per bed	140/-per bed	4.50
Contingency crop Brinjal (var. *PUSA Uttam Swarna Shyamali)*	30	4.6	224.6	206.8	8.6	110000	114600	2.04
Integrated crop management of mustard (*NC-1*)	38	5.9	25.0	15.0	66.7	40000	47630	2.19
Promotion of stem rot resistant Jute (var. *JBO-2003H*)	36	4.0	27.0	18.0	50.0	35500	46670	2.31
Integrated crop management of lentil (*Maitri*)	40	5.5	16.0	12.0	33.3	31500	44500	2.41
Integrated disease management in vegetables	25	5.5	245.0	203.0	20.7	96000	43250	1.45
Demonstration short duration vegetables as contingent crop Tomato (var. *PUSA Gaurav*)	26	4.0	360.0	270.0	33.3	59500	205000	4.45

Technology demonstrated	No. of farmers	Area (ha)	Yield(q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Contingency crop Cauliflower (var *PUSA Sharad*)	30	2.7	260.0	210	23.81	61000	262500	5.30
Short duration blackgram (var. *PU-31*)	40	14.0	5.6	4.3	30.2	17000	16600	1.98
YMV & heat tolerant Greengram Var.*IPM 02-14*	50	20.0	72	5.8	32	18000	18000	2.00
Ileat tolerant tomato (Chiranjibi)	08	0.5	214.6	186.8	14.9	112000	149520	2.34
Seed Production of Gorubathaney (ginger)	16	0.4	41.0	33.7	21	100185	70024	1.66
Low cost Poly house for raising of vegetables	02	02 unit	4.2% mortality	27.8% mortality	84.8	6000	8000	2.33
Treatement of Jute seed with T.Viridal followed lay Soil application of T.Viridal	46	8.0	34.5	30.1	14.62	77128	129872	2.68
Contingency crop Radish (var. *PUSA Chetki*)	37	2.0	136.0	90.0	51.1	52500	65900	2.26
Soil reclamation : Levelling /bunding and flooring for leaching of salt	37	10.0	36.0	30.0	20.0	37500	49000	2.31
Integrated fish farming	26	3.4	2.0	1.5	33.3	49000	132000	3.69
Integrated farming system	31	3.9						
late blight disease of potato	20	2.5	300.0	255.0	17.7	135000	190000	2.41
Bio-control agent production	22	-	-	-	-	Rs. 55/Kg	Rs.600/Kg	-
Mushroom	45	-	22.0	-	-	Rs. 25/ cylinder	Rs.55/ cylinder	3.20
Forest tree plantation	40	900 Plant						
Total	755	119.5 ha & 9 unit						








2.3 MODULE III-LIVESTOCK & FISHERIES

In this module, interventions include introduction of stress tolerant animal and poultry breeds, nutrient supplementation through area specific mineral mixtures, balanced ration using locally available feed material, fodder production in community lands especially during drought/flood situations, silage making for storage of green fodder and feeding during the dry season, improved shelters for reducing heat stress in livestock, captive rearing of fish seed in nursery ponds prior to stocking in main tanks in the village, breed selection and stocking ratios for fish production in farm ponds and monitoring of water quality in aquaculture and integrated farming system models in diverse agro ecosystems.

2.3.1 Use of community lands for fodder production during droughts / floods:

Community lands of an area of 7 ha involving 181 number of farmers utilized for different fodder production were demonstrated in eight different NICRA adopted villages. Sudan chari, hybrid napier were the major fodder produced in the programme. Of all these demonstration quality hybrid napier demonstrated showed maximum benefit return (B:C:: 2.64).

Table: Performance of different fodder demonstration in community lands

Technology demonstrated	No. of farmers	Unit/ Area (ha)	Output (q/ha)		% increase	Economics of demonstration (Rs/ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Sudan Grass	17	6 units	2920 L milk/yr	2620 L milk/yr	11.5	45500	42000	2.08
Hybrid Napier	164	7 ha	185	170	8.8	12500	7600	2.64
Total	**181**	**6 units &7 ha**						

2.3.2 Improved fodder/feed storage methods:

Adequate supply of fodder, either green or dry, is crucial to the livelihoods of livestock in rainfed areas. In 2020-21 delayed onset and deficit rainfall conditions were experienced in several states. There was reduction in area under millets and pulses, which are important to meet the fodder requirements in the rainfed areas. Short and medium duration fodder cultivars of several crops and fodder species both in *kharif* and *rabi* seasons were demonstrated in farmers' fields under rainfed and limited irrigation conditions to support income and cash flow from animal husbandry Improved fodder of rice bean and silage making were demonstrated in farmers' fields. Azolla cultivation for feed supplement of domestic animal for 45 numbers of farmers showed very promising results.

Table: Performance of improved fodder

Technology demonstrated	No. of farmers	Unit/ Area (ha)	Yield (q/ha)		% increase	Economics of demonstration (Rs./ ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Production of Napier grass for feed supplement of domestic animal	12	11 units &1.5 ha						
Azolla cultivation for feed supplement of domestic animal	45	45 units	3 kg/unit/ month			225/unit	950/unit	5.22
Hydroponic fodder production	9	9 units	1900	1200	59.0	18500	54500	3.94
Azolla in poultry	7	7 units	3	2	47.0	115	385	4.30
Rice bean	20	0.5 ha	255	220	20.3	8450	15464	2.83
Maize	30	0.5 ha	280	240	16.6	10500	15330	2.46
Hybrid napier Co4	5	0.4 ha	200	140	42.8	70000	30000	1.42
Total	**128**	**72 units & 2.9 ha**						

2.3.3 Preventive vaccination:

Various vaccination camps were organized against FMD of cattle, PPR against goat, Ranikhet of poultry, BQ vaccine, deworming *etc.* in 18 different NICRA adopted villages. Mortality rate reduce up to the extent of 90% and average increase in cattle milk yield up to 40% have been recorded after the vaccination camps organized.

Table: Performance of various vaccination camps organized

Technology demonstrated	No. of farmers	Unit/ No./ Area (ha)	Measurable indicators of output* (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Vaccination camp against FMD Cattle & PPR against goat	400	517	940 L. milk/yr	840 L. milk/yr	11.9	15000	13500	1.90
Vaccination for PPR in goat and Ranikhet in Poultry.	252	471	Body wt (90days) 6.6kg	5.4kg	23.0	720	1200	2.67
Deworming	290	265	912 L. milk/yr	840 L.milk/yr	8.5	13500	11500	1.85
Mineral mixture	127	270	1000	890	12.4	14500	16000	2.10
Vaccination camp against other diseases	157	47						
Total	**1226**	**1570**						

2.3.4 Management of ponds / tanks for fish and duck rearing:

Composite and cat fish rearing in the existing pond or in renovated pond were demonstrated in 113 farmers' fields of NICRA adopted villages. Khaki Campbell duck was also introduced through this intervention.

Table: Performance of composite and cat fish in the renovated ponds

Technology demonstrated	No. of farmers	Unit/ No. / Area (ha)	Measurable indicators of output* (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Cultivation of cat fish in cemented tank	10	11 units						
Composite fish culture by stocking of yearlings of Catla, Rohu and Mrigal	43	4.1	35.8	24.9	43.8	180000	240000	2.33
Stress tolerant fish (Asian Catfish) integrated with IMC for effective utilization of available water IMC (Catla:Rohu:Mriguel@ 3:4:3) = 1300 no./bigha for 4 months + Asian catfish : 1000 no./bigha for 8 months	4	0.2	35.2	30.0	17.3	220000	516000	3.35
Installation of Periphyton net by covering 40% of water surface area to facilitate natural feed production in pond and to reduce cost of artificial feed in *Tilapia* culture	2	2 units (0.1 ha)	230.0	210.0	9.5	730000	1450000	2.99
Eco Hatchery for Carp Breeding (Reservoir – 1 Breeding pool – 1 Hatching pool – 1 Spawn collection chamber – 1)	1	1 unit	Production of 5.2 million spawn of IMC (Catla, Rohu, Mriguel, Bata and *Puntiusjavonicus*) & Work opportunity for 3 rural youths			17000	43000	3.53
Total	**60**	**14 units & 4.4 ha**						

2.3.5 Livestock demonstration:

Demonstration of rural backyard poultry (*kuroiler, Nicobari fowl*), khaki Campbell duck, T X D breed of pig, mineral mixture and azolla as cattle feed were carried out in 366 number of farmers' fields. Kadaknath bird was introduced through this intervention which showed very promising results (B: C:: 5.00).

Table: Performance of livestock demonstration in NICRA adopted villages

Technology demonstrated	No. of farmers	Unit/ No. / Area (ha)	Measurable indicators of output* (q/ha)		% increase	Economics of demonstration (Rs./ha)		
			Demo	Local		Gross Cost	Net Return	BCR
Promotion of Ghungroo Piglets	7	7 units & 15 nos.				10000	7500	1.75
Promotion of poultry breed Rhode Island Red (RIR)	18	18 units & 280 nos.						
Empowerment of SHG through Egg Incubator	35	1 unit & 1 no.						
Promotion of goatery breeds for strengthening of marginal farm women	13	13 units & 15 nos.						
Duck Rearing-Khaki Campbell	100	295 nos.	2.3	1.9	21.1	550	1650	4.00
Rearing of poultry breed Vanaraj	115	150 nos.	3.5	2.5	40.0	200	600	4.00
Demonstration of stress tolerant breed Kadaknath	60	330 nos.	3.0	2.0	50.0	220	880	5.00
Colourbird poultry	18	360 nos.	2.0 kg	2.0 kg		180	275	2.53
Total	**366**	**39 units & 1446 nos.**						

2.3.6 Improved shelters for reducing heat stress in livestock:

Improved Poultry shed recorded low mortality rate and in shady area reduced heat stress. Standard spacing in improved shed resulted better performance in poultry and dairy animals. Interventions to reduce heat stress for higher survivability of backyard poultry and dairy animals were demonstrated of improved shelter.

Table: Performance of improved shelters for poultry and dairy animals

Technology demonstrated	No. of farmers	Unit/ No. / Area (ha)	Measurable indicators of output* (q/ha)		% increase	Economics of demonstration (Rs./ha)			
			Demo	Local		Gross Cost	Gross Return	Net Return	BCR
Cement flooring, Straw thatched roof, with mosquito repellent net for better hygienic for cattle	15	40	945	830	13.9	17500	32250	14750	1.84
Low cost shed with raised bamboo platform	5	3	20	13	53.8	1975	6880	4905	3.48
Shelter 1 Low-Cost Goatery Shed	62	62	-	-		2500	4125	1625	1.65
Improved cowshed	4	4	4	3	33.3	26000	50000	24000	1.92
Low cost goat shed	10	11	bw. gain- 57 g/day	bw. gain- 46 g/day	-	3500/- per goat per 1 year	9500/- per goat per 1 year	6000	2.71
Total	**96**	**120**							

2.4 Module IV: INSTITUTIONAL INTERVENTION

Strengthening the existing institutional interventions or initiating new ones relating to seed bank, fodder bank, commodity groups, custom hiring centre, collective marketing group, and introduction of weather index based insurance and climate literacy through a village weather station and awareness developed of 4050 number of farmers in the zone.

Seed Bank: Village level seed production of short duration, drought and flood tolerant varieties was taken up by farmers and seed societies in several NICRA villages with the technical support of KVKs in rice, soybean, foxtail millet, greengram, pigeonpea, finger millet, chickpea, wheat, rapeseed and mustard. To tackle contingency situations, increased availability of tolerant varieties was accorded priority especially in the case of paddy, soybean and foxtail millet during 2021-22. It has become a regular practice to source seed of drought tolerant and short duration cultivars from few

NICRA villages as interested farmers and seed societies have taken up this as a livelihood activity.

Fodder bank: Fodder bank was established in the village under NICRA project, green fodder shortage and dry fodder shortage is acute. The green fodder shortage was reduced from 86% to 36% within four years of NICRA project. In several NICRA villages in other districts seed of improved cultivars of fodder sorghum, maize, pearl millet, berseem, lucerne and oats was produced for use in regular and contingency situations.

Collective marketing: Collective marketing is where a number of growers work together to sell their combined crops. This may require additional storage, processing or packaging of the crop, with the costs shared by the collective.

Commodity group: An Agricultural Commodity can be defined as grain, livestock, poultry, fruit or any other items produced from agricultural activities. The general price level of an agricultural commodity, whether at a major terminal, port, or commodity futures exchange, is influenced by a variety of market forces that can alter the current or expected balance between supply and demand.

Climate literacy through village level weather station: The Village Climate Risk Management Committee (VCRMC), after the PRA to assess the climate related problems in the village and baseline survey. Then they followed recommendation by KVK and other institute scientist through village level weather station.

Interventions	No. of KVKs	Details of activity			No. of farmers	Unit/ No. /Area (ha)
		Name of crops / Commodity groups / Implements	Quantity(q) / Number / Rent / Charges	Technology used in seed / fodder bank & function of groups		
Seed bank	15	Rice - Sahabhagidhan, Swarna Shreya	63q	Rouging,drying	159	92.0 ha
		Blackgram	80 q	Seed Production	610	2.0 ha
		Rice var - Swarna Sub – 1	8.9 q	Metal seed bins, layers of dried neem leaves and dry chili kept with seeds to prevent insect infestation	54	8.0 ha
		Rice var – Sahabhagidhan	47 qt/20/300 per month	Paddy var- Sahabhagidhan	32	18.0 ha
		Black gram	63 q	Proper care and storage of black gram. Seed treatment with bavistine. Preservation of germination quality. Registration of seed bank	162	91 q
		Swarna Sub 1 Rice	20 q	-	48	6.7 ha
Fodder bank	9	Hybrid Napier	66		136	1.2 ha
		Maize	45 q	Proper care and storage of maize seeds. Seed treatment with bavistine. Preservation of germination quality. Registration of fodder bank	34	49 q
		Hybrid Napier	66 q	-	136	1.2 ha
Custom hiring centre	16	Rice, Maize, Vegetables, Jute	Rs. 95000		70	3.7 ha
		Power tiller, sprayer, reaper, diesel pump set, weeder, Thresher cum winnower, MB Plough, seed cum fertilizer drill			101	56 nos
		Power tiller	Rs.250/hr	Ploughing	17	16 ha
		Paddy reaper	Rs.250/hr	Reaping paddy	7	5.9 ha
		Power sprayer	Rs. 20/-hr	Spraying pesticides	30	2.4 ha

Interventions	No. of KVKs	Details of activity			No. of farmers	Unit/ No. /Area (ha)
		Name of crops / Commodity groups / Implements	Quantity(q) / Number / Rent / Charges	Technology used in seed / fodder bank & function of groups		
		Power Tiller	6 no. (Rs. 250/hr)	Managed by VCRMC	75	12.4 ha
		Pump set	8 no. (Rs. 80/day)		40	9.2 ha
		Battery operated Sprayer	6 no. (Rs. 50/hr)		35	8.8 ha
		Paddy thresher	7 no. (Rs. 100/ day)		45	12.8 ha
		Tractor drawn labeller, Tractor drawn MB plough, Tractor drawn rotavator, Self-propelled riding type reaper, Diesel pump set, Knapsack Sprayer	14100		98	46 nos
		Power sprayer, power tiller, Thresher, motor Pump			70	2.0 ha
Climate literacy through a village level weather station	8	Weather station- Rain gauge, Stevenson screen, wind vein		Daily data recorded by VCRMC	2055	30 nos
Others (if any)	3	Elephant foot yam	3		36	3.0 ha
Total					**4050**	**175.3 ha, 140 q &132 nos.**

2.4.1 Village Climate Risk Management Committee (VCRMC)

Village Climate Risk Management Committee (VCRMC) was constituted after in-depth discussion with the villagers about the mitigation of the climatic vulnerabilities of the villages and the strategies to be adopted under NICRA. The members of the committee were selected by the villagers under the facilitation of KVKs where NICRA was being implemented. VCRMC became operational with opening of a bank account in their name being jointly handled by the President of VCRMC and the Programme Coordinator of the KVK concerned. The custom hiring of various farm tools and implements was being supervised by VCRMC apart from taking important decisions on the technological interventions to be implemented at the village in consultation with the KVK.

2.4.2 Custom Hiring of Farm Implements and Machinery:

Timeliness of agricultural operations is crucial to cope with climate variability, especially in case of sowing and intercultural operations. Access to implements for planting in ridge-furrow, broad bed furrow and raised beds is essential for widespread adoption of resilient practices for *in situ* soil moisture conservation and drainage of excess water in heavy soils. In rainfed areas, availability of such farm implements to small and marginal farmers is important. Similarly in irrigated areas, residue management of *kharif* crops through zero till cultivation of *rabi* crops reduces the problem of burning of residues and adds to the improvement of soil health and increases water use efficiency. Custom Hiring Centres (CHCs) for farm implements were established in NICRA villages. A committee of farmers' manages the custom hiring centre. The rates for hiring the machines/ implements are decided by the VCRMC. This committee also uses the revenue generated from hiring charges and deposits in a bank account opened in the name of VCRMC. The revenue is used for repair and maintenance of the implements and 25% share is earmarked as a sustainability fund. Different types of farm machinery are stocked in the CHCs, the most popular being zero till drill, happy seeder, BBF planter, drum seeder, multi crop planter, power weeder and chaff cutter. Each CHC was provided an initial sum of Rs. 4.25 lakhs for its establishment under NICRA project. Revenue generated through custom hiring and under VCRMC in different KVKs is presented in the following table.











Table: Revenue generated through Custom Hiring Centres and VCRMC in KVKs during 2021-22

Name of KVK	Revenue Generated (Rs.)	
	From Custom Hiring Centres (2021-22)	Total under VCRMC
Port Blair	8837	51361
Bhadrak	1000	1000
Bolangir	4900	4900
Dhenkanal	0	0
Ganjam-I	25320	29560
Jagatsinghpur	4600	4600
Kalahandi*	0	0
Kendrapara	21200	33100
Keonjhar	0	0
Puri	3600	3600
Coochbehar	32650	78240
Kalimpong	0	0
Malda	5000	50000
Murshidabad (Addl.)	2000	29500
North 24 Pgs.	28000	28000
Purulia	1500	1500
South 24 Pgs.	20489	321576
Total	**159096**	**636937**

*No CHC established





3. CAPACITY BUILDING PROGRAMME

A total of 241 courses were conducted by all NICRA implementing KVKs under Capacity Building Programme on various thematic areas benefitting 5316 farmers and farm women (2952 male and 2364 female) during 2021-22. Thematic areas covered on SRI, scientific crop management, crop diversification, land shaping, green manuring, natural resource management, resource conservation technology, animal feed management, nursery raising, pest and disease management, weed control, vermicompost, value addition, livestock management, oilseed and pulse demonstration, farm implements, drudgery reduction *etc*. The HRD programme conducted on the basis of priority area of farmers or farm women.

Thematic area	Topic of the training	No. of Courses	No. of beneficiaries		
			Male	Female	Total
Livestock and Fishery Management	Empowerment of farm women through Poultry and duckery farming	11	0	340	340
	Sustainable income generation of rural youth through pig farming	3	0	39	39
	Application of Floating feed in Pisciculture	4	52	25	77
	Training on importance of hydroponic & azolla cultivation & animal feed	8	75	33	108
	Training on Scarcity feed management	2	36	20	56
	Training on deworming& vaccination schedule of livestock	1	15	7	22
	Nursery pond management	2	22	14	36
	Composite fish culture	1	20	20	40
	Integrated Fish Farming with livestock & horticultural Crops	3	65	35	100
	Back yard poultry rearing of Kadaknath	2	40	23	63
	Care and management of dairy animal during heat stress	3	45	29	74
	Rearing of feed management of backyard poultry	1	0	15	15

Thematic area	Topic of the training	No. of Courses	No. of beneficiaries		
			Male	Female	Total
Integrated Pest and disease Management	Management of Pest & diseases in Rice	2	30	14	44
	Management of Pest & diseases in Pulses	6	51	33	84
	IPM practices of kharif vegetables	2	24	8	32
	IPM practices of rabi vegetables	2	32	26	58
	IPM practices of summer vegetables	1	19	9	28
	IPM &INM System of Assured Rice Production (SARP)	1	21	11	32
	Disease and pest management in Paddy	5	55	30	85
	Disease management in stress tolerant crops	4	28	49	77
	Practice of bio-pesticides for management of sucking pest in cotton	5	45	34	79
Natural Resource Management	Zero tillage technology of maize	2	46	22	68
	Transplanting paddy through transplanter machine	2	25	25	50
	Waste Management for Sustainable Environment	6	60	45	105
	Water Harvesting and Management	4	52	28	80
	Contingency planning for kharif 2019	1	18	15	33
	Conservation of water & its judicious use for sustainable development	3	39	29	68
	Post Cyclone (Bulbul) Contingency Planning for Rabi season	3	35	23	58
	In-situ moisture conservation in vegetable	1	24	17	41
	Trenching and bunding method in mango plantation	5	62	23	85
	Use of farm machinery for conservation of soil moisture	1	15	10	25
	Onfarm water conservation in rice	1	16	8	24
Crop Management	Cultivation of rabi crops (Paddy, Potato, Vegetables, Lentil, Mustard)	12	230	135	365
	Bio-intensive pest management practices for Rabi crops	8	70	47	117
	Importance and conservation of pollinators for better crop production in climate change perspective	4	68	0	68
	Hybrid vegetable cultivation	3	54	6	60
	Crop diversification from paddy to non paddy crop- groundnut	2	34	18	52
	Training on Use of green manuring for better fertility status and crop yield	1	21	29	50
	Training on high density planting system in cotton	2	32	25	57
	Management in black gram in rice fallow cropping system	2	22	18	40
	Scientific cultivation of swarnasub 1	2	37	22	59
	Management of maie based intercropping system	1	10	20	30
Fodder and feed management	Azolla cultivation for feed supplement of domestic animal	5	49	39	88
Resource conservation Technology	Vermicomposting, use of Bio-Fertilizer in diff. crop	3	37	20	57
	Resource conservation technology and implementation	3	31	24	55
	Cultivation of pulse crop as paira cropping	3	46	20	66
Integrated Farming System	Importance, scope and implementation of IFS	4	38	33	71

Thematic area	Topic of the training	No. of Courses	No. of beneficiaries		
			Male	Female	Total
Farm implements and machineries	Effective use of farm machinery though Petroleum conservation	2	21	5	26
Organic farming	Training on Organic Farming.	1	19	12	31
Vermi composting	Training on Vermi-composting	5	65	48	113
Soil sample collection Technique	Training on Soil sample collection technique	3	42	20	62
Income generation activity	Scientific method of Mushroom cultivation	3	16	45	61
	Employment generation of SHGs through Egg Incubator	1	10	11	21
	Training on Marigold cultivation	1	15	14	29
Mushroom cultivation	Training on mushroom production	7	89	77	166
	Low-cost technology for mushroom cultivation for rural youth	5	53	37	90
	Low-cost technology for mushroom cultivation for women	1	25	17	42
Off- season Vegetable Cultivation	Training on Off- season Vegetable Cultivation	3	25	31	56
Multi tier horticulture	Selection of vegetables to be grown in multitier	1	17	29	46
Value addition	Value addition for fruits and vegetable crops	2	31	0	31
Nutrient Management	Nutritional garden	1	20	14	34
	System of assured Rice production -IPM & INM	9	98	114	212
	Application of chemical fertilizer based on STBF	1	22	18	40
	INM in Groundnut	2	20	23	43
Nursery raising	Nursery raising , Grafting techniques of veg. & fruits	1	15	11	26
	Seedling production of different horticultural crops throughout the year.	4	38	33	71
	Nursery raising under low cost polytunnel	2	21	9	30
Soil health management	Importance of soil health management and soil sampling	2	36	0	36
Seed production	Seed production technology of pulses	4	54	22	76
	Seed production of turmeric ginger elephant foot yam	3	27	44	71
Improved package of practices	Improved package of practices of pulse cultivation	1	23	14	37
	Package of practices for wheat and maize	6	85	50	135
	Improved Package of practices for winter vegetables crops	6	74	37	111
	Improved Package of practices for summer vegetables crops	2	20	15	35
Post harvest technologies	Post harvest technologies for vegetables	1	17	17	34
Traps	Use of different attractants/ traps for vegetables	1	16	8	24
	Use of traps for mango and litchi	1	7	18	25
Care & management	Care & management of lactating mother	3	30	24	54
Water borne diseases	Care & management against water borne diseases particularly after flood	1	19	7	26
Awareness programme	Awareness programme on Swachh Bharat Abhiyan	2	36	25	61
Total		**241**	**2952**	**2364**	**5316**










PLANT PROTECTION









NICRA - TDC PROJECT

4. EXTENSION ACTIVITIES

NICRA implementing KVKs conducted a total of 413 extension activities on various thematic areas benefitting 13474 practicing farmers and farm women (8257 males and 5217 females) during 2021-22. The extension activities were conducted on method demonstrations, agro advisory services, awareness camp, animal health camp, *krishak chaupal*, *kishan gosthi*, resource conservation technologies, celebration field and farmers' days, diagnostic visits, group discussion, technology week, kisan mela *etc*.

Name of the activity	Number of Programmes	No. of beneficiaries		
		Male	Female	Total
Method demonstrations	40	630	290	920
Group meetings	16	410	200	610
Field day	21	521	496	1017
Exposure visits	22	504	196	700
Awareness Campaigns	18	467	314	781
ICT based extension services	12	402	206	608
Diagnostic visit	23	555	280	835
Field Visit	44	504	317	821
World Environment Day Celebration	17	600	450	1050
Live Webcasting	14	315	278	593
Strengthening SHGs	8	0	322	322
Strengthening kisan clubs	5	105	70	175
Other Training Courses	41	814	212	1026
KMAS Services	11	263	142	405
Popular extension literature	24	364	313	677
Animal Health Camp	43	719	417	1136
NICRA Workshop at ATARI Kolkata	5	305	125	430
Scientist visit to field	37	334	200	534
Kisan Mela	12	445	389	834
Total	413	8257	5217	13474

5. SOIL HEALTH CARDS DISTRIBUTION AND OBSERVANCE OF WORLD SOIL DAY

December 5 is declared as 'World Soil Day' by the International Union of Soil Sciences and to celebrate the importance of soil as a critical component of the natural system and as a vital contributor to human wellbeing, all the NICRA-KVKs have organized seminar/symposia/ workshop. The World Soil Day campaign aims to connect people with soil and raise awareness on their critical; importance in our lives. One of the several ways of connecting people with soils is to restore and preserve the soil health. All the 17 NICRA-KVKs of Zone-V distributed the soil health cards among the farmers in NICRA adopted villages. A total of 1367 numbers of Soil Health Cards were distributed among 1753 farmers on that particular day and cards were distributed by the public representatives like MP/MLAs and others in the respective KVKs. KVK wise distribution of soil health cards are presented in the following table.

Table: Soil Health Card prepared and distributed during 2021-22

KVK	No. of soil samples collected	No. of samples analysed	SHC issued	No. of farmers benefitted
Port Blair	28	28	36	38
Bhadrak	15	15	53	68
Bolangir	35	35	61	63
Dhenkanal	10	10	30	30
Ganjam-I	34	34	91	103
Jagatsinghpur	58	58	104	202
Kalahandi	25	25	39	47
Kendrapara	21	21	30	65
Keonjhar	12	12	29	31
Puri	31	31	40	40
Coochbehar	215	215	296	312
Kalimpong	40	40	59	75
Malda	141	141	166	235
Murshidabad (Addl.)	53	53	100	130
N. 24 Pgs	49	49	82	138
Purulia	23	23	33	42
S. 24 Pgs	45	45	118	134
Total	**835**	**835**	**1367**	**1753**

6. CONVERGENCE PROGRAME

A number of interventions were taken up by NICRA KVKs during the year in convergence with developmental programs which are operational at the NICRA adopted villages. Support from these developmental programmes was used for scaling up of proven interventions in the village. In case of NRM, support was mobilized for various water harvesting structures, recharge structures, micro irrigation systems, polythene lining of farm ponds, land shaping and ail cultivation, distribution of green manuring seed to large number of farmers, tree planting including horticulture, *etc*. In crop production, convergence with line departments was used for increasing the spread of HYV of food crops, promotion of cultivation practices such as SRI, Direct seeded Rice, demonstration programme etc. In case of animal husbandry, interventions such as animal vaccination camps, and health camps, timely availability of medicines, large scale production and availability of improved fodder crop seed, planting material and mineral mixture demonstration were taken up in convergence. Capacity building of the farmers in NICRA villages was also taken up in convergence in the form of trainings and exposure visits as part of the ongoing programs. Efforts were made to enhance the coverage of the interventions in the village with the support of the line departments through convergence. Huge number of convergence programmes was carried out by each of the NICRA implementing KVK with ongoing development programmes or schemes during 2021-22. The prominent development schemes are MGNREGA, NTPC, NABARD, Sunderban Development Board, Forest Department, Irrigation Department, different Departments of the concerned states. RKVY *etc*.

KVK	Development Scheme /Programme	Nature of work	Amount (Rs.)
RAKVK, Nimpith	SCSP - Junagarh	Distribution of cast net for enhancing fish farming Beneficiary: 45 in Bongheri & 40 Kaikhali-2	187000/-
	SCSP	Distribution of stress tolerant catfish fingerlings Beneficiary: 10 in Bongheri & 10 in Kaikhali	50000/-
	SCSP	Distribution of ducklings	50000/-
Dhenkanal	Odisha Forestry Sector Development Project	Vermi Composting	105000/-
		NTFP Plantation	400000/-
		IGA Facilitation Centre	415000/-
Kalahandi	Odisha lift irrigation corporation	Construction of deep bore well	650000/-
	Department of Agriculture, Govt. of Odisha	Construction of dug well	200000/-
	Minor irrigation , Govt. of Odisha	Renovation of check dam	600000/-
	Department of Animal Husbandry, Govt. of Odisha	Construction of goat shed	300000/-
	Department of Animal Husbandry, Govt. of Odisha	Distribution of cattle feed, mineral mixture, deworming drug	180000/-
Ganjam-I	MGNREGA	Check dam construction	520000/-
	Woman empowerment by CIWA, Bhubaneswar	Capacity building of Woman farmers	70000/-
	AICRP on Goat, OUAT	Improvement of Goat breed	120000/-
Total			**3847000/-**

7. Launching Workshop of the Project at New Sites

7.1. NICRA-TDC Project launching at cyclone affected Samsernagar village of Sundarbans of West Bengal

ICAR-ATARI Kolkata organized the launching programme of NICRA-TDC Project at Samsernagar Village of Sundarbans of West Bengal on December 30, 2021. The programme was arranged by North 24 Parganas Krishi Vigyan Kendra, Ashokenagar.

Dr. N. J. Maitra, Deputy Director of Reasearch, WBUAFS in his welcome note, thanked the NICRA-TDC team for selecting the cyclone devastated village. He also shared his valuable experience for proper functioning of the programme.

Dr. F. H. Rahman, Nodal Officer, NICRA-TDC Project elaborated the aims, objectives and modus operandi of the project. He explained the villagers about the benefits of the programme for overall livelihood improvement and asked their cooperation for the successful implementation of the project.

Dr. S. S. Singh, DEE, RLBCAU, Jhansi as resource person highlighted the participatory approach of women in agriculture in more number and raised various issues of innovative adaptation strategies for managing the agriculture of the coastal area.

Around 100 farmers and farm women participated in this NICRA-TDC Project launching programme and the interaction. Members of Local Panchayet, Line Department Officials, SHGs were also present in the programme.

7.2 Launching Workshop of New KVKs in NICRA-TDC programmme of ICAR-ATARI Kolkota

The ICAR-Agricultural Technology Application Research Institute, Kolkata virtually organized the Launching Workshop of "NICRA-KVKs of Zone - V" on 28.02.2022 in virtual mode. The workshop was chaired by Dr V.K Singh Director CRIDA Hyderabad. The workshop was attended by Dr S. K. Roy, Director, Dr. F. H. Rahman, ICAR-ATARI Kolkata; Dr. JVNS Prasad, CRIDA Hyderabad; Dr P. J. Mishra, DEE OUAT; Dr. P. K. Pal, DEE, UBKV; Dr. U. K. Sarkar, ICAR-CIFRI Barrackpore; Dr. U. K. Mandal, ICAR-CSSRI-RRS Canning; Dr. N. J. Maitra, DDREF, WBUAFS; Scientists from CRIDA Hyderabad and Heads of 17 NICRA KVKs along with their concerned SMSs.

Dr F. H. Rahman, Nodal officer NICRA-TDC, ATARI Kolkata gave the welcome address to all the NICRA participants. He underlined the salient achievements carried out by the NICRA-KVKs during last 10 Years. The interventions like mulching, soil moisture conservation and custom hiring centre, etc., that are making significant contributions in the resilience against the climate change were also highlighted.

One Technical bulletin NICRA Newsletter Vol 8, No. 1 was released during the workshop.

Dr. V.K Singh, Director, CRIDA Hyderabad emphasized on the progress and documentation as per the farming system typology and component basis at the household level. A format suitable for collecting information with identification of constraints, with better profitability for convergence and upscaling.

Dr. S. K. Roy, Director, ICAR-ATARI, Kolkata stated that the intervention under the NICRA should read vulnerability with the existing cropping practices and preventing the vulnerability through NICRA intervention is to be a priority.

Dr. JVNS Prasad, CRIDA Hyderabad focussed on the diverse climatic constraints of the country , the baseline data collection, identification of important farming system and the constraints for action plan formulation and implementation

Dr P.J Mishra, DEE OUAT suggested for discussion on kharif NICRA 2022 in March for early Action plan 2022-23. He suggested for working of NICRA and DAMU for better convergence and documentation .The technologies for flood prone areas are not available for Extension in the farmer's field, The NICRA technologies for flood prone areas will be helpful for the coastal areas. He suggested for documentation with convergence with line department and progressive farmers

Dr. P. K. Pal, DEE, UBKV thanked CRIDA Hyderabad and ATARI Kolkata for selecting Kalimpong KVK in the next phase of the project. He also highlighted few success cases of NICRA KVKs under UBKV.

Dr. N. J. Maitra, DDREF, WBUAFS shared his vast experiences of handling the project.

Technical Session:

The Chairman Dr V.K. Singh Director CRIDA Hyderabad and Co- Chairman Dr S. K. Roy Director ICAR-ATARI Kolkata

Panelists

Dr. JVNS Prasad; Dr. P. J. Mishra; Dr PK Pal DEE; Dr U. K. Sarkar; Dr U. K. Mandal; Dr. F. H. Rahman; Dr. N. J. Maitra; Dr. S. Kundu; Dr. K Sammi reddy; Dr. Ravindra Chary; Dr. A.K Anthuria; Dr. R. Kumari; Dr. Subba Rao

The Head of existing 7 KVKs presented their progress of activities and new 10 KVKs presented their action plan.

RAKVK, Nimpith, S 24 Pgs

The climatic vulnerabilities of the project area are cyclone, intensive rainfall, submergence, dry spell and soil salinity.

Based on the farming system typology (FST) the project area has been divided into five classes. Dr. S. Reddy was impressed with the technologies of Nimpith KVK and suggested that the new KVKs should follow them. He also suggested to calculate the area under each Farming System Typology and to contact the line department for rejuvenation of the river embankments in convergence mode. Dr. Charry, CRIDA, suggested to follow a uniform classification of land situation like the low, medium and highland condition. Dr. Garain, RAKVK-Nimpith explained that it is classified according to the height of water stagnation during Kharif season. Dr. U.K. Mondal of CSSRI mentioned to carry out impact assessment in the existing NICRA village and stressed upon community level drainage line treatment in the low lying areas. Dr. S. Kundu of CRIDA suggested to study the hydrology of the area for developing irrigation facility and monitor the salinity and pH of the soil at a regular interval. Dr. N. J. Maitra, WBUAFS appreciated the presentation of KVK-Nimpith and suggested that the technologies displayed by the KVK-Nimpith should be followed by other KVKs in Sundarban region. He also suggested to take up another project village, located far from the 1st village.

KVK Cooch Behar

The climatic vulnerabilities of the project area is submergence in Kharif and moisture stress in rabi season.

Important climate resilient technologies demonstrated by the KVK are renovation of water body, zero tillage in wheat and maize, submergence tolerant paddy, short duration paddy, paddy straw mulch, banana bunch cover, poly mulch, broad bed and furrow, azola, poultry, piggery, renovation of drainage channel, solid waste management, mushroom cultivation. Dr. Rahman and all other panellist congratulated them for the award (International FAO Award and National Jalashakti Award). Dr. U. K. Mandal, found the presentation style more like of a KVK activities that are not inter-related and looks independent. Dr. Kundu also opined that the presentation was not according to the CRIDA format and lacked the farming system typology aspects. Dr. Prasad also agreed that the farming system typology concept was already discussed and agreed upon during the last annual review meet and suggested to follow the typology classification as like Nimpith KVK. Dr. Chary enquired about the scalability of the outputs of any intervention and suggested to follow modules based on objectives. Dr. Prasad however appreciated the visit of District officials and their recognition. He requested all KVKs to invite district administration & push the climate resilient technologies in the district development plan

KVK Malda

Climatic constraints: Low lying, Flood prone, prolonged submergence, drainage problem.

Malda presented the climate resilient technologies like, renovation of pond, organic mulching, conservation tillage, renovation of jute retting tank, vermicomposting, improved varieties, intercropping, flood tolerant varieties of rice, sugarcane, jute (JRO-7835), contingency crop (Black gram IPU-2-43), multitier horticulture, IPM(brinjal), crop diversification, fodder production, implement to counter climatic vulnerabilities like flooding (two month submergence) and dry spells. Dr. U. Sarkar pointed out the lack of fishery based intervention and suggested to include climate smart fish species like catfish, mourela, puntia, etc., to which Dr. Rahman also agreed. Dr. Prasad, Dr. Rahman and Dr. Sarkar suggested to increase the bund height and use net barrier. Dr. U. Mandal appreciated the increase in crop area after pond irrigation. However he suggested to explore intercropping in Mango orchards. Dr. Kundu stressed upon contingency plan after recession of flood. He asked to study the seepage loss, type of land, typology and suggested to follow the typology to select beneficiaries. Dr. Maitra asked to recheck the data on double crop area after renovation of three ponds. He suggested to include seed bank, seed village programme through VCRMC. He also suggested to explore water chestnut in submerged field. Dr. Prasad expressed his concern over not following the Farming system typologies. He also suggested to specify the proven technology for horizontal spread through Govt. Departments.

KVK Port Blair

Climatic constraints: Cyclone, intensive rainfall

Dr Ramakrishna presented various interventions like tank cum well system, broad bed furrow, dyke vegetables, paddy cum dhaincha, salt tolerant paddy, disease resistant varieties, low cost hatchery, etc. Dr. Rahman expressed his concern about the budget utilisation of this KVK though all the fund has been released from ATARI. Dr. U Sarkar suggested to study the performance of Anabus and Magur in Andaman and he appreciated the presentation and suggested to record the disease incidence in case of disease tolerant varieties. He suggested to record the status of the sea ingress areas. Dr. Maitra pointed out the similar data under both normal and stressed situation.

KVK Kendrapada

Climatic constraints: Flood, water logging, drought, soil salinity

Kendrapara presented the NICRA intervention on the basis of Farming system typology. The important technologies demonstrated by the KVK are flood tolerant variety CR 1009 sub 1, improved goat housing, portable poultry housing, vaccination, Azolla, low cost polly tunnel, mulching, RF & BBF, Vermi compost, Dyeing and bleaching of jute, grow bag (bitter gourd), Siarohi buck for breed upgradation, etc. They have developed a technology demonstration park for display. Dr. U. Mandal congratulated the KVK for such a nice presentation and suggested the other KVKs to follow it. Dr. Kundu also appreciated the presentation and suggested to give attention to the old village for input analysis and demonstration. He informed that due to fund constraint this year, the check dam intervention may not be possible. He suggested to include yield and BCR and use portable soil moisture instrument. Dr. U Sarkar also appreciated the presentation and suggested to quantify the advantages of the climate resilient technologies. Dr. Maitra suggested to prioritize among the 10 farming system typology and concentrate on a few typologies at a time. So many intervention at a time is not good. So the adoption of a presentation successful technology. The Technology park concept is very good but require a big informative board to be displayed at the entry.

KVK Ganjam 1

Climatic constraints: Drought, dry spell, water logging

The presentation was based on farming system typology. Dr. Rahman informed the KVK that entire fund has been released and may be now lying with the University. He suggested the KVK to follow up with the Comptroller and ensure 100% utilization. Dr. S. Kundu suggested to give importance in farmer election. The varietal performance during stress and normal year needs to be documented. Dr. Prasad requested to identify the predominant typology.

KVK Kalahandi

Climatic constraints: Drought

The technologies like renovation of check dam, farm pond, jalkund, poly mulching, stress tolerant rice, pigeon pea, etc in a farming system typology basis has been presented. Dr. Prasad appreciated the presentation.

He suggested to include soil fertility constraint while classifying typology. But insisted to concentrate on 4-5 predominant typologies. Dr. U. Sarkar appreciated the use of osmo-protectants and dragon fruit. Dr. Kundu suggested to look into the marketing aspects. He enquired about the performance of Swarna Sreya in normal condition. He suggested to for the CHC as soon as possible. Dr. Prasad assured to look into the funding for CHC in 2022 but suggested to explore the MGNREGA scheme for convergence.

New KVKS: Action Plan

KVK Murshidabad Addl

Climatic constraints: Drought, heat wave, cyclone, cold wave, frost etc

The planned interventions based on farming system typologies has been presented. Dr. Rahman enquired about the NRM intervention and informed that the VCRMC room cannot be constructed by the NICRA fund. Dr. Prasad enquired about the extent of area and cropping pattern of each typology. He suggested to integrate the "livestock" typology with the other typologies to which Dr. Biswas replied that there are considerable number of landless for whom livestock rearing is the only typology. For such typology composting, vermicomposting or improved dairy may be important intervention. Dr. U Mondal suggested for zero tillage and short duration crops. He also suggested for zero budget natural farming. Dr. Kundu suggested for interventions for litchi and mango. Dr. Maitra suggested for hydroponic fodder for the livestock based typology.

KVK Purulia

Climatic constraints: Intermediate draught, Heat wave

KVK Purulia presented the plan of work on module based interventions. Dr. Rahman suggested to include more training and awareness programme for the new KVKs. Dr. Prasad suggested to follow farming system typology, focus on important crops of the area, in-situ water conservation and community resource renovation. He also suggested to purchase inputs for coming kharif season. Dr. Maitra suggested bamboo floor animal housing and poly lining of farm pond. Dr. Kundu suggest to give importance for soil erosion check, Agromet advisories and micro-irrigation. Dr. Pal suggested to use black Bengal breed instead of Sirohi and explore non-conventional fodder sources.

KVK North 24 Parganas

Climatic constraints: Cyclone and Flood prone with soil salinity during *Rabi-Summer*

The interventions for countering cyclone, flood and salinity, which are the main constraints of the region has been presented. Renovation of farm pond, land embankment cultivation, land shaping, animal vaccination, etc. are important interventions. Dr. U Mondal suggested to check the salinity of the fresh water canals and practice the brackish water aquaculture. Dr. Prasad, CRIDA, suggested to follow the farming system typology as like Nimpith KVK and explore for convergence with line Departments for NRM.

KVK Kalimpomg

Climatic constraints: Heavy rainfall, soil erosion, cold wave

The action plan of intervention based on climatic constraints like high humidity erratic monsoon, moisture stress, land slide, etc has been presented. The main interventions are water harvesting from jhora, RCT, poly mulching maize fodder, vermicomposting, etc. Dr. Prasad stressed upon farming system typology based activities. Dr. Kundu suggested to take up soil health management and record nutrient deficiencies.

KVK Puri

Climatic constraints: Heavy rainfall with irregular distribution, flood

The action plan of intervention based on climatic constraints like drought, flood and cyclone. The main interventions are bunding, renovation of water body, sprinkler, dhaincha green manure, stress tolerant crops, IPM, etc. Dr. Prasad stressed upon farming system typology based activities. Dr. U. K. Mondal suggested to monitor sea water ingress areas.

KVK Keonjhar

Climatic constraints: Medium rainfall with Irregular distribution

The plan of intervention based on climatic constraints like inter mediate drought has been presented. The main interventions presented are renovation of farm pond, mulching, furrow irrigation, stress tolerant varieties, low cost animal shelter, etc. Dr. Prasad suggested to follow farming system typology based activities. Dr. Kundu also

expressed that the farming system typology concept is not clear for the KVK.

KVK Bhadrak

Climatic constraints: Flood, eratic distribution of rain, thunderstorm in summer

The action plan of intervention based on flood like climatic constraints has been presented. The main interventions presented are rain water harvesting, sprinkler, stress tolerant varieties, IPM, backyard poultry etc. Dr. Kundu suggested to give importance to fodder cultivation.

KVK Dhenkanal

Climatic constraints: Erratic, unseasonal rainfall with irregular distribution

They presented the plan of intervention based on climatic constraints like drought, high temperature, unseasonal rain and cyclone. The main interventions presented are micro-irrigation, in situ moisture conservation, farm pond, stress tolerant crops, CHC etc.

KVK Bolangir

Climatic constraints: Drought

KVK Bolangir presented the plan of intervention based on drought like climatic constraints. The main interventions presented are renovation of water harvesting structures, stress tolerant crops, poultry, etc. Dr. Kundu suggested to check the title of certain interventions like "papaya seedling distribution" which does not specify its relation to climate resilience.

KVK Jagatsinghpur

Climatic constraints: Intense rainfall with with irregular distribution, cyclone, Flood

The action plan of intervention based on climatic constraints like intense rain, water logging and cyclone. The main interventions presented are portable tray vegetable nursery, poly-house, renovation of water body, integrated nutrient management, IPM, dual purpose poultry, fishery, beekeeping, mushroom cultivation, etc.

Remarks of the Panelists

Dr. K. Nagashree, CRIDA advised no separate VCRMC to be formed if the total beneficiaries is less than 200 in two adjacent villages, regular meetings of the VCRMC, one joint account with KVK functionaries, VCRMC a/c fund may be used for repair & maintenance of CHC machineries and register to be maintained at the VCRMC for action plan and its implementation.

Dr. R Chary, CRIDA shared his experience of all the old NICRA KVKs to be shared with the new KVKs and advised for Documentation of all interventions and success stories. He also suggested that brainstorming is required to streamline the farming system typology concept and other terminologies

Dr. Subba Rao, CRIDA suggested to use the weather forecast and agromet data are available at IMD Pune website

Dr. Kundu, CRIDA emphasied on Village and beneficiary selection and classifying the farming system typology, installation of rain-gauge, moisture content of grains and seeds with hand held moisture meter for new KVKs. He also suggested that Line departments should be invited during planning and implementation of the project. They also have technologies and varieties that may be demonstrated.

Dr. Prabhat Kr. Pankaj mainly focused on Livestock and fisheries module. He suggested to ensure feed and fodder that are locally available and use the unconventional sources and staggered trenches are helpful to prevent wild animal entry inside agricultural plots. Locally available animal mineral mixture are important to address any local mineral deficiency. Concrete flooring in animal housing should be discouraged and mulching to be encouraged and locally made low cost egg hatchery to be encouraged

Dr. Maitra suggested every KVK should go for convergence for NRM and to share information with line departments to bridge the gap.

Dr. Prasad advised to plan for the next kharif season, follow the farming system typology model, use the data collection format for quantifying the impact farming system typology, to focus on fisheries. He emphasised on community based NRM activities (like sluice gate repairing, etc.). Dr Prasad also suggested for each intervention, farmers' contribution should be ensured and a systematic comparison required for normal and stress situation.

Concluding remarks of Directors

Dr. Singh, Director, CRIDA, expressed his happiness to learn the progress of work over the last one year. He emphasised upon the farming system based typology and the collection of the base line data based on the format

provided by the CRIDA. He congratulated the team Coochbehar over the awards an International and National level. He emphasised the new KVKs to interact with the old NICRA KVKs for successful implementation of the programme. Convergence with Government departments is utmost important. The household level resilience is very necessary to be documented. He urged all the KVKs to ensure100% fund utilization. He suggested the new NICRA KVKs to start the ground work and the ongoing KVKs to expand their reach in new areas.

Dr. Rahman expressed his gratitude to all participants for successful completion of the workshop and concluded the workshop with thanks giving to all the stakeholders

Salient Suggestions came out during deliberation

- Farming system should be typology based.
- Full Utilization of fund by March 2022.
- Technology should be individual house base not crop base.
- One format should be developed for farm data collection in farming system information.
- All KVKs should do quality publication of NICRA experiment.
- Parameters should be for measuring the efficiency of technology.
- Provision of concrete flooring in case of cattle housing should be avoided as it is cause many problems to the animals.
- Data collection has to be precise while collecting information about yield
- VCRMC is a must in all NICRA villages to take decision about the custom hiring centre.
- VCRMC should have representation from all section of village.
- Agro met advisory should be sent timely and to be reported in presentation.
- Focus should be on convergence of line department activities in NICRA villages
- All line department should be involved /informed from initial days so as to convergence.
- The intervention which are proffering well should be intimate or document properly and conveyed to line department for taking forward to other village of the district.
- Work such as minor repair of existing water bodies/ WHS which enhance the efficiency of the structure should be given importance.

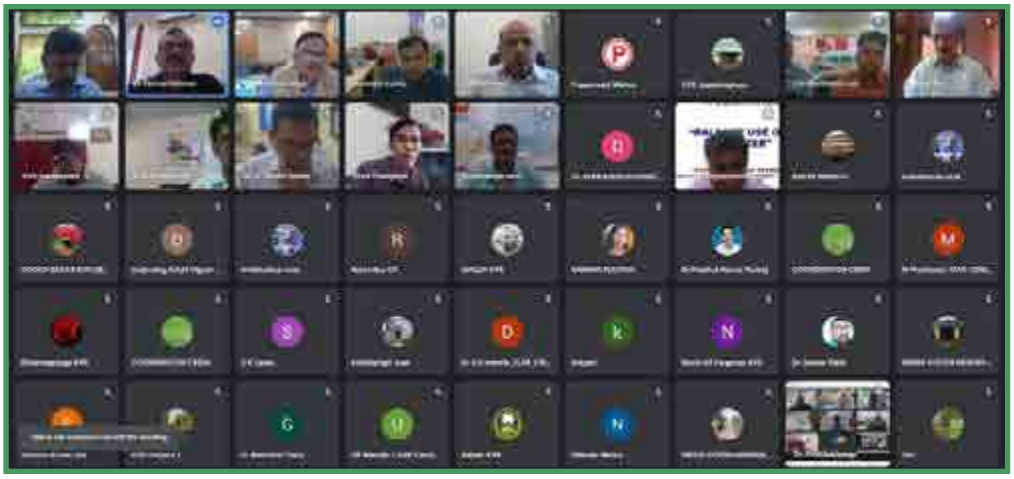
7.3. NICRA-TDC Project launched at Haramjanga village - drought prone tract of Purulia, West Bengal

The ICAR- Agricultural Technology Application Research Institute, Kolkata organised the *Launching programme of "NICRA-TDC Project at Haramjanga village of Purulia, West Bengal" in association with Krishi Vigyan Kendra, Kalyan* on March 16, 2022.

The programme initiated with the inauguration of the Custom Hiring Centre (CHC) managed by VCRMC by Revered Srimat Swami Shivapradananda ji Maharaj, Secretary, Ramakrishna Mission Vidyapith, Purulia in presence of Dr. S.K.Ray, Director, and Dr. F.H.Rahman , Principal Scientist & Nodal Officer NICRA, ICAR- ATARI, Zone -V, Kolkata .

The launching Programme started with lighting the lamp and paying floral tributes to Sri Sri Thakur Ramakrishna, Maa Sarada Devi & Swami Vivekananda.

In his welcome address Swami Vaskarananda ji Maharaj ackwonowledge the presence of scientific personals



from ICAR-ATARI, Kolkata; district level officials of line departments and public representatives.

Dr. F.H.Rahman, Principal Scientist & Nodal Officer NICRA, ICAR- ATARI, Zone -V, Kolkata, highlighted the successful dispersion of this unique NICRA - TDC Project since its initiation in 2011. He elaborates the objectives and components of this scheme emphasising the formation of VCRMC, operationalisation of Custom Hiring Centre and activities to be taken up under the four representative modules with successful examples of interventions.

Dr. S.K.Roy, Director, ICAR- ATARI, Zone -V, Kolkata, express the appropriateness of NICRA-TDC Project for this drought prone tracts of West Bengal and its usefulness in combating the climatic aberrations and its effects on agricultural productivity by taking up appropriate climate resilient technological interventions and successful implementation.

Mr. Swapan Bandopadhyay eminent educationist and chief co-ordinator Kalyan, recalls Swami Vivekananda's vision of new India that emerged through the huts of poor farmers. He express his heartfelt thanks to Dr. S.K.Roy, Director and Dr. F.H.Rahman, Principal Scientist & Nodal Officer NICRA, ICAR- ATARI, Zone -V, Kolkata, for selecting Kalyan Krishi Vigyan Kendra for this prestigious national level programme.

Dr. S.N. Khanra, Deputy Director of Horticulture & Mr. Guraichnad Singh Asst. Director Fishery, Govt. of W.B. express their whole hearted support for this programme and committed to organise different Govt. programmes in convergence mode.

Srimat Swami Shivapradananda Ji Maharaj, Secretary, Ramakrishna Mission Vidyapith, Purulia, and Chairman of this programme, express his concern for the farming community in the face of changing climate and requested all scientific and development departments to come to the villages and serve the people for their socio-economic upliftment.

Around 350 farmers and farm women participated in this programme.

8. Success Stories:

8.1 Optimization of horticultural production through land embankment development in South 24 Parganas

Sri Nepal Naskar is an enthusiastic and progressive farmer of Bongheri village of South 24 Parganas district. A series of natural calamities in the form of cyclone Fani, Bulbul, Amphan and Yaas since the last three years as well as the COVID 19 pandemic could not deter Mr. Naskar from continuing his farming activities when most of the farmers in the district suf-

fered heavy losses.

Shri. Naskar had 0.25 ha of low land, only fit for cultivation of long duration traditional paddy varieties like *Marishal, Kalomota,* etc. in *Kharif*. He was motivated by seeing the benefits of land embankment cultivation in the demonstration plots of NICRA project. In this technology, a peripheral narrow canal was dug around the low land. With the dug-out soil, the land embankment, called "*Ail*" locally, was raised by 3 ft. The bottom and top width of the Ail was maintained at 5 ft and 3 ft, respectively. On an average, 5-10% of the total land thus could be brought under additional cultivation. Simultaneously with rice in the low lying main field, vegetables were grown over this modified embankment that could easily escape submergence during continuous rainfall.

After successful implementation of land embankment by the financial and technical guidance under the NICRA project (in 2020-21) he was able to cul-

tivate bittergourd in *kharif* and chilli in rabi season on 0.04ha of land embankment and medium duration rice in rest of the land.

8.2 Bongheri in South 24 Parganas withstands the massacre of cyclone Yaas in Sundarbans

The recent severe cyclone "*Yass*" ravaged the coastal and deltaic districts along the northern shore of the Bay of Bengal, on 26the May 2021. Though Sundarbans escaped the direct impact of the nightmarish tropical storm, it became probably the worst affected region in terms of damage to the agricultural lands. The cyclone coincided with the full moon high tide (perigian spring tide) and induced an extraordinary rise in the water level (2-4 m) in the rivers and creeks of Sundarbans. The storm surge breached the river embankment in many places, flooding around 1000 villages with saline water.

However, the impact of *Yaas* was minimal at Bongheri village, thanks to the implementation of NICRA programme. The village lies adjacent to the river Matla and has a decade old experience of witnessing the carnage by the cyclone *Aila* in 2009. The untired and united approach towards protection of its river embankment resulted in saving the entire village this time. The Village Climate Risk Management Committee planted and maintained a thick Mangrove barrier on the Matla riverbed which decreased the generation of wind-waves, wave setup and run-up that contributes to surge levels and associated loss during such cyclones. As a consequence, the embankment remained unscathed and the village was saved from saline water intrusion. At the same time he farmers were prepared to harvest the rainwater as much as possible in the numerous farm ponds created during the project.

8.3 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.

8.4 Modern Jute Retting Technology- A cost effective and farmer's friendly practice in Malda

Shri. Sukumar Mandal is a progressive and innovative farmer from *Deherutala* village, West Narayanpur, an adopted village of Malda Krishi Vigyan Kendra, Malda, West Bengal. Most of the people of this village is engaged with farming and farming is their main source of income. They cultivate crops like rice, jute as a major crop. Now jute is one of the most important cash crops in that region. Like every year Sukumar Mandal grows jute crop on about 2 acres of land. Due to the poor quality of jute fibre through tradition retting method his return was low. Malda KVK intervened there with a demonstration and awareness program about "NINFET SATHI Powder". NINFET SATHI Powder is very efficient for jute fibres retting and expression of golden colour of jute. 5 kg of powder is enough for the retting of one acre jute. During 2019-2020 crop seasons, average price of jute fibre he received was Rs. 3500/quintal. But this year, he has got higher product value of about Rs. 4500/quintal. Therefore, the increase in income as compare to traditional method was about Rs. 5000. Through this modern technique his income increases about Rs. 2500/bigha with this improved method. In that awareness program *Sukumar* Mandal also learned about the proper techniques of jute retting using of NINFET SATHI powder. After using this powder, he has got the satisfying results like improved fibre quality, better yield and improve colour as well. This technology also helps to increase interest to others farmers who do not want to grow jute. NINFET SATHI Powder contains nutrients without any microbial consortia and it can enhance the microbial growth at suitable pH so that it accelerates the rate of retting. It also effects by lowering of root content, diminishing of defects in fibres,

improvement in strength, fitness and colour of fibre. With this interference of Malda KVK, he felt motivated that Malda KVK did that kind of demonstration which helps them to boost their economic conditions. This technique helps to increase microorganism content which is essential for retting and express the golden colour which has higher demand for export in foreign countries. This NINFET SATHI powder is made the jute fibre looks like Bangladesh growing jute as compare to golden colour traits.

8.5 Enhancing economic and Social security through different interventions of NICRA Project in Puri

Shri. Naresh is a progressive farmer of Jatipur village of Puri. He holds total 13 acre of land in which he is consequently growing rice (both kharif and rabi), groundnut, vegetables *viz.*, brinjal, okra, bitter gourd, ridge gourd etc. in the maximum portion of his farming area. He also engaged in mushroom cultivation, livestock and fishery.

Components	Acreage (acre)	Productivity (quintal/acre)
Crop		
Paddy	13.0	24.75 q / acre
Groundnut	0.1	12.00 q /acre
vegetables	0.1	100 q / acre
Livestock		
Cow	8 no.	1.5 -2 lit/day/cattle
Poultry	50.0	-
Fishery		
1. Rohu + Catla	0.2 acre	8-9 quintal /acre

After harvesting of rice for processing these in rice flakes, he used to hire five labours to roast the rice in a roasting pan along with Silica at about 100°C. But, since 8 years, they are producing rice flakes with ease. He welded the iron channel with the rotating impellers, installed a blower and a vibration machine. A wooden box is made with a controlling wooden gate, which is useful to feed saw dust powder into the roasting machine by means of air pressure. In response to the feedback of some of the villagers, he again prepared a furnace out of brick and clay. Then, he installed a roasting machine in the furnace cavity, which used to roast the raw rice. Then, they pour the roasted rice in to the Rice Flake machine to flatten it in order to make rice flakes/ beaten rice/ pounded rice / chura.

He is also bearing an acreage of 0.40 acre under banana and papaya plantation. He is very enthuciastic about latest agricultural techniques in both agriculture and allied sector. He is heartly supporting the team members of NICRA-TDC Project. He has been proved as a perfect village leader, who influences the villagers to adopt the innovated technologies prescribed by the scientists of KVK, Puri under NICRA-TDC project. He is also an active member of Parikalpana producers company ltd., FPC that working for the welfare of Jatipur farmers.

8.6 Climate Resilient Technologies - A way for better livelihood in Kalahandi district

a) Shri. Khirasindhu Sahu, a progressive farmer of Kalahandi district of Odisha, having 4 acre land used to get annual income of Rs. 108628/- from rice, cotton, cauliflower, cow, etc. He faced problems like low yield and low income, disease infestation etc. With interventions like HYV, Hybrids and disease resistance varietal trial, CB Cow etc., he is getting annual income of Rs 358914/-.

Component Description		Benchmark (Baselineperiod2016-17)			
Components	Names	Area (Acre)/Number	Production (Q/Liter/No.)	GrossIncome (Rs.)	Net Income (Rs.)
FieldCrop1	Paddy	3	42.3	62128	24628
Hort.Crop1	Cauliflower	1	52	78000	62000
Livestock1	Cow	4	1400	42000	22000
Total				**182128**	**108628**

ComponentDescription		Period2020-21				%increase over base year	
Components	Names	Area (Acre)/No	Production (Q/Liter/No.)	GrossIncome (Rs.)	Net Income(Rs.)	production	income
FieldCrop1	Paddy	2	41	76214	26414	45	162
Hort.Crop2	Cauliflower	2	180	270000	248500	73	83
Livestock1	Cow	4	3000	120000	84000	114	282
Total				**466214**	**358914**		**230**

b) Shri Jhasketan Sahu, another progressive farmer of Kalahandi district of Odisha having 5 acre land used to get annual income of Rs. 79350 fromRice, arhar, black gram, brinjal, tomato etc. He faced problems like blast and YSB in paddy, mosaic in arhar and green gram , fruit and shoot borer in brinjal etc. With interventions like resistant cultivars, IPM, INM etc., he is getting annual income of Rs.265788.

Component Description		Benchmark (Baselineperiod 2016-17)			
Components	Names	Area (Acre) / Number	Production (Q/ Liter/No.)	GrossIncome (Rs.)	Net Income (Rs.)
Field Crop1	Rice	3.0	51.5	75700	37600
FieldCrop2	Arhar	1.5	6.0	30300	13650
FieldCrop3	Maize	0.5	7.0	9500	1400
Hort.Crop1	Brinjal	0.1	7.5	7500	5500
Hort.Crop2	Tomato	0.2	9.0	10000	7500
Livestock2	Cow	3.0	950.0	28500	13700
Total				**161500**	**79350**

Component Description		Period 2020-21				%increase over base year	
Components	Names	Area (Acre)/No	Production(Q/ Liter/No.)	Gross Income(Rs.)	NetIncome (Rs.)	production	income
FieldCrop1	Rice	2.0	41.0	76588	43388	19.5	73.0
FieldCrop2	Arhar	2.0	10.5	63000	34100	31.0	87.3
FieldCrop3	Maize	1.0	17.5	31800	11600	25.0	314.2
Hort.Crop1	Brinjal	0.5	41.0	49000	39000	9.3	41.8
Hort.Crop2	Tomato	0.5	33.5	46800	37700	11.7	50.8
Livestock2	Cow	5.0	3000.0	120000	100000	89.8	338
Total				**387188**	**265788**		**234.5**

8.7 Water saving technology of okra with using poly mulch in Coochbehar

Okra is one of the demanding crop throughout the year in Cooch Behar district. It is mainly grown during summer and rainy season. Farmers of NICRA villages mainly prefer to grow these crops during rabi season for higher market demand. The winter mulch provides better physiological growth of flowering and fruit setting of okra. Low temperature during winter months also causes chilling injury. The problem is that rainfall received during rabi season is very scanty and water table is very low. Number of irrigation required more on these crops which also increase the cost of cultivation.

The demonstration was conducted at NICRA villages of Cooch Behar district. The crop grow in broad bed system and beds are raised at a height of 15 cm. Length of the bed at convention size with 1 meter wide leaving 15 cm wide drainage channel. After proper land preparation the recommended dose of fertilizer applied in the bed. The beds covered with black polythene mulch film 25 cm gauge. The okra sapling planted at a distance of 50cm x 50cm by making whole on the polythene. Other intercultural operation followed as per recommendation.

Soil temperature under mulch condition is higher during day and night which increase the fruit setting and reduce the flower drop. Polythene mulch also reduces the weed growth and save irrigation water upto 40.9%. In this technology the soil temperature during growth period is higher than the atmospheric temperature under black polythene mulch condition (about 5^0 c). This is because of black polythene mulch promote large radiation of soil surface and soil heat flux. Black polythene mulch led to reduction of IWR and increase water use efficiency (WUE). The consumptive use of water gives better retention of soil moisture.

Higher yield under black polythene mulch about 32 quintal per acre where without mulch condition give 24 quintal per acre. The Gross cost is higher in without mulch condition (about 59 thousand per hectare) due to increase number of irrigation and weeding problem. In case of mulch condition the gross cost about 46 thousand per hectare.

8.8 Integrated Farming system in NICRA villages of Ganjam district in Odisha

Smt. Sunita Gouda, a farm-woman, has 1.6ha of farming land (0.4ha irrigated land), 2 crossbred livestock in Chikili, Ganjam district Odisha.

Dry spell decrease the yield and low income due to non-adoption of integrated farming system

Integration of Fodder, mineral mixture to Dairy along with Drought tolerant Rice var. MTU-1156, YMV tolerant Greengram-IPM02-14,Brinjal & Okra, vermicompost-01 unit

Rice- 0.8ha, Brinjal-0.4 ha., Fodder-0.4ha, Okra-0.2ha, Tomato-0.2ha,Greengram-0.8ha,

By adopting drought tolerant Rice var. MTU-1156 the yield increased by 14%, By fodder cultivation the feed cost decreased by 40%, mineral mixture increased the milk yield by 21%.By poly mulching the weed population decreased by 75%.

How the interventions minimized the impact of climate variability

Rice var. Swarna Shreya tolerate dry spell for 10 days, Integration of Fodder, mineral mixture increased income in Dairy enterprise, Poly mulching in Brinjal increased yield by 14%. By application of vermicompost the storage period of vegetable increased by 4-5 days.

Earlier she was getting profit of Rs.1,48,000/- per year & after IFS integration she got a profit of Rs.2,34,00/- per year.

8.9 Cultivation of leafy vegetables - climate Resilient technology in flood situation at Bhadrak

The village Fatepur was identified for NICRA- TDC for the year 2021-22. The village is affected by frequent floods. The vegetable crops are damaged by flood water. Mostly vegetables are grown after recession of flood during late rabi and summer season. But the water is scare during summer season The medium irrigated land during summer 2022 was selected for demonstration when Farmers were facing the problem of low income and water scarcity . The farmers practice was to grow leafy vegetables of local variety in small patches. Therefore the demonstration on income generation by leafy vegetables was conducted during 2021-22. Leafy vegetables like Amaranthus, Ipomoea were given for demonstration. A total of 25 farmers have conducted demonstration on leafy vegetable. Within a small period of 2 months farmers could harvest the crop and get a net income of of Rs 22000.00 from Amaranthus and Rs 25000.00 from *Ipomoea aquatic*. The cultivation of leafy vegetables in summer season during peak water scarcity was remunerative for the farmers

Economics of the technology:

Technology demonstrated	No. of farmers	Area (ha)	Yield(q/ha)		% increase	Other parameter		Economics of demonstration (Rs./ha)		
			Demo	Local		Demo	local	Gross Cost	Net Return	BCR
Leafy vegetables – income generating (Amaranthus	25	0.1 ha	87	70	24	No of leaf/ plant-14	No of leaf/ plant-10	65000	22000	1.30
Leafy vegetables – income generating (Ipomea)	25	0.1 ha	90	75	20	No of leaf/ plant-30	No of leaf/ plant-19	65000	25000	1.36

8.10 Use of Hermetic storage bag for safe storage of black gram at Bhadrak

In the identified NICRA village, Fatepur of KVK, Bhadrak pulse like green gram and black gram are important pulse crop of irrigated medium land and low land respectively. The pulse seed crop is affected mainly by pulse beetle *Callosobruchus maculates* during storage in normal gunny bags which is the farmers practice. Adult and grub of pulse beetle feed on the grain by making a small hole. Infested stored seed can be recognized by the white egg on the seed surface and round exit holes with flap of seed coat. Demonstration on Hermetic storage bag was conducted during 2021-22 including 50 beneficiaries. No pulse beetle incidence was seen in hermetic storage bag while 12 percent marked in farmer practice.

8.11 Integrated pest management practices in summer rice proved remmunerative at Bhadrak

Under NICRA programme, KVK, Bhadrak, adopted one village *i.e.* Fatepur, Dhamnagar during 2021-22. After the baseline survey it was found that the farmers are practicing chemical method of pest management in rice cultivation. They are applying pesticides at higher doses and unaware about the IPM practices in rice. As per the discussion taken in the village,10 nos of farmers were selected for demonstration of IPM practices in summer rice in 5 acre.

The objective of the demonstration was to minimize the pest population with higher net return in summer rice by adopting the IPM strategy. The input like chlorantraniliprole 0.4G,Pheromone trap lure, BT, Neem oil, Lambda cyhalothrin,Trichocard were provided as IPM components under this demonstration.Under IPM practices in summer rice demonstration dead heart percentage was minimise to 6.31 % against 13.6% of local practice the net return obtained from the demonstration was 12200 per ha. After successful demonstration of the technology farmers were advised to take up it in kharif rice also motivating other farmers to adopt the technology

Economics of the technology before and after NICRA intervention during summer 2021-22

Technology demonstrated	No. of farmers	Area (ha)	Yield(q/ha)		% increase	Other parameter		Economics of demonstration (Rs./ha)		
			Demo	Local		Demo	local	Gross Cost	Net Return	BCR
Demonstration on IPM practices in summer rice	10	2.5	43.2	36.4	18.7	Dead heart-6.31% Leaf damage 10.5%	Dead heart 13.6% Leaf damage 18.2%	45,700	12,200	1.26

8.12 Cultivation of heat tolerant Tomato during summer months- a new avenue for adding more income for resource poor farmers of Purulia

Shri. Mahato owned a land area of about 03 acre where he normally grows Kharif Rice followed by Mustard for the last 3yrs. using locally available seed and traditional knowhow. The demonstration plot is located just beside the main approach road of the village that passes through the village to another neighboring village. Mr. Mahato was willing to cultivate Tomato during Summer as per our direction in 0.5 Acre land keeping rest portion fallow considering the availability of irrigation water. Mr. Mahato dug a field well within his plot that can regularly accumulate the available sub-surface flow which can be utilized for crop growth. Ms. Mahato was capable of and committed to arrange all physical and financial requirements, like timely land preparation, sowing, Transplanting,weeding, fertilization, irrigation etc as per our direction.

Details of technology demonstrated: Date of transplanting- 28/03/2022.

Pre sowing irrigation instead of post sown flooding.
Variety- F1 Hybrid- *Shaksam*
Spacing- 75cm X 45 cm
Seed treatment seven (7) days prior sowing with *Trichoderma viride* & *Pseudomonas*
Seed bed is prepared mixed with FYM-4 Kg/sq.m. Before sowing the nursery beds were drenched with Dithane-M 45 @3gm/sq.m
Soil application of Micronutrient: Zn @ 8 Kg/ha & Mn @ 8 kg/ha
Basal application of chemical fertilizer @ 60kg N ,60 kg P_2O_5&60 Kg K_2O / ha
Weeding and Hoeing -4 times followed by top dressing- two times with N@ 30kg at 30 & 60 DAT
Staking was done for getting high yield and good quality fruits.
Plant protection measures as and when required

A Meeting of VCRMC was called to discuss the objectives and modalities of implementing the programme in our Operational area.

Then VCRMC members called a meeting in their respective villages involving potential farmers of their locality to discuss the objectives and modalities of implementation and came out with a probable list of farmers.

Then a Team comprising KVK functionaries visit those farmers field to have a on spot verification of the demonstration to guess the suitability of the plot for taking up the programme like- its location, soil, distance from village road, proximity to irrigation sources etc.

Made a clear cut discussion with the farmer about What KVK will provide apart from technical knowledge as Critical input and what he has to arrange for fulfilling our objectives.

On the basis of a positive outcome Mr. Mahato has been picked up for conducting Demonstration on Summer Tomato using heat tolerant variety- *Shaksam*

Increasing cropping intensity of areas with limited irrigation facility.
Increasing farmer income by producing Tomato in a period when it could fetch very high price.
They have to explore the suitability of introducing much higher yielder heat and wilt tolerant Hybrids instead of available HYVs.
Varieties of 90 days variety.
Explore the possibility of growing Cabbage along with tomato during summer.
Powdery mildew resistant varieties suitable for late sown crops.

Performance of technology (Increase in productivity and returns)

Technology demonstrated	Area (Acre)	Yield (q/ha)		% Increase Gross Cost	Economics of demonstration (Rs/ha)		
		Demo	Local		Gross Cost	Net Return	BCR
Heat Tolerant Tomato (*Shaksham*)	0.5	96	58	65.5	96600.00	143400.00	2.48

9. Dignitaries visited NICRA Villages during 2021-22:

Name of KVK	Name of VIPs/Experts	Date of visit
Purulia	Srimat Swami Shivapradanandaji Maharaj, Secretary Ramakrishana Mission Vidyapith, Purulia.	16.03.2022
	Dr. S.K.Roy, Director, ICAR-ATARI, Kolkata	
	Dr. F.H.Rahman, Nodal Officer NICRA, ICAR-ATARI Kolkata	
	Dr. S.N.Khanra, Dep;uty Director of Horticulture, Purulia, W.B.	
	Dr. K.Mahato, BLDO, Purulia II	
	Mr. Guraichnad Singh Asst. Director Fishery, Govt. of W.B.	
Puri	Dr.S.K.Roy, Director, ICAR-ATARI, Kolkata	04.04.22
	Dr. F.H.Rahman, Nodal Officer NICRA, ICAR-ATARI Kolkata	
North 24 Parganas	Dr. S S Singh, Director of Extension, RLBCAU, Jhanshi	30.12.2021
	Dr. F.H.Rahman, Nodal Officer NICRA, ICAR-ATARI Kolkata	
	Dr. N J Maitra, Deputy Director Research, WBUAFS	
	Dr. K K Goswami, Senior Scientist & Head, Nadia KVK,BCKV	
Kalahandi	Sumanta Kundu (Scientist, CRIDA)	11.10.2021
Dhenkanal	Dr. F.H.Rahman, Nodal Officer NICRA, ICAR-ATARI Kolkata	07.04.2022
	Dr. Amit Phonglosa, DDE, DEE, OUAT	
	Sri Anshuman Pattnaik, CDAO	
	Dr. Prakash Ch. Gogineni, DFO	
	Smt. Geetashree Parhi, DDH	
	Dr.Gyanendra Rout, DDM, NABARD	
	P.K Bhuyan, Dist. Fisheries Officer	
	Chandramani Behera, Range Officer	
	Dr. Krushna Ch. Malik, Block Veterinary Officer	
Kalimpong	Dr. F.H.Rahman, Nodal Officer NICRA, ICAR-ATARI Kolkata	24.03.2022
	Prof. P.K Pal, DEE, UBKV Coochbehar	
Cooch Behar KVK	District officials constituted by District Magistrate	07.12.2021
Ganjam-I	Dr. S. Kundu, Senior Scientist, CRIDA, Hyderabad	11.11.2021


JALKUND
Unnamed Road, Odisha 756130, India
Latitude 20.030929N Longitude 83.348986E

10. Newspaper coverage


আরও খবর

কৃষিবিজ্ঞানে তথ্যচিত্রের স্বীকৃতি রাষ্ট্রসংঘে

শীতলকুচিতে ফের সিবিআই


ছাগল পালনের প্রশিক্ষণ

পুণ্ডিবাড়ি, ৭ ফেব্রুয়ারি : কোচবিহার কৃষিবিজ্ঞান কেন্দ্রের পরিচালনায় এবং আইসিএআর-এর সহযোগিতায় সোমবার পুণ্ডিবাড়িতে তিনদিনব্যাপী প্রাণী পালনের উপর 'সামর্থ্য নির্মাতা কর্মসূচি' শুরু হল। এই শিবিরে ছাগল পালনের ওপর বিশেষ গুরুত্ব দেওয়া হয়। প্রথমদিনের শিবিরে আইসিএআর আটারির কৃষিবিজ্ঞানী ডঃ ফিরোজ হাসান রহমান, কোচবিহার কৃষিবিজ্ঞান কেন্দ্রের প্রধান ডঃ বিকাশ রায় সহ অন্য বিজ্ঞানীরা হাজির ছিলেন। পশ্চিমবঙ্গের বিভিন্ন প্রান্ত থেকে ৪০ জন প্রাণীপালক এদিনের শিবিরে অংশ নিয়েছে। তিনদিনব্যাপী চলা শিবিরে উত্তরবঙ্গ কৃষি বিশ্ববিদ্যালয়ের দক্ষ প্রাণীবিজ্ঞানীরা ছাগল পালনের ওপর প্রশিক্ষণ দিচ্ছেন বলে জানা গিয়েছে। বিজ্ঞানী ডঃ ফিরোজ হাসান রহমান জানান, প্রাণী পালনের গুরুত্ব অপরিসীম। তাই কৃষিকাজের পাশাপাশি প্রাণী পালন করেও অনির্ভর হওয়া সম্ভব। এই কর্মসূচির প্রধান উদ্যোক্তা ডঃ রাজলক্ষ্মী মুখোপাধ্যায় বলেন, আইসিএআর পরিচালিত পাঁচটি শিবিরের মধ্যে এটি তৃতীয়। এই শিবিরে মূলত ছাগল পালনের ওপর হাতে-কলমে প্রশিক্ষণ দেওয়া হচ্ছে।


পোষ্যদের চিকিৎসায় অপারেশন থিয়েটার


শীতে গবাদিপশুর পুষ্টিতে সমতা আনা জরুরি

জাকির হোসেন


এনআইসীআরए परियोजनाको उद्घाटन


কৃষি সচেতনতা শিবির


Watch

Bissa Bangla News


ধরিত্রী


আরম্ভ হেলা 'নিক্রা'


ঢেঙ্কানাল—অনুগোল ৭৩

11. Awards/Recognition

Accomplishments of Coochbehar KVK in NICRA project were filmed naming "RESONATING RESILIENCE" which was awarded with FAO Award 2021 in 37th International Agro Film Festivals at Bratislava, Slovakia.

- **Dr. P. K. Garain**, **SMS (Plant Protection) RAKVK, South 24 Parganas**, has have been awarded with **Best Paper Presentation Award** on "Climate Resilient Farming Models for different Farming System Typologies in Sundarbans" ley Society for Fertilizers and Environment, during February 25-26, 2022
- **RAKVK, Nimpith, South 24 Parganas** have been awarded with **Mahindra Samriddhi Krishi Vigyan Kendra Samman** for the innovative Technology demonstrated in NICRA village ley Mahindra of Mahindra.
- **Shri Gauranga Naskar, NICRA Farmer, Nimpith, South 24 Parganas** has been awarded with **Best Innovative Farmer Award 2021** ley CRIDA, Hyderabad and got 1st Prize in '**Khet Khamane Bazimat**' from **Door Darshan** for NICRA activities.

12. Publication

Research Paper

1. N. Bommayasamy, L. B. Singh , B K Nanda and F. H. Rahman (2021). Effect of split application of nitrogen on productivity, profitability and nitrogen use efficiency of drought tolerant rice. *Indian Journal of Extension Education*, Vol. 57, No.3, 2021.

2. Ali, T. Golam, Das, Ganesh & Pal, Prabhat. (2021). Inter-collaboration Network among Institutional Actors of Agricultural Knowledge Information System (AKIS): A Comparative Study between Cooch Behar and Jalpaiguri Districts of West Bengal, India. *Asian Journal of Agricultural Extension, Economics & Sociology.* 35-41. 10.9734/ajaees/2021/v39i1130723

3. Das, Ganesh; Hajra, D; Mukherjee, Rahul; Hembram, Sandip and Roy, B. (2021). Sustainable income generation of the farmers through pig farming: A case study in Terai region of West Bengal. *Journal of Livestock Science.* 12. 241-245. 10.33259/JLivestSci.2021.241-245.

4. Hembram Sandip, Mukhopadhyay Prabir and Das Ganesh. (2021). Evaluation of the Sulphur-Supplying Ability of Soils to Support Plant Growth and Assessment of Relative Crop Response to Sulphur Application through Neubauer Technique. *International Journal of Plant & Soil Science.* 33. 1-10. 10.9734/IJPSS/2021/v33i1630518.

5. Das, Ganesh; Rahman, Feroze; Saha, Sankar; Hembram, Sandip; Biswas, Sujan; Sultana, Samima; Sarkar, Suraj; Saha, Augustina; Bhattacharya, R ; Ganguly, Bablu ; Mukherjee, Rahul ; Roy, Bikash and Pal, Prabhat. (2021). Pond Renovation for Harvesting and Recycling of Rain Water: An Experimental Trial in Sub Himalayan Terai Region of India. *International Journal of Environment and Climate Change.* 11. 1-7. 10.9734/IJECC/2021/v11i530403.

Book

1. L.B. Singh, B.K. Nanda, N. Bommayasamy, H. Nayek, V.K. Pandey, B.A. Jerard and F.H. Rahman (2021). *Climate Resilient Technological Intervention for Sustainable Agriculture Production System for Andaman under TDC-NICRA.* Published by ICAR-CIARI Port Blair, India. p. 1-186

2. P.K. Garain, P. Chatterjee, F. H. Rahman and S. Jana. (2021). *Climate Resilient Agriculture – a road map towards sustainable rural livelihood in Sundarbans.* Published by Ramakrishna Ashram, Nimpith, South 24 Parganas.

3. Ganesh Das, F. H. Rahman, Surajit Sarkar. (2021). *Climate Smart farming and ICT*. ISBN-979-8682613809

Technical bulletins

1. F. H. Rahman, R. Bhattacharya and S. Nandi (2021). *NICRA Newsletter: Towards Climate Smart Agriculture*, Pub. by ICAR-ATARI Kolkata, Vol. 7 No. 2 pp 1 – 8.

2. F. H. Rahman, R. Bhattacharya and S. Nandi (2022). *NICRA Newsletter: Towards Climate Smart Agriculture*, Pub. by ICAR-ATARI Kolkata, Vol. 8 No. 1 pp 1 – 12.

Paper presented in national/ international seminars etc.

1. P. Majhi, R. Bhattacharya, S. Ghosh and F. H. Rahman (2021). Continuous Rice Cropping System with Integrated Use of Inorganic and Organic Sources of Nutrients for Soil Quality Improvement. Paper presented in the National seminar of 85th ISSS Annual Convention held at PSB, Sriniketan, Santiniketan, Nov 16-19 2021.

2. S. Sarkar, G. Das, S. Sarkar, S. Saha and B. Roy, S. Biswas, R. Bhattacharya and F. H. Rahman (2021). Use of Black Polythene Mulch as a Climate Smart Technology on Performance of winter cucumberand Resource Conservation In Terai Agro-climatic Zone of West Bengal. Paper presented in the National seminar of 85th ISSS Annual Convention held at PSB, Sriniketan, Santiniketan, Nov 16-19 2021.

3. R. Bhattacharya, S. Ghosh and F. H.Rahman (2021). Organic Carbon fractions show how rice cultivation may impact on soil carbon pools in Baruipur district of West Bengal. Paper presented in the National seminar of 85th ISSS Annual Convention held at PSB, Sriniketan, Santiniketan, Nov 16-19 2021.

4. Ganesh Das and Sarhak Chowdhury (2021). Identifying the factors influencing farm women's

information network output. Paper presentend in International Symposium on Coastal Agriculture: Transforming Coastal Zone for Sustainable Food and Income Security, March 16 - 19, 2021.

5. Ganesh Das and Sarhak Chowdhury (2021). Constraints affecting the agricultural information network output of the farm women. Paper presented in XV Agricultural Science Congress & ASC Expo 2021 National Academy of Agricultural Science, New Delhi and Institute of Agricultural Science, Banaras Hindu University

6. Ganesh Das, F. H. Rahman, Sankar Saha, Sandip Hembram, Sujan Biswas, Samima Sultana, Suraj Sarkar, Augustina Saha, R. Bhattacharya, Bablu Ganguly, Rahul Deb Mukherjee, Bikash Roy and Prabhat Kumar Pal (2021). Recycling of rain water through renovation of pond in sub-Himalayan Terai region of India. Paper presented in Fifth International Agronomy Congress on Agri Innovations to combat food and nutrition Challenges, The Indian Society of Agronomy, Professor Jayashankar Telangana State Agricultural University, Hyderabad, 2021

Table. Expenditure details during 2021-22

S. N	Name of the ATARI /KVK	Sanction for the year 2021-22						Expenditure for the year 2021-22						Closing balance as on 31st March, 2022		
		Grants-in-Aid-General (REVENUE)			Grants for creation of capital assets (CAPITAL)		Total	Grants-in-Aid-General (REVENUE)			Grants for creation of capital assets (CAPITAL)		Total	Grants-in-Aid-General (REVENUE)	Grants for creation of capital assets (CAPITAL)	Total
		Operational	TA	SCSP	Equipment	SCSP		Operational	TA	SCSP	Equipment	SCSP				
1	ATARI	800000	86000	0	0	0	886000	780343	85620	0	0	0	865963	20037	0	20037
2	Coochbehar	0	0	1200000	0	200000	1400000	0	0	1200000	0	200000	1400000	0	0	0
3	Ganjam	1730000	36000	0	0	0	1766000	1730000	36000	0	0	0	1766000	0	0	0
4	Kalahandi	1850000	16000	0	0	0	1866000	1850000	16000	0	0	0	1866000	0	0	0
5	Kendrapara	194000	26000	0	0	0	1966000	194000	26000	0	0	0	1966000	0	0	0
6	Malda	0	0	1182000	0	0	1182000	0	0	1182000	0	0	1182000	0	0	0
7	Port Blair	1466000	0	0	0	0	1466000	1435933	0	0	0	0	1435933	30067	0	30067
8	South 24 Parganas	0	0	1200000	0	200000	1400000	0	0	1200000	0	200000	1400000	11718	0	11718
9	Jagatsinghpur	378000	12000	0	157000	0	547000	378000	12000	0	157000	0	547000	0	0	0
10	Puri	380000	10000	0	157000	0	547000	380000	10000	0	157000	0	547000	0	0	0
11	Bhadrak	382000	8000	0	157000	0	547000	382000	8000	0	157000	0	547000	0	0	0
12	Keonjhar	384000	6000	0	157000	0	547000	384000	6000	0	157000	0	547000	0	0	0
13	Murshidabad	470000	0	0	157000	0	627000	470000	0	0	157000	0	627000	0	0	0
14	Bolangir	384000	6000	0	157000	0	547000	384000	6000	0	157000	0	547000	0	0	0
15	Dhenkanal	385000	5000	0	157000	0	547000	385000	5000	0	157000	0	547000	0	0	0
16	Purulia	380000	10000	0	157000	0	547000	380000	10000	0	157000	0	547000	0	0	0
17	Darjeeling	370000	20000	0	157000	0	547000	370000	20000	0	157000	0	547000	0	0	0
18	North 24 Parganas	0	0	1182000	0	600000	1782000	0	0	1182000	0	600000	1782000	0	0	0
	Total	**11299000**	**241000**	**4764000**	**1413000**	**1000000**	**18717000**	**9503276**	**240620**	**4764000**	**1413000**	**1000000**	**18666896**	**61822**	**0**	**61822**

Annexure II

NICRA-TDC PROJECT SITES

West Bengal, Odisha, A&N Islands



भाकृअनुप
ICAR

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

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