ADAPTION OF RESILIENT TECHNOLOGIES TO MITIGATE CLIMATE CHANGE IN FARMING PRACTICES UNDER KHOWAI DISTRICT OF TRIPURA

Compiled and Edited by
Manoj Singh Sachan
Dipankar Dey

Contributed by:

Dipankar Dey
Lord Liton Debbarma
Ardhendu Chakraborty
Subhra Shil
Nurul Islam
Suresh Chandra Biswas
Rajib Das
Manoj Singh Sachan

Krishi Vigyan Kendra (Divyodaya) Khowai: Tripura- 799 207
(An ISO 9001: 2015 Certified Organization & Category 'A' as per NITI Ayog)
(Host Organization- Sri Rama Krishna Seva Kendra, Kolkata W.B.)

Citation- Sachan, M.S. and Dey, D. (2022). Adaption of Resilient Technologies to Mitigate Climate Change in Farming Practices under Khowai District of Tripura. Pp- 122.

Project: National Innovations in Climate Resilient Agriculture, Technology Demonstration Component (NICRA- TDC)

Funded By: Central Research Institute for Dryland Agriculture, Hyderabad (Telengana)

Adopted village: North Pulinpur ADC Village and Duski ADC Village
Implemented by: Krishi Vigyan Kendra (Divyodaya) Khowai Tripura- 799 207

December, 2022

ISBN No: 978-93-94375-19-2

This compilation has been compiled based on technology demonstration, dissemination, and adoption, impact, mitigation and information management activities of Krishi Vigyan Kendra (Divyodaya) Khowai: Tripura

Compiled and Edited by:
Dr. Manoj Singh Sachan, Senior Scientist & Head,
Krishi Vigyan Kendra (Divyodaya) Khowai: Tripura- 799 207
&
Dipankar Dey, Subject Matter Specialist- Soil Science,
Krishi Vigyan Kendra (Divyodaya) Khowai: Tripura- 799 207

Contributed by:

Dipankar Dey, SMS-Soil Science
Lord Liton Debbarma, SRF, NICRA- TDC
Ardhendu Chakroborty, SMS- Plant Protection
Subhra Shil, SMS-Horticulture
Nurul Islam, SMS-Animal Science
Suresh Chandra Biswas, SMS-Home Science
Rajib Das, SMS-Agril Extension
Manoj Singh Sachan, Senior Scientist & Head

Published by:
Senior Scientist & Head,
Krishi Vigyan Kendra (Divyodaya) Khowai: Tripura- 799 207

Copies available at:
Krishi Vigyan Kendra (Divyodaya) Khowai: Tripura- 799 207
Email: dkvkwestripura@gmail.com

Design and printed by and also copies available at:
Scripown Publications
2nd Floor, 304 and 305, PKT-4 Sec-22, Rohni, North West, Delhi- 110 086, India
Phone + 91-9911126113; Email: scripownbooks@gmail.com

Dr. A.K. Singha,
Director (Acting)
ICAR-ATARI, Zone-VII

ICAR-Agricultural Technology
Application Research Institute,
Zone-VII, Umiam, Meghalaya-793103
Tel. No. : 0364-2950033(O)
Mobile : 09436349584,
E-Mail :icarzcu3@gmail.com

FOREWORD

Enhancing the resilience of Indian Agriculture to cope with climate variability and climate change is imperative to the livelihood security of millions of small and marginal farmers in the country. Devising appropriate adaptation strategies will enable farmers to cope with various climate risks, promote efficient use of natural resources to bring sustainability to farm production and stability of their incomes. The Indian Council of Agricultural Research (!CAR) has responded to this challenge of climate change on Indian Agriculture and launched National Innovations on Climate Resilient Agriculture (NICRA) in 2011. The project has major aim of evolving climate resilient agricultural technologies to address the concerns of projected climate change scenarios in the country and also to demonstrate the best practices that can help farmers cope with current climate variability.

Technology Demonstration Component is the lifeline of NICRA and is being implemented through Krishi Vigyan Kendra's (KVKs) in 6 climatically vulnerable districts of the zone. Demonstration of appropriate practices and technologies with a climate focus evolved by the National Agricultural Research System (NARS) is taken up through farmer participatory mode in NICRA villages. These practices broadly fall into four modules: natural resource management, crop production, livestock, fisheries, and institutional interventions. The NICRA villages have become hubs of learning on climate resilient agriculture in a short span of three years, opening up oppo1tunities for horizontal and ve1tical diffusion of the successful experiences in other parts of the districts.

This document is the outcome of the experiences of KVK Khowai during the process of dissemination of climate resilient technologies in farmer's fields of North Pulinpur ADC village and Duski ADC Village of Khowai district of Tripura. Some of the adaptation technologies have potential to transfer to other villages of Tripura having similar agro-climatic conditions.

I congratulate the team of KVK, Khowai and compliment all the participating farmers and VCRMC members for their commendable effo1ts in bringing out the significant highlights of the NICRA project and lessons learnt in the form of document. I am sure this publication will be helpful to different stakeholders in agriculture and allied sectors towards horizontal spread of the technologies among the farming communities in the state and devising strategies for location specific developmental programmes.

Date: 21.10.2022
Place: Umiam, Meghalaya

A.K. Singha (Director Acting)
ICAR- ATARI, Zone- VII, Umiam, Meghalaya

Preface

National Innovations in Climate Resilient Agriculture- Technology Demonstration Component (NICRA- TDC) was operated in climate vulnerable district in Khowai Tripura. Enhancing the adaptive capacity and building resilience of the farming communities is important in the context of climate variability and to cope with these extreme events effectively. Location specific best bet innovative practices to address major climatic vulnerabilities drought, heat stress and other extreme weather events were demonstrated in a participatory mode in farmers' field in both villages. Technology interventions in natural resource management, crop production, livestock and fisheries production systems were assessed for imparting resilience to climate vulnerabilities faced by the farmers in the adopted villages.

In situ soil moisture conservation practices and ex-situ rainwater harvesting for supplemental micro irrigation and use of nano pumps enhanced resilience with higher productivity in paddy, maize, bitter gourd and other seasonal vegetables. Soil test based fertilizer application, mulching and green manuring and recycling of crop residues through composting enhanced soil quality, water holding capacity and fertility.

Improved breeds, fodder, feed and shelter management practices in livestock, poultry, and captive fish rearing enhanced productivity and resilience. Capacity building programmes and extension activities were also taken up in villages for bringing awareness among farmers on climate smart practices for encouraging wider adoption and spread.

The authors are deeply thankful to the Director, ICAR- CRIDA, Hyderabad for sponsoring the NICRA- TDC Project. We gratefully acknowledge the guidance and constant support received time to time from Director- ICAR- ATARI, Zone- VII, Umiam Meghalaya. The moral support from the host Institute SRSK Kolkata is also greatly acknowledged. The authors also acknowledge the contributions of the former Programme Co-coordinators/ Senior Scientist & Head (Dr. Pranab Dutta; Dr. L.C Patel; Mrs. Sucheta Chakraborty, Dr. Dipak Nath) of the KVK who are involved with the NICRA Project since its inception for its successful implementation in the adopted villages. The contributions of the present and former Subject Matter Specialists, Programme Assistants, and project fellows in generating the information included in this book are gracefully acknowledged. We appreciate the valuable contributions of VCRMC members and farmers of NICRA villages for contributing to the practices of climate resilient agriculture in this district.

Editors

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1

INTRODUCTION

Climate change impacts on agriculture are being witnessed all over the world, but country like India are more vulnerable in view of the high population depending on agriculture, excessive pressure on natural resources and poor coping mechanism. The warming trend in India over the past 100 years was estimated to be 0.60ºC (Arunachalam, 2011). It is astonishing to know that Agricultural activity also contribute to global warming. The agriculture sector emitted 334.41 million tons of carbon dioxide in 2007. Estimates of green house gas emissions from the agricultural sector arise from enteric fermentation in livestock, manure management, paddy cultivation, and agricultural soils and on field burning of crops residue. Climate change is also affecting Tripura in a big way. Its impacts are many and serious like erratic monsoon, spread of pests and diseases, floods, storms, increase in temperature etc. Therefore small and marginal farmers will be more vulnerable to climate change. Making the farming systems of rural poor of Tripura less vulnerable to climate change is imperative. Managing the connections among agriculture, natural resource conservation and the environment must be an integral part of using agriculture for development.

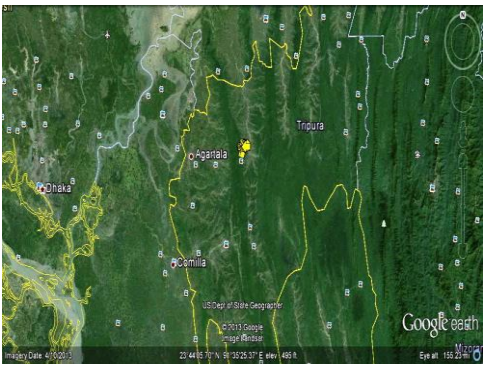


Fig. 1: Yellow dot representing village N. Pulinpur

Village Profile: North Pulinpur (Fig. 1) with GPS location 23°52.836′ N, 91°35.275′ E and elevation 47m and Duski with GPS location **Latitude:** 23°5259.8′ **Longitude:** 91°3534.7’ are two of the draught prone tribal inhabited ADC villages of the district Khowai under the state Tripura. The total geographical area of the

North Pulinpur ADC Village is 950 hectare with cultivable area of about 250 hectare only among 806 farm families whereas, total geographical area of the Duski ADC village is 1017 hectare with cultivable area of about 140 hectare only among 500 farm families Most of the families are holding either small or marginal farms. There were no perennial streams, rivers, ponds and other irrigation facilities in the villages. Prevailing temperature ranges from 16°C to 37°C. Annual rainfall ranges from 2050 to 2550 mm, but almost whole amount goes out to neighboring lower elevated village. Agriculture is the mainstay of the people, about 85 percent of them engage in agriculture and its allied activities. Farmers earned their livelihood from only rainfed rice based monocropped cultivation & rearing of low profit making local pig and poultry before NICRA intervention. In this connection, KVK Khowai identified the major three problems - a) moisture stress during kharif dry spell and winter season which lead to rice based mono-cropping system b) low fish production due to unavailability of water throughout the year c) livelihood vulnerability in changing climate due to low income from small farm. So based on this, the present Climate Resilience Project entitled' 'National Innovation in Climate Resilient Agriculture (NICRA)' was initially started at village North Pulinpur and further at Duski ADC Village to develop sustainable production system by protecting them from extreme climatic condition to raise overall profitability of farm household by crop diversification under such water stress village.

Project Details: The technology demonstration component of NICRA consists of i) 100 Krishi Vigyan Kendra (KVK) in all over India including 17 KVK of NE India with 2 in Tripura, i.e., KVK, Khowai , Chebri, Khowai; and KVK, Dhalai ii) Co-operative centers of All India Coordinated Research Project (AICRP) on Dry land Agriculture-25 and iii) Technology Transfer Divisions of Core Institute-7. Under this component, an integrated package of proven technologies would be demonstrated in one village Panchayat in each district for adaptation and mitigation the crop and livestock production system to climate variability based on available technologies. The intervention covers four modules:

Module I: Natural resources- This module consist of interventions related to 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.

Module II: Crop production- This module consist of introducing draught/ temperature tolerant varieties, advancement of planting dates of rabi

crops in areas with terminal heat stress, water saving paddy cultivation methods(SRI, direct seeding), frost management in horticulture through fumigation, community nurseries for delayed monsoon, custom hiring centres for timely planting, location specific intercropping system with high sustainable yield index.

Module III: Livestock and fisheries- Use of community lands for fodder production during draught /floods, improved fodder/feed storage methods, preventing vaccination, improved shelters for reducing heat stress in livestock, management of fish pond/tanks during water scarcity and excess water, etc.

Module IV: Institutional intervention- This module consist of either of institutional interventions either by strengthening the existing one or initiating new ones relating to seed bank, commodity groups, custom hiring centre, collective marketing , introduction of weather index based insurance and climate literacy through a village level weather station.

Main Problems identified:

- Moisture stress during pre kharif dry spell and winter season which lead to rice based mono-cropping system.
- Low fish production due to unavailability of water throughout the year.
- Livelihood vulnerability in changing climate due to low income from small farm.

Fig 1

Fig 2

Fig 3

Thrust Areas of Intervention Under NICRA:

- Increasing water storage capacity for irrigation.
- Sustainable soil health management
- Assimilation of better agronomical and horticultural practices to sustain farm profit.
- Crop diversification.
- Development of integrated farming system.
- Providing nutritional security.
- Capacity building of the farmers to adopt with changing climate.

Successful Demonstration Component for Crop Diversification

Module I: Natural resource management - Rainwater harvesting structures, Vermicomposting, Bio-gas plant.

Module II: Crop production - Introducing short duration variety of paddy, Introducing potato/maize/lentil/pea/ bitter gourd as second crop, water saving paddy cultivation method (SRI), custom hiring centers for timely planting, Kitchen garden, Green manuring (Dhaincha).

Module III: Livestock and fisheries - Improved breed of poultry, Animal health camp and vaccination, improved shelters of pig, composite fish culture, Duck cum fish culture etc.

Module IV: Institutional - Custom hiring centre, Climate Literacy

Reorienting Some Interventions to Climate Variability Challenges

Interventions Undertaken	Justification with climate resilient agriculture
Excavation of ponds/ farm new pond, Community bunds	Meant for harvesting water in rainy season and utilizing it in rabi-summer season to maximise water retention and economic utilization of its water during kharif dry spell as well as growing next crop after kharif

Jalkunds	To provide irrigation to kitchen garden
Vermicomposting	To enhance soil buffer system/fish feed
SRI Technology (paddy var. Ranjit)	Low water requirement with high return
Introduction of TPS potato/maize/ lentil/ pea /bitter gourd	To enhance cropping intensity
Mulching in bitter gourd	For moisture conservation
Kitchen garden	Providing nutrition to small farm family
Improvement in performance of Farm live stocks (Pig, poultry and fishery)	Meant as alternative livelihood strategies to sustain farm families when agricultural and horticultural crops may be damaged due to unexpected climatic effect

Fig 4

Fig 5

Fig 6

Fig 7

Fig 8

Fig 9

Fig 10

Fig 11

Fig 12

Fig 13

Fig 14

Fig 15

Fig 16

Fig 18

2

ADDRESSING THE CLIMATE WITH SPECIAL REFERENCE TO RAINFALL

The primary source of water for agricultural production in most of the country is rainfall. The crop productivity in rainfed areas depends upon the amount intensity and distribution of rainfall in a given season and place. Precise documentation of these three main characteristics is essential for planning its full utilization in view of changing climate scenario, especially rainfall. Hence, in Khowai district especially NICRA adopted villages, recorded rainfall pattern through AWS to understand the crop and livestock behavior.

Table data shows that increasing the decadal trends (1980 to 1990; 1990 to 2000; 2000 to 2010 and 2011 to 2020) decreasing the number of rainy days, annual rainfall and number of intensive rain spells (< 60 mm/ day) and also enhanced number of dry spells (<10 days) during kharif season respectively.

Table: Historical trend in rainfall of the district

Decadal Trend		**Decadal Average**			
		1980-90	**1990-2000**	**2000-10**	**2011-20**
No. of rainy days		123.5	118.2	109.6	110.6
No. of dry spells during kharif season	**>10days**	1.1	1.5	2.6	2.0
	>15days	-	-	0.1	1.2
	>20days	-	-	-	2.8
	>60 mm per day	9.2	8.5	7.3	0.0
Average annual rainfall (mm)		2675.00	2545.00	2235.00	1832.97

Table. In the year 2017 total actual rainfall received 2401.4 mm which was excess (3.0%) as compared with normal rainfall 2329.2 mm (average value of 30 years). Rest of years starting from 2011 to 2020 received deficit rainfall.

Table: Rainfall received in the NICRA village (mm):

0	Normal rainfall (mm)	Actual 2011	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Actual 2017	Actual 2018	Actual 2019	Actual 2020
January	8.3	0	13.9 (1)	0 (0)	0 (0)	0.7 (0)	3.9	0 (0)	0.0	0.0	16.4
February	12.1	0	4 (1)	2.4 (0)	10.2 (1)	13.5 (1)	23.3	0 (0)	2.6 (1)	22.0	4.5
March	73.5	72.4 (3)	29.4 (3)	12.8 (2)	51.4 (3)	9.4 (1)	101.5	0 (0)	34.2 (9)	47.7	3.9
April	186.0	37.8 (3)	251 (14)	115.4 (5)	91.6 (6)	332.6 (10)	164.9	425.0 (9)	192.3 (24)	131.8	168.1
May	358.7	386 (17)	185.2 (9)	602.2 (21)	266.4 (11)	288.3 (13)	404.8	178.6 (7)	503.3 (31)	257.9	239.3
June	496.1	402.6 (17)	524 (15)	309 (14)	483.6 (13)	276.4 (14)	170.4	582.6 (20)	374.6 (30)	308	246.8
July	401.4	264.4 (15)	209.6 (16)	128.6 (12)	110.2 (11)	562.0	346.8	227.4 (20)	250.3 (29)	304.8	258.87
August	306.0	363 (18)	208 (17)	234.8 (14)	451.8 (13)	311.9	192.5	455.6 (19)	192.1 (31)	253.2	202.1
September	298.2	96 (5)	160.8 (14)	267.6 (12)	300.6 (11)	207.8	119.6	246.4 (12)	165.3 (30)	147.6	207.4
October	162.6	125.8 (3)	88.8 (7)	192.8 (7)	18.7 (1)	79.3	90.5	189.8 (6)	104.8 (9)	110.9	110.5
November	17.4	0 (0)	8.4 (1)	0(0)	3.4 (1)	0.4	195.8	2.6 (1)	4.0 (3)	29.7	12.0
December	8.9	0 (0)	0 (0)	0 (0)	0 (0)	7.2	0.5	93.4 (3)	33.9 (2)	0.0	0.0
Total	**2329.2 mm**	**1748 mm**	**1683.1 mm**	**1865.6 Mm**	**1787.9 Mm**	**2088.4 mm**	**1814.5 mm**	**2401.4 Mm**	**1857.4 Mm**	**1613.6 mm**	**1469.87 mm**

Table shows the mean rainfall (mm) and coefficient of variation of the district for the monsoon months and annual during the period of 2011 to 2020. It can be seen that the district gets highest rainfall 33% in June month followed by 26% in August months. July and September receive 24% and 17% of monsoon rainfall, respectively. About 61% of annual rainfall receives during the monsoon season. The variability for monsoon and annual rainfall is about 38% each.

Table: Mean rainfall (mm) and coefficient of variation of the district for the monsoon months and annual for the period of 2011 to 2020.

Months	Average	%	SD	CV
June	367.8	33.06	130.89	35.58
July	266.3	23.94	126.39	47.46
August	286.5	25.75	103.94	36.27
September	191.9	17.25	65.88	34.32
Total (JJAS)	1112.5	60.70		38.41
Annual	1832.97			

Rainfall monsoon season of Khowai district showed in June to September months which comes in Kharif season are depicted in table. The district has received deficient rainfall ranges from (-8.48 to -42.82%) except 2014 (9.41%) and 2017 (22.88%) as compared to the normal rainfall. Duration of dry spells >10 days; > 15 days and > 20 days observed ranges from 1 to 4 days; 1 to 2 days and 1 to 6 days, respectively. Dry spells period (91 to 120 days) in a year and maximum and minimum number of rainy days (183 to 66) were also recorded between the period of 2011 to 2020 resulting crops experiencing the impact of dry spells and drought like situation at grain filling and maturity stages.

Table: Rainfall of monsoon season and dry spells of Khowai district for the period of 2011 to 2020

Year/Month	Normal	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
June	420.6	402.6	524	309	483.6	115	11.5	582.6	374.6	308	246.8
July	294.6	264.4	209.6	128.6	110.2	347.5	347.5	227.4	250.3	304.8	258.87
August	293.7	363	208	234.8	451.8	203.5	203.5	455.6	192.1	253.2	202.1
September	221.5	96	160.8	267.6	300.6	178.5	141	246.4	165.3	147.6	207.4
Total kharif rainfall (mm)	1230.4	1126	1102.4	940	1346.2	844.5	703.5	1512	982.3	1013.6	915.17
Deviation (%) = ((Actual-Normal)/Normal))*100		-8.48	-10.40	-23.60	9.41	-31.36	-42.82	22.88	-20.16	-17.62	-25.62
Classification* (D, LD, N, E, LE)		D	D	D	N	D	D	N	D	D	D
Number of dry spells		107 days	91 days	96 days	106 days	103 days	86 days	92 days	117 days	120 nos.	119 nos.
Duration of dry spells (>10 days)		4	3	3	3	2	1	-	-	2	2
>15 days		1	2	1	1	1	1	1	1	1	2
>20 days		2	1	2	2	3	3	4	6	4	1
Details of dry spell (Between dates)		17.10.2011-29.10.2011, 21.11.2011-2.12.2011, 15.12.2011-27.12.2011, 2.1.2012-12.2.2012, 16.2.2012-27.2.2012, 1.3.2012-16.3.2012	15.11.2012-28.11.2012, 2.12.2012-14.12.2012, 25.12.2012-9.1.2013, 14.1.2013-28.1.2013, 5.2.2013-25.2.2013, 7.3.2013-18.3.2013	10.11.2013-21.11.2013, 26.11.2013-11.12.2013, 18.12.2013-6.1.2014, 2.3.2014-19.3.2014, 19.3.2014-29.3.2014	2.11.2014-14.11.2014, 17.11.2015-2.12.2014, 5.12.2014-18.12.2014, 27.12.2014-8.1.2015, 10.1.2015-23.2015, 27.2.2015-21.3.2015	5.11.2015-16.11.2015, 22.11.2015-3.12.2015, 4.12.2015-4.2.2016, 9.3.2016-26.3.2016	12.11.2016-23.12.2016, 28.12.2016-28.2.2018, 5.3.2018-20.3.2018	17.11.2017-5.12.2017, 12.12.2017-9.2.2018, 10.2.2018-25.2.2018	15.10.2018-1.11.2018, 7.11.2018-16.12.2018, 19.11.2018-16.2.2019	12.11.2019-21.12.2019,22.11.2019-2.1.2020,13.1.2020-25.1.2020, 4.1.2020-12.2.2020, 8.3.2020-22.3.2020	04.11.2020-20.11.2020, 22.11.2020-19.01.2021, 21.01.2021-04.03.2021
Impact of dry spells on the crop stage		Rabi crops	Rabi crops	Rabi crops	Rabi crops	Rabi crops	Rabi crops	Rabi crops	Rabi crops	Rabi crops	Rabi crops
No. of intensive rain spells (>60 mm/day)	-	-	-	-	-	-	-	-	-	-	-
Number of rainy days		78 days	92 days	85 days	66 days	72 days	83 days	94 days	183 days	174 days	179 days

Fig 1.

Fig 2.

Fig 3.

3

SUMMARY OF ACTIVITIES UNDER NICRA BY KVK, KHOWAI NATURAL RESOURCE MANAGEMENT MODULE

1. Efficient Utilization of the Water Harvesting Structures:

a) Climatic vulnerability: North Pulinpur and Duski are two of the draught prone tribal inhabited ADC villages of the district Khowai under the state Tripura. Agriculture is the mainstay of the people, about 85 percent of them engage in agriculture and its allied activities. Farmers earned their livelihood from rainfed rice based mono- cropped cultivation. Moisture stress during Kharif dry spell and winter season which lead to rice based mono-cropping system.

b) Description of resilient practice: Under the NRM component KVK, Khowai constructed and rejuvenated 28 water bodies from 2011-12 to 2020-21 at the adopted villages; all of which provided life saving irrigation for paddy during Kharif dry spell as well as during Rabi season through Nano Pumps installed nearby Farm Ponds.

c) Impact observed in NICRA Village: Before implementation of NICRA project to North Pulinpur ADC village, most of the areas remain dry during Rabi season. After the intervention, approximately 26187 ft^3 rainwater has been harvested covering an area of about 113.48 ha for winter vegetables and Rabi maize cultivation and during dry period. In addition to this, a total area of about 1 ha waste land has been converted to paddy land using water from community bund. Ponds were also used for composite fish culture with average yield of 30 q/ farmer/ year/ ha similarly, after Kharif paddy fallow land is now successfully utilized by introduction of second crops like maize var. HQPM, bitter gourd with mulching practice to conserve soil moisture and by using irrigation water through nano pumps introduced under NICRA.

These water reservoir structures are also using for table fish production. Through all these successful interventions on crop diversification, the cropping intensity of the village has been increased from 116 to 175% within the period from 2011-2021

Fig 1.

Fig 2.

Fig 3.

Fig 4.

Fig 5.

Fig 6.

- ✓ **Nano Pump**

During 2011 to 2020 in the NICRA adopted village of North Pulinpur provided hiring services on an area of 113.48 ha covering 501 nos of farmers and earned net profit of Rs. 900/-from nano pump by the VCRMC.

✓ **Mulching in Bitter Gourd**

Paddy straw mulching (@ 3.0 tones/ ha) with supplemental irrigation (manual basal application) was demonstrated) in bitter gourd crop after rice fallow is better realized in terms of their positive effect on improving soil moisture status and maintain a congenial micro- climate for better growth, development and productivity of the crop. Using two varieties (Jyoti Boulder & Local) resulted average yield 95 q/ ha in 5 picking and estimated net profit was gain Rs. 2, 95, 923/- per ha with benefit cost ratio of 3.04, covering 661 farmers in an area 123 ha consequently from 2011 to 2020 during the project tenure (table 1 & 2).

Fig 7.

Fig 8.

Fig 9.

✓ **Furrow Irrigation in Maize**

Demonstration on irrigation is applied to furrows in maize crop using small discharges to favour water infiltration while advancing down the field with interventions of high yielding varieties of maize (HQPM-5 and Disha-3502). Water harvesting and recycling for supplemental irrigation through ponds utilized nano pump in North Pulinpur village was demonstrated in maize crop using two varieties viz., HQPM-5 and Disha- 3502 in an area of 99 ha (between 2011 to 2020) covering 346 farmers and the yield recorded 52 q/ ha and estimated net profit obtained Rs. 65,811/- per ha with benefit cost ratio is 2.99 (table 1 & 2).

Fig 10.

Fig 11.

Fig 12.

Table 1: Extent of up-scaling & Out Scaling of Most Successful Interventions under NRM

Successful Interventions	Extent of up-scaling & Out Scaling
Nano Pump Technology	113.48 (ha)
Mulching in Bitter Gourd with Paddy Straw	122.78 (ha)
Furrow irrigation with High yielding variety of Maize	99.12 (ha)

Table 2: Economics of Most Successful Interventions under NRM during stress year

Interventions	Yield (q/ha)	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return(Rs/ha)	BCR
Mulching in Bitter Gourd	95	145,000.00	440923.00	295923.00	3.04
Furrow irrigation in Maize	52	32929.00	98800.00	65811.00	2.99

2. Crop production module:

a) A. SRI in Paddy- North Pulinpur & Duski are two of the tribal village of Khowai district of Tripura. People of this village are mostly Schedule tribe and mainly depend on agriculture. Paddy is the major crop of the village and they used to grow it in both Kharif as well as in Rabi season. Earlier, they were growing paddy by using traditional system of cultivation like irregular spacing, no seed treatment, continuous flooding, seedling of older age, use of more than 3 nos seedling during transplanting, no plant protection measures etc. With the technological and critical input support of KVK-Khowai, under Crop Production Module of NICRA, Cluster demonstration programme of SRI on HYV paddy has been demonstrated in two of the adopted villages at an area of 249.44 ha covering a total of 523 numbers of farmers in the Village. During 2011 to 2021 average yield 65 q/ ha was recorded with benefit cost ratio of 2.22 and estimated net profit was gain Rs. 62,250/- per ha (Table 3 & 4).

Fig 13.

Fig 14.

Fig 15.

b) IPM in TPS- KVK, Khowai has successfully introduced TPS presently known as Hybrid Potato Seed (HPS) technology which was previously unknown to the farmers of North Pulinpur after

Aman paddy with the provision of irrigation from the rejuvenated pond or newly excavated pond under NRM intervention of NICRA. TPS with IPM technology was demonstrated as an alternative to *Aman* paddy which resulted in an average net income of Rs. 176000/- per ha with the benefit cost ratio of 3.37 which was higher than the normal farmers practice (Table 3 & 4).

Table 3: Extent of up-scaling & Out Scaling of Most Successful Interventions under Crop Production

Successful Interventions	Extent of up-scaling & Out Scaling (ha)	Number of Farmers Covered
SRI in Paddy	249.44	523
IPM in Potato (TPS)	16.88	95

Table 4: Economics of Most Successful Interventions under Crop Production during stress year

Interventions	Yield (q/ha)	Gross Cost(Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	BCR
SRI in Paddy	65	51500.00	113,750.00	62,250.00	2.20
IPM in TPS	95	74000.00	25,0000.00	176,000.00	3.37

3. Livestock's & Fishery Module:

A. Composite Fish Culture

Scientific management of fishery was not practiced before NICRA intervention in the adopted village. As most of the ponds of North Pulinpur ADC village are seasonal in nature the farmers of the village could not grow fishes profitably before the NICRA intervention. After initiation of NICRA during the year 2011, KVK Khowai has constructed and rejuvenated many water bodies with an objective to increase the overall income of the farmers. Composite fish culture has been found to be productive and economical venture as compare to conventional fish culture. KVK Khowai has selected five numbers of progressive farmers and trained them about Composite fish culture under different Capacity building programme of NICRA. After getting proper training these farmers applied their technical knowledge of composite fish culture in their farm ponds constructed and rejuvenated under NICRA.

Composite fish culture with the species that survive in low water levels during drought like rohu, mrigal, common carp. Tilapia and *Cirrhinus reba*

were demonstrated in North Pulinpur village of Khowai district. Yield of fish increased from 21 to27 q/ ha with an additional income increases Rs. 35,250/- per ha which was higher (29%) from farmers practice. There was also an increase in the benefit cost ratio from 1.69 to 1.81 (Table 5).

Table 5. Economics of Composite Fish Culture during stress year

Intervention	Yield (q/ ha)	Gross Cost (Rs/ ha)	Gross Return (Rs/ ha)	Net Return (Rs/ ha)	BCR
Composite Fish Culture	27	148750.00	270000.00	121250 .00	1.81
Farmers Practice	21	124000.00	210000.00	86000.00	1.69

B. Livestock Interventions:

To aware the farmers about the economic loss due to different diseases which are related to climate change animal health camp is organized at NICRA village which plays very important role in aware the farmers about the proper management of animals taking into consideration of the changing climate scenario. High temperature causes serious health problems of animals to come out of this problem improved shelters have been prepared in NICRA village.

Before NICRA: Local piggery, local poultry with very poor management. Scientific rearing of livestock and management of fishery were not practiced before NICRA intervention in the adopted village. There was no shelter for piggery. Animals were directly exposed to extreme climatic condition like direct rain fall, heat or cold stress etc which severely affect on their production.

After NICRA:

Successful introduction of improved pig, poultry with scientific management intervention had taken on introduction of improved breed of poultry (Kuroiler and Gramapriya) under backyard rearing and rearing of improved cross breed pig (Yorkshire x Humpshire) with improved housing management (Pig sty), duck cum fish rearing for nutritional security as well as alternative livelihood strategies to adjust with shifting climate.

✓ **Livestock**

Body weight of pigs reared in improved shelter was much higher. Cross breed pigs (White Yorkshire x Landrace) reared. At puberty, the body weight of individual pigs was on an average 80 kg in improved shelter and in

farmers practice it was 65 kg. There was improvement of 23% which may be contributed due to improved shelter. Land races and white York shire cross pigs were supplied whose growth were compared to locally crossed pigs.

In improved cross breed pigs ((White Yorkshire x Landrace) body weight attained at puberty was 80 kg, while the local crossed pigs were 60 kg on an average. There was improvement in body weight gain in cross bred improved pig in comparison to locally crossed pigs.

Fig 18.

- ✓ **Poultry**

Improved varieties like Kuroiler and Gramapriya were introduced as interventions. At puberty, Kuroiler birds reared in improved shelter attained body weight on an average 1.8 kg, while the indigenous birds without proper shelter attained only 1.1 kg. Total egg production in a year recorded in Kuroiler birds was 180 eggs while in local deshi bird it was only 110 numbers.

In case of Grammapriya bird reared in improved shelter, body weight attained at puberty was 1.4 kg. Total egg production in a year recorded in Gramapriya variety was 210 numbers and in local deshi bird it was only 110 numbers.

So there was improvement in weight gain and egg production in both improved birds in comparison to deshi birds.

Fig 19. **Fig20.**

Fig 21.

Table 6: Economics of the improved shelters for reducing heat stress in pigs during stress year

Intervention	Gross Cost (Rs/sow/year)	Gross Return (Rs/sow/year)	Net Return (Rs/sow/year)	BCR
Farmers practice	17500.00	24000.00	6500	1.37
Improved shelters for reducing heat stress in pigs	21250.00	36000.00	14450.00	1.7

Table 7: Economics of the Improved cross bred pigs suitable for dry prone areas during stress year

Intervention	Gross Cost (Rs/sow/year)	Gross Return (Rs/sow/year)	Net Return (Rs/sow/year)	BCR
Farmers practice	14500.00	17500.00	3000.00	1.21
Improved shelters for reducing heat stress in pigs	18500.00	28000.00	9500.00	1.51

Table 8: Economics of the Backyard rearing of improved poultry bird suitable for dry prone areas

Intervention	Gross Cost (Rs/bird /year)	Gross Return (Rs/bird /year)	Net Return (Rs/sow/year)	BCR
Farmers practice	950.00	1400.00	450.00	1.47

Improved shelters for reducing heat stress in pigs	1650.00	2880.00	1230.00	1.75

4. Institutional Intervention Module:

Institutions were established at the village to guide the implementation of climate resilient technologies and for their long lasting impact. The community based institutional structures foster group action among the communities, mobilize individual resources for addressing community problems, generate understanding among the community and harness synergies, effective management of resources based on shared utilization and promotes collective action.

A. Village Climatic Risk Management Committee (VCRMC):

From the inception of the Project to 2020-21 a total of Rs. 505771.00 has been generated by implements hired from custom hiring centre by the farmers of the North Pulinpur ADC Village village resulting in Net Revenue with the VCRMC is Rs. 100680.00, out of which 11849.00 has been utilized for asset generation and remaining 88,831.00 **is available in the account of the VCRMC. Total of 114 numbers of** VCRMC meetings held from the inception of the project to 2020-21

Constrains:

No permanent shelter for CHC.

Repairing of machineries.

Transportation of heavy machineries is restricted due to undulating topography.

B. Custom Hiring Centers (CHCs)

Timely agricultural operations are crucial for better performance of crops and more important in the context of climate variability, especially with sowing, intercultural operation, crop harvesting, and also in soil management. The revenue generated from the CHCs is used for the maintenance of these implements and to purchase new implement based on the availability of revenue and needs of the farming community

Fig 22.

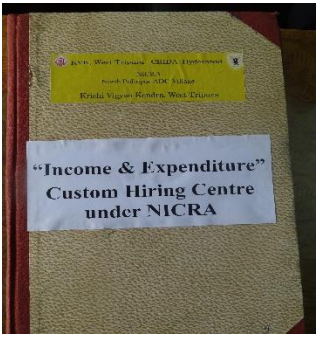


Fig 23.

Fig 24.

C. Seed Bank

Seed bank is a important critical input in the farming community. Ensuring the seed at the right time is important or enhancing resilience to climate risks. Farmer groups were encouraged to multiply seeds of varieties at the village level for self reliance in seed at the local level for timely and affordable access. Truthful level (TL) quality paddy seeds produced by VCRMC members of both villages and sold to ICAR (RC) for NEH Region, Tripura centre, Lembucherra.

Table 9: Seed production with farmer's participatory mode.

Year	Details of activity			Critical input	No. of farmers	Area (ha)
	Name of crops	Quantity (q)	Technology			
2017-18	Paddy	1.8	Gomati, Tripura Nirog & Tripura Chiken	Seeds	6	3.28
2019-20	Paddy	3.0	Gomati, Tripura Nirog & Tripura	Seeds	42	24.00

			Chiken			
2020-21	Paddy	5.0	Gomati, Tripura Nirog & Tripura Chiken	Seeds	5	5.00

Fig 25.

D. Agro Advisories

The information was used by farmers to plan the crops, choice of cultivars, enhance input use efficiency, timely and cost effective management of pests and diseases and harvesting operations. Agro advisories were issued during the cropping season to enable farmers to take timely decisions.

Capacity building- Capacity building of farmers in NICRA adopted villages was taken up by KVK Khowai through series of knowledge and skill development training programme conducted on varied thematic areas related to resilient technologies. Under NICRA adopted villages organized need based 105 numbers of training programmes with the 2668 numbers of ST beneficiaries of farmers and farm women during the period of 2011 to 2021. A total of 105 numbers of Trainings programme has been conducted by KVK, Khowai (Tripura) during the period from 2011-2021 covering a total of 2668 ST Farmers.

Table 10: Training programmes conducted during the 2011 to 2021

Year-wise	No. of Courses	No. of beneficiaries
2011-12	10	225
2012-13	16	330
2013-14	10	127
2014-15	13	253
2015-16	15	337

2016-17	12	486
2017-18	3	45
2018-19	11	328
2019-20	6	222
2020-21	9	315
Total	**105**	**2668**

Extension Activities-

Various extension activities were taken up by KVK Khowai in NICRA adopted villages in order to bring awareness among farmers on climate resilient agricultural technologies and motivate them for wider adoption of the same include awareness of climate resilient agricultural technologies, field days, participation in exhibition and kisan melas, method demonstrations, health camp (animal, soil and plant), agro- advisories diagnostic advisories services, exposure visits etc. A total of 1086 numbers of Extension Programmes has been conducted by KVK, Khowai (Tripura) during the period from 2011-2021 covering a total of 6408 ST Farmers.

Table 11: Other Extension activities conducted during the 2011 to 2021.

Year-wise	Number of programmers	No. of beneficiaries
2011-12	8	248
2012-13	38	374
2013-14	38	445
2014-15	57	1411
2015-16	6	116
2016-17	13	464
2017-18	21	508
2018-19	24	945
2019-20	356	817
2020-21	525	1080
Total	**1086**	**6408**

Fig 26.

Fig 27.

Fig 28.

Table 12: Outcome of the project

NRM			Crop production			Livestock & Fisheries				Institutional Interventions			Capacity Buildi ng		Extensio n Activitie s	
Total Demonstrations (Nos.)	Total Farmers (Nos.)	Total Area (ha)	Total Demonstrations (Nos.)	Total Farmers (Nos.)	Total Area (ha)	Total Demonstrations	Total Farmers (Nos)	Total Area (ha)	Total No. of animals	Total Demonstrations	Total Farmers (Nos.)	Total Area (ha)	Total No of Courses (Nos.)	Total Farmers (Nos.)	Total No. of programme	Total Farmers (Nos.)
1891	1891	665	804	804	294.1	193	193	22.16	1513	53	747	240	105	2668	1086	6408

Fig 29.

4

PUBLICATIONS

Sl. No.	Type of publications	Authors name	Year	Title	Journal/ Pulisher/ Magazine name, volume & page no.	No of copy
1	Book (Success story)	D. Dey, S. Shil, A. Chakraborty, S. Choudhury, L.L Debbarma	2017	Success Stories on Climate Smart Agricultural Practices under NICRA	KVK Khowai 2017-18/08	7
2	Book (Success story)	D. Dey, S. Shil, A. Chakraborty,N. Islam,S.C Biswas, , S. Chowdhury, P. Debbarma, LL. Debbarma	2017	Success Story Under NICRA	KVK Khowai 2017-18/09	40
3	Book (Success story)	D. Dey, N. Islam, S.C Biswas, S. Shil, A. Chakraborty, R. Das,D. Nath, S. Chowdhury, P. Reang, P. Debbarma, LL. Debbarma	2019	Drishyayan	KVK Khowai 2019-2020/02	2
4	e-Publication: Kiran	D. Dey, D. Nath, S. Shil, A. Chakraborty, N. Islam, S.C Biswas, S. Chowdhury, P. Debbarma, LL. Debbarma	2018	Empowering Agricultural Knowledge and innovative in North East	Kiran-Empowering Agricultural Knowledge and Innovation in Norh East	1
5	Book Chapter	D. Dey, M.C Kundu, D. Nath	2019	Resilience Building and Sustainable Development-Indian	ND Publisher	1

				Perspective		
6	Case study	D,Dey; D;Nath; SP, Das; LL,Debbarma; S.C,,Biswas, A,Chakraborty	2019	Paddy Maize Cropping Doubled the Farmers Income of North Pulinpur ADC Village of Tripura-	Souvenir cum Compendium of National Seminar on Promotion of Maize in North East India- Opportunities & Strategies	
7	Case study	D. Dey; D. Nath; L.L. Debbarma; S. Shil; S.C Biswas; A. Chakraborty; R. Das; N. Islam; S. Choudhury; P. Reang	2020	Efficient Utilization of Water Bodies increasing the Cropping Intensity of North Pulinpur ADC Village of Tripura-A case study under NICRA Project	Agriculture Update	
8	Research paper	Dipak Nath and Subhra Shil	2016	Initiatives of KVK, Divyodaya, West Tripura under NICRA Project in North Pulinpur ADC village of Tripura.	Tui A Journal on Tribal Life& Culture	
9	Research paper	D. Dey; D. Nath; S. Shil; A. Chakraborty and Suresh Biswas	2015	Identification of suitable and profitable rabi crops for high altitude and tribal areas of Tripura	National Seminar on Sustainable Hill Agriculture in Changing Climate	
10	Research paper	D. Dey and D. Nath	2015	Effect of raised bed planting method of Maize under sandy loam soil of West Tripura.	International Journal of applied research	

11	Research paper	L.C. Patel, D. Nath, N. Islam, S.C. Biswas, S. Shil and D. Dey	2014	Dissemination of outcome of climate resilient agricultural technologies in a tribal village of Tripura	International Journal of Farm Science	
12	Research paper	D. Dey; S.P. Das; D, Nath; L.L. Debbarma; R. Das; S.C. Biswas and A, Chakraborty	2019	Integrated Crop Management in Paddy changing the income level of paddy farmers of North Pulinpur ADC village of Tripura under NICRA	International Journal of Agricultural Science	
13	Research paper	D. Dey; A. Das; D. Nath; S. Choudhury; A. Chakraborty; R. Das; L.L. Debbarma; P. Reang	2019	Doubling income of paddy farmers of Tripura through raised bed and sunken bed technology-A Review.	International Journal of Agricultural Science	
14	Research paper	D, Dey; A. Das; D. Nath; S. Choudhury; A. Chakraborty; R. Das; L. Debbarma; P. Reang	2019	Raised and Sunken Bed Technology for Doubling Paddy Farmers Income of Tripura		

Training Manuals Published:

Sl No	Author/Authors	Year	Title of Manual/Teaching aids	Published by
1	D. Dey, S. Shil, A. Chakraborty, D. Nath	2017	Training Manual on Soil Health Management of Tripura and Integrated Nutrient Management for Better Crop Yield	KVK Khowai Tripura, KVK(KT)/2017-18/03

2	S. Shil, L.C Patel, D. Dey, D. Nath	2014	Training Manual on Scientific Modern Cultivation of Tuber Crops	Krishi Vigyan Kendra,West Tripura
3	S. Shil, D. Nath, A. Chakraborty, D. Dey, S.C Biswas	2017	Training Manual on True Potato Seed (TPS) An Alternative Method of Potato Production	Krishi Vigyan Kendra, West Tripura
4	D. Nath, N. Islam, D. Dey, A. Chakraborty, S. C. Biswas, S. Shil, S. Choudhury	2014	A Training Manual published under National Initiative on Climate Resilient Agriculture	Krishi Vigyan Kendra, West Tripura

Extension Bulletins:

S. No.	Author	Year	Title of Extension Bulletin	Published By
1	D. Dey, D. Nath, S. Shil, A. Chakraborty, S.C Biswas, R. Das, P. Reang, S. Choudhury, P. Debbarma, L.L Debbarma	2018	Raised and Sunken Bed Technology-A boon for doubling the Paddy Farmers Income of Tripura	Krishi Vigyan Kendra, Khowai, 2018-19/09

Folder/Leaflet:

S. No	Author/Authors	Year	Title of Folder/Leaflet	Folder/Leaflet	Language	Published By
1	D. Dey, D. Nath, S. Shil, A. Chakraborty	2014	Management of Acid Soil of Tripura	Folder	English	KVK, West Tripura
2	D. Dey, D. Nath, S. Shil, A. Chakraborty	2015-16	Scientific Way of Collection of Soil	Folder	Bengali	KVK, West Tripura, KVK(WT)/2015-16/1
3.	D. Dey, D. Nath, S. Shil, A. Chakraborty	2016-17	Status of Micronutrients in the Soils of Tripura and their Management	Folder	Bengali	KVK, West Tripura, KVK(WT)/2016-17/19
4	D. Dey, D.	2015	Effect of	Folder	Bengali	KVK, West Tripura,

	Nath, A. Chakraborty, S. Shil, S.C Biswas		Submerged Soil in Paddy and its management			KVK9WT)/2015-16/16
5	A. Chakraborty, D. Dey, D. Nath, S. Shil, S.C Biswas	2015	Package and Practice of Pea	Folder	Bengali	KVK, West Tripura, KVK(WT)/2015-16/15
6	S. Shil, D. Nath, D. Dey, A. Chakraborty, S.C Biswas	2016	TPS- An Alternative way of Potato Cultivation	Folder	Bengali	KVK, West Tripura, KVK(WT)/2016-17/17
7	A. Chakarabory, M. Sehgal, S. Chander,M. S Sachan, S. Shil, D. Dey, M. Malik, L. Acharya	2021	Integrated Pest Management of Cucurbits	Folder	Bengali	KVK, Khowai DKVK/NCIPM/2021/02
8	S.C Biswas, A. Chakraborty, D. Dey, D. Nath, S. Shil	2017	Procedure of Preparation of Jam,Jelly and Squash	Folder	Bengali	KVK, Khowai, KVK(KT)/2017-18/02
9	S. Choudhury, D. Dey, L.L Debbarma	2019	Scientific Fish Farming	Folder	Bengali	KVK, Khowai, KVK/2019-20/01
10	D. Dey, D. Nath, A. Chakraborty, S. Shil, S.C Biswas	2015	Vermi compost-An ideal choice to utilize organic waste	Folder	English	
11	D. Dey, D. Nath, A.	2015	Zero Tillage	Folder	English	

	Chakraborty, S. Shil, S.C Biswas		Cultivation of Rape Seed and Mustard			

Conference Proceedings:

Sl No	Author	Year	Title of Proceedings	Journal/ Souveniour/ Book Chapter	Published by
1	Dey. D; Nath. D.; Jamatia P.B.	2015	Effect of Raised Bed Planting Method of Maize under Sandy loam Soil of Tripura	Souveniour of National Seminar on "Biodiversity for Sustainable Development" organized by Tripura Biodiversity Board and Department of Botany, Tripura University during May 25-26, 2015	Tripura Biodiversity Board and Department of Botany, Tripura University
2	Dey D; Nath D; Shil S.; S.C Biswas; A Chakraborty	2015	Identification of suitable and Profitable rabi crops for high altitude and Tribal areas of Tripura	Souveniour of National Seminar on "Sustaining Hill Agriculture in Changing climate"	Indian Association of Hill Farming and ICAR Research complex for NEH Region, Umiam during December 5-7, 2015
3.	Dey. D, Nath D., Chakraborty A., Shil S. Biswas S.C., Reang P., Chowdhury S., Debbarma L.L.	2018	Doubling Income of Paddy Farmers of Tripura Through Raised and Sunken Bed Technology	Souveniour of International Conference on Doubling the Farmers Income of Farmers of SAARC Countries: Extension Strategies and Approaches"	Agriculture Information and Training Center, Ministry of Agriculture and Livestock Development, Nepal and Nepal Agricultural Extension Association in collaboration with International Society of Extension Education, India (Oral Presentation)
4.	D. Dey, A. Das, D. Sen, S. Chowdhowry, D. Nath, L.L.	2019	Raised and Sunken Bed Technology for Doubling Paddy	Published in the Proceedings of the 33rd National Convention of Agricultural	The Institution of Engineers (India), Tripura State Centre in association with

	Debbarma, P. Reang, S.C. Biswas, A. Chakraborty, S. Chowdhury		Farmers Income of Tripura	Engineers and "National Conference on Commercial Crops and Value addition"	Department of Agriculture and Farmers Welfare, Govt of Tripura, College of Agriculture, Tripura, ICAR Tripura Centre, NABARD Tripura (Oral Presentation)
5.	Dey D; Nath D; Das SP. D, Debbarma LL, Biswas S.C; Chakraborty, A	2019	Integrated Crop Management in Paddy-Maize Cropping Sequence	Souveniour of National Seminar On Promotion of Maize in North East India: Opportunities and Strategies	ICAR Research Complex for NEH Region, Umiam, Meghalaya and ICAR-Indian Institute of Maize Research, Ludhiana (Oral Presentation)

Popular Article/Short notes/Short Communication

Sl. No.	Author/Authors	Year	Title of Articles/Short Notes/Short Communication	Journal/Book/News Paper
1	Dey D; Nath D; Jamatia P.B	2015	Lentil Cultivation brings Smile to the tribal farmers of Tripura	Rashtriya Krishi,10(1):97-98
2	Dey D; Nath D	2015	Prosperity through SRI technology intervention in Tripura	Rashtriya Krishi,10(1):91-92
3.	Dey D; Nath D; Debbarma LL	2019	A dream journey from *Cannavis sativa* grower to prestigious ICAR Pandit Deen Dayal Upadhyay Antyodaya Award winner 2018	Rashtriya Krishi14(2):27-28

Video Documentation:

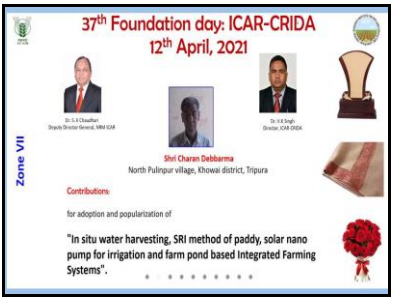
Sl No	Name of the Video	Year of Release
1	NICRA bringing smile at Khowai district of Tripura	2020
2.	Mulching Miracle	2019
3.	NICRA-An Overview	2016

5

AWARDS AND RECOGNITIONS RECEIVED BY KVK (INSTITUTIONAL/ INDIVIDUALS/ FARMERS) THROUGH DIFFERENT ORGANIZATIONS UNDER NICRA- TDC INTERVENTIONS

S. No.	Type of Award	Name of Award	Year	Awarding organization
1	Institutional (NICRA- KVK, Khowai, Tripura)	Best Zonal (Zone VII) NICRA KVK, 2017-18	2017	ICAR ATARI Zone VII
2	Farmers (Mr. Charan Debbarma)	Pandit Deendayal Upadhyay Antyodaya Krishi Puraskar-2018 (Zone- VII)	2018	Indian Council of Agricultural Research, New Delhi
3	Farmers (Mr. Mantu Debbarma)	Innovative Rice Farmer	2018	ICAR Research Complex for NEH Region, Tripura Centre
4	Farmers (Mr. Mangal Debbarma)	Innovative Farmer Award for Climate Resilient Agriculture	2019	ICAR Research Complex for NEH Region, Tripura Centre, Lembucherra, Agartala, Tripura
5	Individual Staffs (Mr. Lord Litan Debbarma, SRF-NICRA)	Young Researcher Award	2019	Society for Biotic and Environmental Research, Salem, Tamil Nadu
6	Individual Staffs (Mr. Dipankar Dey, SMS- Soil Science)	Best Oral Presentation	2019	ICAR Research Complex for NEH Region, Tripura Centre, Lembucherra, Agartala, Tripura during National Workshop on "Promotion of Maize in North –East India: Opportunities and Strategies"
7	Indivisual Staffs(Mr.	Best Oral Presentation	2019	The Institute of Engineers(India),Tripura

	Dipankar Dey,SMS-Soil Science)			State Centre In Association with Department of Agriculture and Farmers Welfare,Govt of Tripura and ICAR Tripura Centre
8	Farmers (Mr. Charan Debbarma)	Innovative Farmer award	2021	ICAR-CRIDA, Hyderabad
9	Farmers (Mr. Alen Debbarma)	Innovative Maize Farmer	2020	ICAR Tripura Centre during Workshop cum Capacity Building Programme on "Maize as Food-Feed Crop for Farmers' Prosperity"
10	Farmers (Mr. Anil Debbarma)	Innovative Maize Farmer	2020	ICAR Tripura Centre during Workshop cum Capacity Building Programme on "Maize as Food-Feed Crop for Farmers' Prosperity"
11	Farmers (Mr. Mantu Debbarma)	Innovative Maize Farmer	2020	ICAR Tripura Centre during Workshop cum Capacity Building Programme on "ICAR-CRIDA, Hyderabad Maize as Food-Feed Crop for Farmers' Prosperity"
12	Farmers (Mr. Chabi Kumar Debbarma)	Innovative Maize Farmer	2020	ICAR Tripura Centre during Workshop cum Capacity Building Programme on "Maize as Food-Feed Crop for Farmers' Prosperity"
13	Farmers (Mr. Mitra Debbarma)	Innovative Maize Farmer	2020	ICAR Tripura Centre during Workshop cum Capacity Building Programme on "Maize as Food-Feed Crop for Farmers' Prosperity"
14	Farmers (Mr. Charan Debbarma)	Best Innovative Farmers Award	2021	ICAR- CRIDA, Hyderabad


37th Foundation day: ICAR-CRIDA
12th April, 2021
Zone VII
Shri Charan Debbarma
North Pulinpur village, Khowai district, Tripura
Contributions:
for adoption and popularization of
"In situ water harvesting, SRI method of paddy, solar nano pump for irrigation and farm pond based Integrated Farming Systems".


Workshop cum Capacity Building Programme
on
"Maize as Food-Feed Crop for Farmers' Prosperity"
(29th February-1st March, 2020)
Organized by
ICAR Research Complex for NEH Region, Tripura Centre, Lembucherra, Tripura-799210
In collaboration with
ICAR-Indian Institute of Maize Research, Ludhiana, Punjab-141004
Certificate of Recognition
Mr/Mrs Alen Debbarma has been recognized as
Innovative Maize farmer for his/her contribution in promoting improved maize production technology,
Sole Maize Production in the state of Tripura.
Anup Das
Organizing Secretary
Joint Director
ICAR RC for NEHR, Tripura Centre


National Seminar on
Promotion of Maize in North-East India : Opportunities and Strategies
(22-23 October, 2019)
Jointly organized by
ICAR Research Complex for NEH Region, Tripura Centre & ICAR-Indian Institute of Maize Research, Ludhiana
Innovative Maize Farmer
This certificate is awarded to-
Mr/Ms Chitaranjan Debbarma of District Khowai, Tripura
for contribution to innovative Maize cultivation practice.
(Anup Das)
Principal Scientist & Convener
Organizing Committee
(Bedabrat Kashyap)
Director & Chairman
Organizing Committee


Workshop cum Capacity Building Programme
on
"Maize as Food-Feed Crop for Farmers' Prosperity"
(29th February-1st March, 2020)
Organized by
ICAR Research Complex for NEH Region, Tripura Centre, Lembucherra, Tripura-799210
In collaboration with
ICAR-Indian Institute of Maize Research, Ludhiana, Punjab-141004
Certificate of Recognition
Mr/Mrs Mantu Debbarma has been recognized as
Innovative Maize farmer for his/her contribution in promoting improved maize production technology,
Sole Maize Production in the state of Tripura.
Anup Das
Organizing Secretary
Joint Director
ICAR RC for NEHR, Tripura Centre


National Seminar on
Promotion of Maize in North-East India : Opportunities and Strategies
(22-23 October, 2019)
Jointly organized by
ICAR Research Complex for NEH Region, Tripura Centre & ICAR-Indian Institute of Maize Research, Ludhiana
Innovative Maize Farmer
This certificate is awarded to-
Mr/Ms Chitaran Debbarma of District Khowai, Tripura
for contribution to innovative Maize cultivation practice.

6

CASE STUDIES EFFICIENT UTILIZATION OF WATER BODIES INCREASING THE CROPPING INTENSITY OF NORTH PULINPUR ADC VILLAGE OF TRIPURA, INDIA – A CASE STUDY UNDER NICRA

Introduction:

Climate change is affecting Tripura in a big way. Its impacts are many and serious like erratic monsoon, spread of pests and diseases, floods, storms, increase in temperature etc. Therefore small and marginal farmers will be more vulnerable to climate change. Making the farming systems of rural poor of Tripura less vulnerable to climate change is imperative. Managing the connections among agriculture, natural resource conservation and the environment must be an integral part of using agriculture for development. North Pulinpur is one of the draught prone ADC village of Khowai district of Tripura. There are no perennial streams or rivers in the entire village. Cropping system is mainly rice based monocropped which is purely rainfed. Agriculture is the mainstay of the people of North Pulinpur ADC village. Rice is cultivated in the lowlands whereas maize, vegetables are cultivated in the hills. Important livestock are pig, cows, poultry, duck, goat and also fishery contribute handsome percentage to family income. Water scarcity and unavailability of irrigation facility forced the farmers towards practice of Jhumming which leads to high rate of erosion with rapid loss of top soil and reducing agricultural area due to more area being utilized for rubber plantation. So based on this the present Climate Resilience Project entitled "National Innovations in Climate Resilient Agriculture' Initially known as 'National Initiative on Climate Resilient Agriculture' (NICRA) was started at village North Pulinpur of Khowai Tripura district. This is a network project of the Indian Council of Agriculture Research (ICAR) launched in February; 2011.The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research on adaptation and

mitigation covers crops, livestock, fisheries and natural resource management.

Work Village Profile

North Pulinpur, a tribal village is located at 50 km from state capital Agartala and 25 km from KVK West Tripura Campus. The village comes under Tripura Tribal Area Autonomous District Council (TTAADC) and falls under Teliamura RD Block. The village consists of 5 wards and 806 families with total population of 3681, (Male: 1779 and Female: 1902). The total BPL family is 121. The village is inhabited by 100 percent tribal community. The total geographical area of the village is 950 hectare where as cultivable area is 250 hectare. There are no perennial streams or rivers in the village. Prevailing temperature ranges from 16°C to 37°C. The soils are classified as hill red loamy to plain sandy loamy soil. Annual rainfall ranges from 2050 to 2550 mm. Agriculture is the mainstay of the people, about 85 percent of them engage in agriculture and its allied activities. There is a galaxy of scope for integrated faming approach for overall agricultural development of the village which ultimately can contribute to the state.

Development of Harvested Rainwater Based Sustainable Farming System:

Rain water harvesting structures including community bund, jalkund and farm pond were constructed to minimize water scarcity. Community bund in between two hillocks was meant for harvesting water in rainy season and utilizing for fish cultivation as well as crop cultivation in other seasons. Rooftop water were channelized and collected in jalkund for the utilization of water in the non rainy season. Ponds were constructed to store water. Rejuvenation of ponds was done to maximize water retention and economic utilization even during dry spell of the year. Scientific utilization of the side of pond was not practiced by the farmers earlier. After the KVK initiatives they have started Integrated farming approach. Side of the pond are utilizing for vegetable cultivation such as colocasia, pumkin, dolichos bean, banana etc. Plantation of drum stick, coconut, beetle nut etc. were done around the side of pond for future income generation. Some of the farmers have started duck cum fish rearing and composite fish culture. Approximately 26187 ft^3 rainwater had been harvested by this water harvesting structure, all of which provided life saving irrigation for vegetables during *kharif* dry spell as well as during *rabi* summer season covering an area of about 135.0 ha. A total of 9 numbers of farmers were selected from different catchment areas of the water bodies constructed or rejuvenated under NICRA. Farmer Wise Details of Harvested rainwater based sustainable farming system is given below:

Table 1

1.	Name of the farmer	Judha Kumar Debbarma
2.	Latitude and Longitude of pond/structure	23.87623 and 91.60076
3.	Soil type and depth	Light Texture and Sandy loam soil
4.	Catchment area/plot area	Area: 0.72 ha
5.	Dimensions of the structure	Top (L W H) : (50'x50'x3') ft Bottom (L W H) : (43'x45'x3') ft Side slope : 1:2
6.	When it was constructed (Year)	28/ 03/ 2012
7.	Whether water was used for Supplemental irrigation in *Kharif /Rabi* crop	Kharif and Rabi Crop

For Kharif Crop:

8.	Crop sown & Area	SRI with Paddy Area: 0.72 ha

For Rabi Crop:

Crop sown & Area	Maize (0.12ha), Bitter gourd (0.16 ha), cucumber (0.08ha), Chilli (0.04 ha), Boro rice (0.08 ha).
Increase in cropping intensity, ha	From 100% to 166.66%

Table 2

	Name of the Farmer	**Pati Kanya Debbarma**
1.	Latitude and Longitude of pond/structure	23.86814, 91.60779
2.	Soil type and depth	Light Texture and Sandy loam soil
3.	Catchment area/plot area	Area: 0.24 ha
4.	Dimensions of the structure	Top (L W H) : (16'x26'x2.5')ft Bottom (L W H) : (12'x21'x2.5') ft Side slope : 1:2
5.	When it was constructed (Year)	Year: 14/01/2012
6.	Whether water was used for Supplemental irrigation in *Kharif /Rabi* crop	Kharif and Rabi Crop

For Kharif Crop:

7.	Crop sown and Area	SRI with Paddy Area: 0.24 ha

For Rabi Crop:

8. Crop sown & Area	Bitter gourd (0.16 ha), Cucumber(0.08ha)
Increase in cropping intensity, ha	From 100% to 200%

Table 3

Name of the Farmer	**Mantu Debbarma**
1. Latitude and Longitude of pond/structure	23.86915, 91.60477
2. Soil type and depth	Light Texture and Sandy loam soil
3. Catchment area/plot area	Area: 0.64 ha
4. Dimensions of the structure	Top (L W H) : (16'x36'x3')ft Bottom (L W H) : (9'x28'x3')ft Side slope : 1:1
5. When it was constructed (Year)	Year: 08/01/2012
6. Whether water was used for Supplemental irrigation in *Kharif /Rabi* crop	Kharif and Rabi Crop

For Kharif Crop:

7. Crop sown and date of sowing & Area	SRI with Paddy Date of sowing: 15th to 20th June. Area: 0.64 ha

For Rabi Crop:

8. Crop sown & Area	Maize (0.12ha), Bitter gourd (0.24 ha), cucumber (0.08ha)
9. Increase in cropping intensity, ha	From 100% to 168.75%

Table: 4

1. Name of the farmer	**Mr.Bhidu kumar Debbarma**
2. Latitude and Longitude of pond/structure	23.86878 and 91.61225
3. Soil type and depth	Light Texture and Sandy loam soil
4. Catchment area/plot area	Area: 0.48 ha
5. Dimensions of the structure	Top (L W H) : (40'x48x2.5')ft Bottom (L W H) : (37'x44'x2.5')ft Side slope :1: 2
6. When it was constructed (Year)	14/01/2012
7. Whether water was used for Supplemental irrigation in *Kharif /Rabi* crop	Kharif and Rabi Crop

For Kharif Crop:

8.	Crop sown & Area	SRI with Paddy Area: 0.48 ha

For Rabi Crop:

9.	Crop sown & Area	Maize (0.12ha), Bitter gourd (0.16 ha), cucumber (0.08ha), Chilli(0.04 ha), Boro rice (0.08 ha).
10.	Increase in cropping intensity, ha	From 100% to 200%

Table: 5

	Name of the Farmer	**Mr. Anil Debbarma**
1.	Latitude and Longitude of pond/structure	23.86783 and 91.60500
2.	Soil type and depth	Light Texture and Sandy loam soil
3.	Catchment area/plot area	Area: 0.48 ha
4.	Dimensions of the structure	Top (L W H) : (40'x50'x2')ft Bottom (L W H) : (35'x43'x2')ft Side slope : 1:2
5.	When it was constructed (Year)	14/01/2012
6.	Whether water was used for Supplemental irrigation in Kharif /Rabi crop	Kharif and Rabi Crop

For Kharif Crop:

7.	Crop sown & Area	SRI with Paddy Area: 0.48 ha

For Rabi Crop:

8.	Crop sown & Area	Maize (0.12ha), Bitter gourd (0.16 ha)
9.	Increase in cropping intensity, ha	From 100% to 158.33%

Table: 6

Name of the farmer		**Mr. Surjya kumar Debbarma**
1.	Latitude and Longitude of pond/structure	23.86374 and 91.58991
2.	Soil type and depth	Light Texture and Sandy loam soil
3.	Catchment area/plot area	Area: 0.64 ha
4.	Dimensions of the structure	Top (L W H) : (40'x45'x2.5') ft Bottom (L W H) : (36'x40'x2.5')ft Side slope : 1: 1
5.	When it was constructed (Year)	14/02/2012
6.	Whether water was used for	Kharif and Rabi Crop

Supplemental irrigation in *Kharif /Rabi* crop	

For Kharif Crop:

7.	Crop sown & Area	SRI with Paddy .Area: 0.64 ha

For Rabi Crop:

8.	Crop sown & Area	Maize (0.12ha), Bitter gourd (0.24 ha)
9.	Increase in cropping intensity, ha	From 100% to 156.25%

Table: 7

	Name of the Farmer	**Mr. Sujit Debbarma**
1.	Latitude and Longitude of pond/structure	23.86477 and 91.58838
2.	Soil type and depth	Light Texture and Sandy loam soil
3.	Catchment area/plot area	Area: 0.48 ha
4.	Dimensions of the structure	Top (L W H) : (40'x45'x2.5')ft Bottom (L W H) : (36'x38'x2.5') ft Side slope : 1: 2
5.	When it was constructed (Year)	09/12/2011
6.	Whether water was used for Supplemental irrigation in *Kharif /Rabi* crop	Rabi Crop

For Kharif Crop:

7.	Crop sown & Area	SRI with Paddy Area: 0.48 ha

For Rabi Crop:

8.	Crop sown & Area	Maize (0.12ha), Bitter gourd (0.24 ha), Chilli, (0.08 ha)
9.	Increase in cropping intensity, ha	From 100% to 199.66%

Table: 8

	Name of the Farmer	**Mr. Janel Debbarma**
1.	Latitude and Longitude of pond/structure	23.86307 and 91.59021
2.	Soil type and depth	Light Texture and Sandy loam soil
3.	Catchment area/plot area	Area: 0.32 ha
4.	Dimensions of the structure	Top (L W H) : (29'x38'x4.5')ft Bottom (L W H) : (25'x31'x4.5')ft Side slope :1 : 2

5.	When it was constructed (Year)	11/12/2011
6.	Whether water was used for Supplemental irrigation in *Kharif /Rabi* crop	Kharif and Rabi Crop

For Kharif Crop:

7.	Crop sown and date of sowing & Area	SRI with Paddy Area: 0.32

For Rabi Crop:

8.	Crop sown & Area	Maize (0.08ha), Bitter gourd (0.12 ha)
9.	Increase in cropping intensity, ha	From 100% to 162.5%

Table: 9

Name of the Farmer		**Mr. Nripendra Debbarma**
1.	Latitude and Longitude of pond/structure	23.87833 and 91.58991
2.	Soil type and depth	Light Texture and Sandy loam soil
3.	Catchment area/plot area	Area: Area: 0.48 ha
4.	Dimensions of the structure	Top (L W H) : (60'x45'x2.5') ft Bottom (L W H) : (53'x41'x2.5') ft Side slope : 1 : 2
5.	When it was constructed (Year)	08/12/2011
6.	Whether water was used for Supplemental irrigation in *Kharif /Rabi* crop	Kharif and Rabi Crop

For Kharif Crop:

7.	Crop sown and date of sowing & Area	SRI with Paddy Date of sowing: 15th to 20th June. Area: 0.48 ha

For Rabi Crop:

1.	Crop sown & Area	Maize (0.08ha), Bitter gourd (0.08 ha)
2.	Increase in cropping intensity, ha	From 100% to 133.33%

Conclusion

Through all these successful interventions on crop diversification, the cropping intensity of the village has been increased from 115 to 170 % within 8 years only. Besides this, all the successful climate resilient technologies are horizontally spreading to the nearby Villages having similar Agro-climatic Condition. Due to Inadequate fund under NICRA project no

water bodies could be constructed during the last 5 years. This problem can be solved by intervention of other related departments like rural development department, Department of Agriculture, Government of Tripura. By convergence with other programmes this successful model can be replicated to the many other villages of Tripura having similar Agro climatic and socio economic condition.



1. Recycling of Organic Waste

Introduction

Cycle of Jhum (2-3 years) leads to large scale loss of forest resources, loss of fertile top soil due to erosion and loss of carrying capacity of the soil and reducing agricultural area due to more area being utilized for rubber plantation. Rearing of cattle in North Pulinpur village was only for draught purpose and cow dung were used in the crop field. . In this regard, to cope up with soil fertility deterioration in shifting climate for optimum utilization of dairy KVK, Khowai has demonstrated Vermicompost production technology along with its application and benefits at adapted village and production of bio-gas using cow dung.

Impact

After successful adoption of the technology, each beneficiary is now harvesting on an average of around three quintal Vermicompost along with fifteen litre vermiwash/chamber (2m×1m×0.6m×2)/cycle. The adopted farmers are regularly using the Vermicompost & Vermiwash in their

agricultural land and also selling to other farmers. Intervention has also been taken on demonstration of use of vermicompost as fish pond manure to cope up with mortality and morbidity of fishes due to abiotic stress.

Table: Economics of vermicomposting and vermicompost as fish feed

Technology	**Area/ unit No.**	**Yield (Demo)**	**Yield (local)**	**Economics of demonstration (Rs.)**				**Economics of local (Rs.)**			
				Gross Cost	**Gross Return**	**Net Return**	**CR**	**Gross Cost**	**Gross Return**	**Net Return**	**CR**
Vermicomposting	10	1.5 t/yr	NA	5600/ unit	15000/ unit	9400/ unit	1.68	NA	NA	NA	NA
Use of Vermicompost in fish pond	0.08 ha	25 q/ha	20 q/ha	50000/ ha	125000/ ha	60000/ ha	1.92	40000/ ha	100000/ ha	40000/ ha	1.6

2. Integrated Crop Management in Paddy Changing the Income Level of Paddy Farmers of North Pulinpur Adc Village of Tripura Under Nicra-A Case Study

Introduction:

North Pulinpur is one of the draught prone tribal inhabited ADC Village of the district Khowai under the state Tripura. The total geographical area of the village is 950 hectare with cultivable area of about 250 hectare only among 806 farm families. So, most of the families are holding either small or marginal farms. There was no perennial streams, rivers, ponds and other irrigation facilities in the village. Prevailing temperature ranges from 16°C to 37°C. Annual rainfall ranges from 2050 to 2550 mm, but almost whole amount goes out to neighbouring lower elevated village. Agriculture is the mainstay of the people, about 85 percent of them engage in agriculture and its allied activities. Farmers earned their livelihood from rainfed rice based monocropped cultivation. Moisture stress during Kharif dry spell and winter season which lead to rice based mono-cropping system. Farmers generally grows paddy with ad-hok application of fertilizers in the plot which have resulted in poor paddy yield with less income. Moreover, they were growing paddy by using traditional system of cultivation like old traditional variety, irregular spacing, no seed treatment, continuous flooding, seedling of older age, use of more than 3 nos seedling during transplanting, no plant protection measures etc. After harvesting of paddy the farmers used to get very less return as there was no ready market for paddy and they had to sell their product to the middle man at a very low rate. It has resulted in poor economic condition of the farmers.

KVK Interventions:

Under the National Innovations in Climate Resilient Agriculture (NICRA) Project KVK, Khowai has collected soil samples from 62 numbers of farmers before the initiation of kharif season for the year 2018-19. After soil analysis at KVK, Soil Testing Laboratory 62 numbers of soil Health

Cards were distributed to the farmers of North Pulinpur ADC Village. From Soil testing results it was found that the farmers were mostly over or under using the fertilizers in their plots which have resulted in deficiency or toxicity of many important nutrients. Under NICRA programme HYV of paddy var. Gomoti were supplied to the farmers and those farmers were given training on SRI cultivation which is based on six major principals:

- Young seedlings between 8-12 days old (2-3 leaf stage) are transplanted to preserve potential for tillering and rooting ability;
- Careful planting of single seedlings rather than in clumps that are often plunged in the soil; Transplanting of tender seedlings need care to minimize root trauma.
- Wider spacing at 25 cm x 25 cm. in square planting rather than in rows; this can also be done with the help of rope by marking.
- Use of cono-weeder/ rotary hoe/power weeder to aerate the soil as well as controlling weeds; The first advantage of using the weeder is the control of weeds and also adding organic matter to the soil. This gives the benefits of cultivating a green manure crop. Further, the soil gets aerated and the roots are exposed to air. This results in profuse growth of diverse soil microorganisms which make nutrients available to the plant.
- Alternate wetting and dry method rather than continuous flooding in the field; as the soil is not flooded, the roots of the paddy plants grow healthy, deeply in all directions. The root growth is extensive also due to the wide spacing. As the field is intermittently irrigated and dried, the microorganisms grow well which make nutrients available to the plants. This method also helps in better growth and spread of roots.
- Use of organic manure or Vermicompost / FYM.

All the six principals were followed in the field of 62 numbers of farmers with critical input support from KVK,Khowai. Convergence with the ICAR Research complex for NEH region were done to scientific breeder seed production in the farmers field itself. Regular field visit and monitoring programmes were done by experts from KVK as well from ICAR, Tripura Centre.

History of SRI:

The SRI methodology was synthesized in the early 1980s by Fr. Henri de Laulanié, S.J., who came to Madagascar from France in 1961 and spent

the next (and last) 34 years of his life working with Malagasy farmers to improve their agricultural systems, and particularly their rice production, since rice is the staple food in Madagascar (see article listed below). Rice provides more than half the daily calories consumed in Madagascar, a sign of the cultural and historic significance of rice to Malagasies, but also an indication of their poverty. Fr. Laulanié want to help farmers improve their productivity without being dependent on external inputs because Malagasy households had so little purchasing power.

Fr. de Laulanié (right) established an agricultural school in Antsirabe in 1981 to help rural youths gain an education that was relevant to their vocations and family needs. Though SRI was "discovered" in 1983, benefiting from some serendipity, it took some years to gain confidence that these methods could consistently raise production so substantially. In 1990, together with a number of Malagasy colleagues, Fr. Laulanié established an indigenous non-governmental organization (NGO), named Association Tefy Saina, to work with farmers, other NGOs, and agricultural professionals to improve rural production and livelihoods in Madagascar. In 1994, Tefy Saina began working with the Cornell International Institute for Food, Agriculture and Development (CIIFAD) based in Ithaca, NY, to help farmers living in the peripheral zone around Ranomafana National Park to find alternatives to their slash-and-burn agriculture. So long as paddy yields, even with irrigation, averaged only 2 tons/hectare, rural households would need to continue growing upland rice and reducing Madagascar's precious but endangered rain forest ecosystems. These could not last long unless paddy yields were raised on the limited irrigated lowland area. Farmers using SRI methods could average 8 tons/hectare after these methods were introduced around Ranomafana.

Methods of SRI:

The System of Rice Intensification is not a new method or technology. It can be accomplished by the following methods:

1. **Raising nursery**

   (a) Selection of Site: In SRI method, almost care should be taken in the preparation of nursery bed, as 8-12 days old seedlings and in some places 14-15 days old seedlings (2-3 leaf stage) are transplanted. The nursery bed should be preferably prepared in the centre / corner of the plot for quick/ efficient transplanting.

   (b) Size of Bed: For one acre transplantation, the nursery bed can be raised in 48 square yard (40 sq meter) plot. Depending upon the

situation, two beds can be raised each measuring 24 sq. yards (20 sq meters) per 1 kg seed.

A bed with a width of 125 cm or 4 feet is ideal. Length of the bed can be decided by the farmers depending on the ground situation.

According to one's convenience either a single bed or several small beds (4 beds measuring 4 X 28 feet or 1.25 X 8 m each, **Fig- 1**) can be prepared. As the roots of 8-10 days old seedlings grow up to 3 inches (7.5 cm), it is necessary to prepare raised beds of 5-6 inches (12.5-15 cm). To drain excess water, appropriate channels should be provided on all sides by making drainage cum irrigation channels (0.5-1 feet width). To prevent soil erosion, the bed on all side should be made secure with wooden reapers/ planks or paddy straw etc.

(c) Bed Preparation: Nursery bed is prepared with application of farm yard manures (FYM) and soil in four alternating layers. 1st layer: 1 inch (2.54 cm) thick well decomposed FYM, 2nd layer: 1.5 inch (3.75cm) soil, 3rd layer: 1 inch (2.54 cm) thick well decomposed FYM, 4th layer: 2.5 inch (6.3 cm) soil. All these layers should be mixed well as it will helps in easy penetration of roots. Besides compost or vermin compost can also be used and spread it over all the bed in 3-5 cm layer.

(d) Seed rate: 2 kg of seeds (5 kg/ ha) is required to transplant in one acre of land. Seed should be thinly spread to avoid crowding of seedlings. Care should be taken that no two seeds should touch each other.

(e) Seed Treatment: Healthy and pure seeds are used Soak the seeds for 12 hours in water. Drain the water and treat the seed with bavistin (2 gm/ kg seed) or Trychoderma (3 gm/ kg seed) or streptocyclin (1 gm/ kg of seeds). There after transfer the treated seeds to a water soaked gunny bag. Leave it for 24 hours. Sprouted seeds are taken to the nursery for sowing. To ensure uniform broadcasting, divide the seed into four part and broadcast thinly over the bed (each part at a time). It is better to broadcast seeds in the evening.

(f) Mulching: Cover the bed with paddy straw to cover from direct exposure to the sun and also to ensure protection from birds. Depending upon recruitment, apply water with rose cans twice daily. Care should be taken to see that the seeds do not come out while watering. Remove the straw once seeds germinate.

2. Preparation of main filed

Land selected for SRI should be well levelled and should not have water logging condition. When the plot is irrigated the water should spread uniformly across the field. Similarly, whenever needed there should be previous to drain the excess rain water. Farmers must have their own irrigation resources so that they can provide irrigation whenever it is needed. The main field is prepared and levelled with little standing water a day before planting for grid marking. Provision should be made for 30 cm wide channels at 2 meters interval. Perfect levelling is the pre-requisite for proper water management and good crop stand.

3. Method of Transplanting

3.1 The field should be well puddle and levelled. After levelling the field, a marker can be used to lay out the plot into wider spacing i.e., 25 cm x 25 cm row to row and plant to plant. This can also be done with the help of rope by marking.

3.2 Young rice seedlings 8 to 12 days old and in some places 14-15 days old seedlings (2-3 leaf stage) is considered to be ideal for transplanting as compared to 25 – 30 days old seedlings in traditional method of rice cultivation. The seedlings with 2-3 leaves stage have great potential for profuse tillering and root development. It results to achieve maximum yield potential of varieties / hybrids.

3.3 Care should be taken to prevent any harm to seedlings while pulling them from nursery or at the time of transplanting. A metal sheet is inserted 4-5 inches below the seedbed and seedlings scoped along with soil without any disturbance to their roots. Transplanting of tender seedlings need care to minimize root trauma. The farmers and farm labourers need to be educated on this aspect. Young seedlings are planted shallow horizontally thus establish quickly. Seedlings are transplanted with the help of index finger and thumb and by gently placing them at the intersection of marking. Light irrigation should be given on the next day of the transplanting.

4. Nutrient Management

Organic manures / vermicompost are recommended in SRI cultivation as they give better response and improve soil health. Application of FYM / compost (10-12 t/ ha) before ploughing and incorporation of in situ grown 45-60 days old green manures crops are beneficial. Though complete organic manuring is recommended for SRI, in case of short supply of organics,

fertilizer supplementation may be adopted for better yields. Apply and incorporate 50% of recommended fertilizers (NPK) through in-organics i.e., 50:30:20 kg NPK in kharif and 60:30:20 kg NPK in rabi depending on soil test values at the time of preparation of the field.

Apply second dose (25 per cent) of N at the time of 2nd weeding (20 DAT) and final dose of 25 per cent N and remaining 25 per cent K a week before panicle initiation stage. Need based N can be applied with the use of Leaf Colour Chart to enhance the N use efficiency.

5. Water Management

SRI method does not require continuous flooding. Irrigation is given to maintain soil moisture near saturation initially and water is let in when surface soil develops hairline cracks. The irrigation intervals, however, vary with soil texture. Soils having low water holding capacity require frequent irrigation.

As the soil is not flooded, the roots of the paddy plants grow healthy, deeply in all directions. The root growth is extensive also due to the wide spacing. As the field is intermittently irrigated and dried, the microorganisms grow well which make nutrients available to the plants. This method also helps in better growth and spread of roots.

The field should be irrigated again when the soil develops hair line cracks. Depending upon the soil and the environment conditions, the frequency of irrigation should be decided. At the time of weeding operation to avoid shoulder pain, the field should be irrigated to have 2-3 cm of water. After completion of weeding the water should not be left out of the field. After the panicle initiation stage until maturity, one inch of water should be maintained in the field until maturity. The water can be drained after 70 per cent of the grains in the panicle get hardened.

6. Weed Management

As there is no standing water in SRI method, weeds would be more. There are several advantages of turning the weeds into the soil by using an implement called ‘weeder’. Use the weeder on the 10th and 20th day after transplanting. The weeding problem is addressed to a large extent with this effort.

Alternate wetting and drying in SRI results in excessive weed growth which if unchecked in time may cause immense loss in yield. In SRI, the weeds are incorporated by operating cono weeder between rows at the right time, which also supply nutrients to the crop as green manures. First weeding

is to be done 10-12 days after planting. Further weeding may be undertaken depending on the necessity at 10-15 days interval until crop reaches panicle stage. For smother and easy operation of cono weeder, it is advisable to coincide the weeding with irrigation. Rotary weeding may be supplemented with 1 or 2 hand weedings to remove the weeds growing near the hills which might have escaped during rotary weeding. The first advantage of using the weeder is the control of weeds and also adding organic matter to the soil. The gives the benefits of cultivating a green manure crop. Further, the soil gets aerated and the roots are exposed to air. This results in profuse growth of diverse soil microorganisms which make nutrients available to the plant.

SRI in Tripura:

Tripura is a state in North-East India which borders Bangaldesh, Mizoram and Assam. It is surrounded by Bangladesh on its north, south and west. It shares a 53 km border with Assam and 109 km border with Mizoram. Tripura is a land locked state. Rice is the major staple food of Tripura with 75 percent of cropped area devoted to production of rice. In terms of production, it ranks next to Assam in north eastern states(Das D.K *et al*,2016).Department of Agriculture, Govt of Tripura and Krishi Vigyan Kendra"s are trying their level best to popularize SRI in Tripura.SRI method of cultivation is having several advantages over the traditional system since the seed and water requirement and incidences of pests and diseases are lower than the traditional system .Despite of several advantages the farmers are facing several problems like timely availability of skilled labour, high cost of labour due to which the practice is not getting enough popularity.(Nath *et al*,2017).

Table: Description of farmers practice and technology in ICM in paddy crop.

Item	Description
Title of the intervention	Integrated Crop Management in Paddy var Gomoti
Problem to be addressed	To make paddy Cultivation more profitable
Description of the farmers' practice	Conventional paddy cultivation (comparatively long duration variety- Ranjit and MTU 7029) that requires more water and ad-hok application of fertilizers
Description of the technology	• Cultivation of medium duration HYV of paddy (Variety-Gomoti) • Use of Soil Health Cards • Adoption of SRI • Breeder Seed Production • Seed Treatment with Carbandazim 25%+ Mancozeb 75%

	• Need Based PPC application
Area covered under demonstration (ha)	40 ha
No. of farmers covered	62 nos.
Convergence and type of Convergence	Convergence with ICAR Research complex for NEH region, Tripura Centre for paddy seed production

Table: Farmer-wise description of interventions

Farmer Name	Item	Crop	Variety	Area (ha)	Date of sowing	Seed Yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross Income (Rs/ha)	Net return (Rs/ ha)	B:C ratio[2]
Mangal Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7200	51000	126000	75000	2.47
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4200	48000	63000	15000	1.31
Bodhini Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	51000	122500	71500	2.40
	Farmer's practice	Paddy	MTU 7029	0.64	15th to 20th June 2018	4000	48000	60000	12000	1.25
Ajoy Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7000	51000	122500	71500	2.40
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Chittaranjan Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7200	50090	126000	75910	2.51
	Farmer's practice	Paddy	MTU 7029	0.8	15th to 20th June 2018	4200	47800	63000	15200	1.31
Sabi Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	6800	51000	119000	68000	2.33
	Farmer's practice	Paddy	MTU 7029	0.64	15th to 20th June 2018	4000	48000	60000	12000	1.25
Charan	Treatment /	Paddy	Gomoti	0.64	15th to 20th June	7100	51000	124250	73250	2.43

Debbarma	demo				2018					
	Farmer's practice	Paddy	MTU 7029	0.64	15th to 20th June 2018	4100	48000	61500	13500	1.28
Muni Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7000	51000	122500	71500	2.40
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Mansi Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	50000	122500	72500	2.45
	Farmer's practice	Paddy	MTU 7029	0.64	15th to 20th June 2018	4000	48000	60000	12000	1.25
Brajabahadur Debbarma	Treatment / demo	Paddy	Gomoti	0.72	15th to 20th June 2018	7000	51000	122500	71500	2.40
	Farmer's practice	Paddy	MTU 7029	0.72	15th to 20th June 2018	3800	48000	57000	9000	1.18
Jitendra Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7100	51000	124250	73250	2.43
	Farmer's practice	Paddy	MTU 7029	0.8	15th to 20th June 2018	4100	47600	61500	13900	1.29
Bijoy Kumar Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7000	50700	122500	71800	2.41
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47500	60000	12500	1.26
Bodulaxmi Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7000	51000	122500	71500	2.40

	Farmer's practice	Paddy	MTU 7029	0.8	15th to 20th June 2018	4200	48000	63000	15000	1.31
Badal Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7100	50300	124250	73950	2.47
	Farmer's practice	Paddy	MTU 7029	0.64	15th to 20th June 2018	3800	48000	57000	9000	1.18
Bikram Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7200	51000	126000	75000	2.47
	Farmer's practice	Paddy	MTU 7029	0.64	15th to 20th June 2018	4100	48000	61500	13500	1.28
Ramani Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7000	50108	122500	72392	2.44
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Ranjan Kumar Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	52815	122500	69685	2.31
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Birgumani Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7000	50125	122500	37875	2.44
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Binata Debbarma	Treatment / demo	Paddy	Gomoti	0.56	15th to 20th June 2018	7200	50100	126000	75900	2.51
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25

Binata Debbarma	Treatment / demo	Paddy	Gomoti	1.12	15th to 20th June 2018	7200	51664	126000	74336	2.43
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Ratna Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7200	51200	126000	74800	2.4
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Sankar Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	51000	122500	71500	2.40
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Pratesh Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7100	52101	124250	72149	2.38
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Surjya Kumar Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	51000	122500	71500	2.40
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Balendra Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	51000	122500	71500	2.40
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Rabi Charan Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7100	52160	124250	72090	2.38

	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Sabita Debbarma	Treatment / demo	Paddy	Gomoti	0.56	15th to 20th June 2018	7100	51010	124250	73240	2.43
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Rama Debbarma	Treatment / demo	Paddy	Gomoti	0.32	15th to 20th June 2018	7000	53650	122500	68850	2.28
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Alen Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7000	51100	122500	71400	2.39
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	12000	1.25
Badharai Debbarma	Treatment / demo	Paddy	Gomoti	0.72	15th to 20th June 2018	7000	52100	122500	70400	2.35
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47000	60000	13000	1.27
Tarit Kumar Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7100	51810	124250	72440	2.39
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Abhijit Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7000	52200	122500	70300	2.34
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	46700	60000	13300	1.28

Rebati Debbarma	Treatment / demo	Paddy	Gomoti	0.418	15th to 20th June 2018	7200	51200	126000	74800	2.46
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Anjurani Debbarma	Treatment / demo	Paddy	Gomoti	1.28	15th to 20th June 2018	7200	50166	126000	75834	2.51
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47600	60000	12400	1.26
Hiralal Debbarma	Treatment / demo	Paddy	Gomoti	0.96	15th to 20th June 2018	7200	51000	126,000	75000	2.47
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Sarubala Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7000	51020	122500	71480	2.40
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Fullarani Debbarma	Treatment / demo	Paddy	Gomoti	0.41	15th to 20th June 2018	7200	51122	126,000	74878	2.46
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Mitra Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7100	50130	124250	74120	2.47
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47000	60000	13000	1.27
Sunil Debbarma	Treatment / demo	Paddy	Gomoti	0.96	15th to 20th June 2018	7000	53450	122500	69050	2.29

	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Shital Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7100	51180	124250	73070	2.47
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	46800	60000	13200	1.28
Sukurani Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7200	51770	126000	74230	2.43
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Biswajit Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	50668	122500	71832	2.41
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Biraja Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7100	51001	124250	73249	2.43
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47900	60000	12100	1.25
Purnimala Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	51096	122500	71404	2.39
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Amrish Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7200	50196	126000	75804	2.51
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27

Arun Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7200	50188	126000	75812	2.51
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Malen Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7100	50296	124250	73954	2.47
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Birmohan Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7000	51600	122500	70900	2.37
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	46900	60000	13100	1.27
Sanjit Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7200	50190	126000	75810	2.51
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Samprai Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7200	50001	126000	75999	2.51
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47700	60000	12300	1.25
Baijanti Debbarma	Treatment / demo	Paddy	Gomoti	0.88	15th to 20th June 2018	7000	52600	122500	69900	2.32
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Sayati Debbarma	Treatment / demo	Paddy	Gomoti	0.72	15th to 20th June 2018	7100	54800	124250	69450	2.26

	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Parendra Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7000	50100	122500	72400	2.44
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	46800	60000	13200	1.28
Nikhil Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7200	51000	126000	75000	2.47
	Farmer's practice	Paddy	MTU 7029	0.48 ha	15th to 20th June,2018	4000 kg/ ha	48000.00	60000.00	13000.00	1.27
Bamrai Debbarma	Treatment / demo	Paddy	Gomoti	0.8	15th to 20th June 2018	7000	54106	122500	68394	2.26
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Srimati Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7200	51654	126000	74346	2.43
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47600	60000	12400	1.26
Sudhanya Debbarma	Treatment / demo	Paddy	Gomoti	0.8 ha	15th to 20th June,2018	7000 kg/ha	51005.00	122500.00	71495.00	2.40
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Sulekha Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7100	50169	124250	74081	2.47
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27

Adhinkanya Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	6800	50100	119000	68900	2.37
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Annarani Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	51300	122500	71200	2.38
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	47200	60000	12800	1.27
Bishu Kumar Debbarma	Treatment / demo	Paddy	Gomoti	0.64	15th to 20th June 2018	7000	52101	122500	70399	2.35
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Niran Debbarma	Treatment / demo	Paddy	Gomoti	0.96	15th to 20th June 2018	7200	51608	126000	74392	2.44
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	4000	48000	60000	13000	1.27
Samaresh Debbarma	Treatment / demo	Paddy	Gomoti	0.48	15th to 20th June 2018	7100	51806	124250	72444	2.39
	Farmer's practice	Paddy	MTU 7029	0.48	15th to 20th June 2018	3900	47000	58500	11500	1.24

Convergence with ICAR Research Complex for NEH Region, Tripura Centre:

Getting quality seed is a major constrain for the farmers of Tripura. Moreover to produce quality seeds sufficient area is not available in the research stations. To overcome the problem KVK, Khowai in collaboration with ICAR, research complex for NEH region Tripura Centre, Plant Breeding division taken the initiative to produce quality breeder seeds at North Pulinpur ADC Village with 62 above mentioned farmers. All the seed production protocols were followed and regular field visits were done by the Scientists of KVK and ICAR.

After harvesting seeds were supplied to ICAR Tripura Centre at a very good price so that farmers can get good return out of paddy cultivation.

Output:

On an average they got an average yield of 7.07 t/ha, with a gross return of Rs.12375.00 and net return of Rs. 72725.00. Moreover, after this successful intervention many of the farmers of nearby villages are also coming in huge number to adopt scientific crop management practice in paddy to improve their economic status.

Outcome:

Based on the their dedication and hard work many of the organization including the Krishi Vigyan Kendra Khowai, ICAR research complex for NEH region, Tripura Centre have recognized their efforts and awarded them with many awards. List of the farmers who have received awards under the programme is given below:

Name of award	Award Given to	Award given by
Innovative Rice Farmer Award	Shri Mantu Debbarma	ICAR Research Complex for NEH region, Tripura Centre
Innovative Farmer Award	Shri Mangal Debbarma	ICAR Research Complex for NEH region, Tripura Centre
Best Farmer of the Year Award	Shri Charan Debbarma	Krishi Vigyan Kendra,Khowai

Mulching in Bitter Gourd for in-Situ Moisture Conservation

Introduction

North Pulinpur ADC Village of Khowai Tripura is a drought prone area of the district. Farmers of this village were following monocropping i.e. only

Aman paddy. After Aman Paddy the land used to keep fellow during the remaining period of the year due to water scarcity. As this village was under NICRA project, main emphasis was given on construction of rain water harvesting structures to minimize the water scarcity and to increase the cropping intensity under the supervision of KVK. With the initiation of KVK, Bitter gourd was introducing to the village with mulching practice. Initially some farmers were selected and provided with sufficient training on mulching. And small demonstrations were given during the year 2012-13. After getting confidence of growing bitter gourd with straw mulching with assured profit, they increased the area under bitter gourd cultivation with lifesaving irrigation from the farm pond constructed under the project.

Impact and Economics

Technology Intervention:

1. Use of Bitter gourd variety Jyoti bolder
2. Time of planting: First week of January
3. Use of straw mulching to cope up with the adverse climatic condition was special practice. It helped to reduce soil moisture loss as well as for easy trailing of the bitter gourd vines on the ground.
4. Use of Balanced fertilizer as recommended by soil testing report.

Before KVK intervention in the village total area under bitter gourd cultivation was 1.2 ha and after the intervention there was huge horizontal spread of this crop and at present farmers are growing this crop in an area of 8.16 ha which was earlier remain totally fallow after kharif paddy.

Another important point is that as they are growing paddy as previous crop which they can easily use the paddy straw for mulching purpose. Now most of the farmers of the village have accepted this technology under water stress situation.

Table: Economics of bitter Gourd Cultivation

Economics of Bitter gourd Cultivation / ha area	**Cost involved (Rs)**
Input Cost	
Seed	10000.00
Fertilizer and organic manure	20000.00
Straw	7000.00
PPC	15000.00
Labour Cost (Including land preparation, sowing, spreading of mulching material, irrigation, harvesting etc)	90000.00

Average yield /ha	97q/ha
Gross Cost	142000.00
Gross income	395600.00
Net income	253600.00
Benefit Cost Ratio	2.78

4. A Dream Journey From Cannavis Sativa Grower To Prestigious ICAR Pandit Deen Dayal Upadhyay Antyodaya Award Winner, 2018

Introduction:

Shri Charan Debarma a Progressive tribal farmer of North Pulinpur ADC Village has adopted the Pond Based Farming System under the Project National Innovations on Climate Resilient Agriculture. North Pulinpur is one of the draught prone tribal inhabited ADC village of the district Khowai under the state Tripura. There was no perennial streams, rivers, ponds and other irrigation facilities in the village. Prevailing temperature ranges from 16°C to 37°C. Annual rainfall ranges from 2050 to 2550 mm, but almost whole amount goes out to neighbouring lower elevated village. Before initiation of NICRA Shri Charan Debbarma was growing only Kharif rice. In his remaining land he was growing *Cannavis Sativa*, the of flowers (called marijuana) and leaves and preparations derived from resinous extract (e.g., hashish) are consumed by smoking, vaporising, and oral ingestion. Because of this type of use it is banned to grow the crop in India.

Under the National Innovations in Climate Resilient Agriculture (NICRA) Project KVK, Khowai has given training to the farmer about the climate smart agriculture and has constructed a farm pond in his farm, harvested Water from the farm pond provided lifesaving irrigation for paddy during kharif dry spell as well as during rabi season. A Nano pump was Installed nearby to his Farm Pond which was utilized for providing easy Irrigation at a rate of 60 lit of water/hour. The Pond is also used for composite fish culture with average yield of 30 q/farmer/year/ha during 2017-18.His Cannavis Sativa crops were demolished and mosambi plants were planted in that plot

Adaptation of SRI in paddy as first crop by Mr Charan Debbarma could minimize the losses due to water shortage in Kharif paddy cultivation. Shri Charan Debarma has introduced zero tillage in bitter Gourd Cultivation with Paddy Straw as Mulch Material at North Pulinpur ADC, with critical input support of KVK, Khowai. Similarly, after kharif paddy fallow land is now successfully utilized by introduction of second crops like maize var. HQPM

with Furrow Irrigation method, lentil var. WBL 77 as relatively drought tolerant variety. Besides these he has also successfully adopted TPS presently known as Hybrid Potato Seed (HPS) technology which was previously unknown to the farmers of North Pulinpur.He is also Growing Growing Dhaincha as Green Manuring Crop after Harvesting of Winter Crops .At present he is Growing three Crops in his plot with adoption of Climate Smart Technologies.

Shri Charan Debarma is also producing and harvesting Vermicompost in his farm, on an average of around three quintal Vermicompost along with fifteen litre vermiwash/chamber (2m×1m×0.6m×2)/cycle.

Shri Debbarma is also Rearing Ducks Breed Khaki Cambell Which are giving him a High Retrun with Production of Eggs and meat. He is also following Pig Cum Fish farming in his Pond based farming System. The pond Embankment are utilized for Growing Fruit Trees like Drumstick, Papaya etc which are giving him an additional income.

Output:

With adoption of Pond based Farming System along with various Climate Smart Technogies the Cropping Intensity of Mr.Charan Debbarma"s Farm increased from 100% to 300% and Annual Income Increased from 60000.00 to 150,000.00 within a very short Period of time. He is now acting as a motivator for all the Small and Marginal farmers of the Village as well as farmers of the the nearby Village of the District.

Key Highlights of Mr. Charan Debbarma"s Contribution:

- First Farmer to adopt Nano Pump Technology for Supplemental Irrigation at North Pulinpur ADC Village, the technology is now accepted by eight more farmers of the Village
- First Farmer to adopt TPS Technology at North Pulinpur ADC Village
- Involve in the Paddy Seed Production Programme and Supplied Breeder Seeds to ICAR Tripura Centre.
- First farmer to adopt Pond Based Integrated Farming System involving Fishery-Piggery-Duckery- Horti,the technology is now widespread to entire Village
- Innovator of Zero Tillage Bitter Gourd Cultivation Technology, the technology is now widespread to 30 ha area of the Village.

Outcome:

Based on the inspirational work of Shri Charan Debbarma, he has been

awarded with prestigious ICAR Pandit Deen Dayal Upadhyay Antyodaya Award, 2018.He is also awarded with Smart Farmer award by CRIDA,Hyderabad and Best Farmer of the year award,2018 by KVK,Khowai.

5. Integrated Crop Management in Paddy – Maize Cropping Sequence Doubled the Farmers income of North Pulinpur ADC Village of Tripura, India with sustainable natural resource management-A Case Study

Introduction:

Maize is one of the most important food grains grown in Tripura after rice. In Tripura maize generally cultivated from decades, mainly in jhum lands but it has been observed that the area and production of maize has been increased tremendously almost 5 times as compare to the year 2015-16 to present. It is due to the promotion of this crop through various centrally sponsored schemes like National Food Security Mission. Maize is mostly consumed by the tribal communities of Tripura. Although production and productivity of Maize in Tripura is in increasing trend, still there is an immense scope to promote maize with scientific interventions.

Table 1: Area, Production and Productivity of Maize in Tripura

Crop	Area in ha	Production in mt	Yield in kg/ha
Kharif Maize 2015-16	4549	5805	1276
Rabi Maize 2015-16	40	58	1450
Total Maize 2017-18	**16196**	**19170**	**1183**

There is a tremendous potential in promotion of scientific maize cultivation under Tripura Condition especially during the Rabi season as majority of lands remain fallow post kharif paddy cultivation. At present the productivity of maize is very low under Tripura Condition as compare to the majority of the maize growing states of the country. There is also immense scope for maize based small scale entrepreneurship development in the state. Maize based cropping system can lead to the development of small scale enterprises within a short period of period of time. Among the major problems, pest infestation throughout the life cycle of Maize has been found to be a cause of yield loss and production gap. Further poor irrigation facilities, ad- hok fertilizer application, unorganized market facilities, un-availability of quality seed and poor farm mechanization was found major constraints to the farmers. Maize being a high feeder crop generally do lot of nutrient mining from soil as a result of this restoration of soil fertility as well

as balance application of fertilizers is very important. Considering all these facts “Integrated Crop Management in Paddy var. Gomoti – Maize DA-61A Cropping Sequence has been demonstrated at North Pulinpur ADC Village Under Technology Demonstration component of NICRA” with the following objectives:

1. To improve the productivity of Paddy & Maize with Integrated Crop Management.
2. To increase the farmers income with judicial use of natural resources.
3. To increase the Cropping intensity by introducing Rabi Maize.

KVK Interventions:

Under the National Innovations in Climate Resilient Agriculture (NICRA) Project KVK, Khowai in collaboration with ICAR research complex for NEH region Tripura Centre has selected 69 numbers of farmers. To increase their income initially capacity building were done to the farmers under NICRA .During the paddy cultivation HYV of Paddy var. Gomoti was distributed to the farmers and SRI practice was followed with soil test based Integrated Nutrient Management.

Fig: Digital Map of Demonstration plots under Paddy var. Gomoti

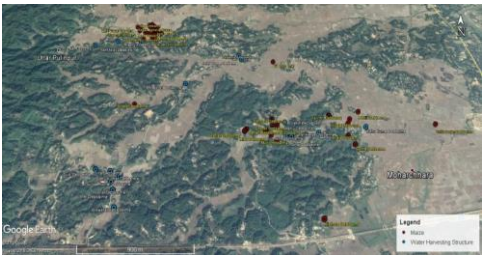


Fig: Digital Map of Demonstration plots under Maize var. DA-61A

After the successful paddy cultivation the farmers were supplied with HYV of Maize var. DA-61A from ICAR research complex for NEH region

Tripura Centre. In case of Maize cultivation providing irrigation during the critical stages was the major problem, to address the issue KVK has provided nano pumps to the farmers which has supplied irrigation to the maize plots from the water bodies constructed under NICRA.Maize was grown with Raised bed furrow irrigation method which was found to be better option as compare to conventional planting as it had better water availability and improved soil physical condition which led to enhanced root growth, and higher maize yield. Earlier Studies reveal that furrow irrigated raised bed planting system got wider adaptability in Indo Gangetic plains of India, Bangladesh, Pakistan and some parts of China, Central Australia (Hobbs and Gupta 2003,Timsina and Connor 2001). Aggarwal and Goswami (2003),Zhang *et al.(*2007) and Sing *et al*.(2010) found lower water consumption and higher wheat yield under furrow irrigated raised bed planting than under conventional flatbed planting due to decrease in irrigation amount. Bed planting also created better soil physical environment all throughout the crop growth, which led to higher crop productivity (Aggarwal and Goswami 2003, Sharma and Bhushan 2001). Research trials at Delhi showed that beds were most suited for growing crops like maize wheat and soybean as they significantly decreased water use (Aggarwal and Goswami 2003). Besides this Soil Health Cards were provided to all the farmers and lime was applied on soil test result basis (10% of actual LR) and Seed treatment with Phosphate solubilizing bacteria was done was followed which has affected maize yield significantly.

Results and Discussion:

Table: Farmer-wise description of interventions:

Farmer Name	Item	Cropping system	Variety	Area (ha)	Date of sowing	Seed Yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross Income(Rs/ha)	Net return (Rs/ha)	B:C ratio[2]	System Productivity (ton/ha)
Mangal Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.32 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4800 kg/ha	105000.00	222000.00	117000.00	2.11	12.68
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June.2018 Maize: 10th to 25th December,2018	Paddy: 4200 kg/ha Maize: 2300 kg/ha	82300.00	109000.00	26700.00	1.32	7.26
Bodhini Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.32 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ ha Maize: 4600 kg/ha	1,03500.00	2,14,500.00	1,11,000.00	2.07	12.25
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June.2018	Paddy: 4000 kg/ ha	48,000.00	60,000.00	12000.00	1.25	-
Usharani Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 7000 kg/ ha	105700.00	218500.00	112800.00	2.06	12.45

			Maize: DA61A	Maize: 0.16 ha	Maize:10th to 25th December,2018	Maize: 4800 kg/ha					
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize:2300 kg/ha	82300.00	106000.00	23700.00	1.28	7.06
Chittaranjan Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.8 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ ha Maize: 4500 kg/ha	105090.00	216000.00	110910.00	2.05	12.34
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.8 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4200 kg/ ha Maize: 2400 kg/ha	81100.00	111000.00	29900.00	1.36	7.4
Sabi Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6800 kg/ ha Maize: 4800 kg/ha	106000.00	215000.00	109000.00	2.02	12.28
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2200 kg/ha	77500.00	104000.00	26500.00	1.34	5.93

Charan Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.48 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ ha Maize: 4800 kg/ha	103108.00	218500.00	115392.00	2.11	12.58
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.04ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2300 kg/ha	80000.00	91000.00	11000.00	1.13	6.06
Muni Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6800 kg/ ha Maize: 4300 kg/ha	95500.00	205000.00	109500.00	2.14	11.71
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Mansi Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ ha Maize:4500 kg/ ha	100000.00	212500.00	112500.00	2.12	12.4
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Brajabahadur Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti	Paddy: 0.72 ha	Paddy: 15th to 20th June,2018	Paddy: 6500 kg/ ha	98000.00	199750.00	101750.00	2.03	11.41

			Maize: DA61A	Maize: 0.08 ha	Maize:10th to 25th December,2018	Maize: 4300 kg/ha					
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.72 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2100 kg/ ha	75600.00	87000.00	11400.00	1.15	5.8
Jitendra Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.8 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 5600 kg/ ha Maize: 4100 kg/ha	98000.00	180000.00	82000.00	1.83	10.28
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.8 ha	Paddy: 15th to 20th June,2018	Paddy: 4100 kg/ ha	47600.00	61500.00	13900.00	1.29	-
Bijoy Kumar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6000 kg/ ha Maize:4700 kg/ha	82700.00	199000.00	116300.00	2.40	11.37
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	47500.00	60000.00	12500.00	1.26	-
Bodulaxmi Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th	Paddy: 6000 kg/ ha Maize: 42 kg/ha	99500.00	189000.00	89500.00	1.89	10.8

					December,2018						
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4200 kg/ ha	48000.00	63000.00	15000.00	1.31	-
Badal Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ ha Maize:4200 kg/ha	95300.00	208250.00	112950.00	2.18	11.9
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3800 kg/ ha Maize: 2000 kg/ha	84000.00	97000.00	13000.00	1.15	6.46
Rabindra Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Paddy: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ ha Maize: 4000 kg/ha	98000.00	206000.00	108000.00	2.10	11.77
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4100 kg/ ha	48000.00	61500.00	13500.00	1.28	-
Ramani Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.12 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6500 kg/ha Maize: 4000 kg/ha	98108.00	193750.00	95642.00	1.97	11.07
	Farmer's	Paddy-	Paddy:	Paddy:	Paddy: 15th to	Paddy:	80600.00	102000.00	21400.00	1.26	6.8

	practice	Maize	MTU 7029 Maize: Local	0.48 ha Maize: 0.08 ha	20th June,2018 Maize:10th to 25th December,2018	4000 kg/ ha Maize: 2100 kg/ha					
Ranjan Kumar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6200 kg/ha Maize: 4300 kg/ha	102815.00	194500.00	91685.00	1.89	11.11
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2100 kg/ha	82000.00	102000.00	20000.00	1.24	6.8
Birgumani Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4400 kg/ha	98625.00	210500.00	111875.00	2.13	12.02
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2000 kg/ha	82000.00	100000.00	18000.00	1.21	6.66
Binata Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti	Paddy: 0.56 ha	Paddy: 15th to 20th June,2018	Paddy: 7200 kg/ha	97100.00	216000.00	118900.00	2.22	12.34

			Maize: DA61A	Maize: 0.16 ha	Maize:10th to 25th December,2018	Maize: 4500 kg/ha					
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.56 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2000 kg/ha	79000.00	100000.00	21000.00	1.26	6.66
Swarna Kumar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 1.12 ha Maize: 0.24 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4300 kg/ha	101664.00	212000.00	110336.00	2.08	12.11
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 1.12 ha	Paddy: 15th to 20th June,2018	4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Ratna Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4200 kg/ha	100200.00	210000.00	109800.00	2.09	12.0
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Sankar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 7000 kg/ha	101000.00	202500.00	101500.00	2.00	11.57

			Maize: DA61A	Maize: 0.08 ha	Maize:10th to 25th December,2018	Maize: 4000 kg/ha					
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Pratesh Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy : 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ ha Maize: 4300 kg/ha	101101.00	210250.00	109149.00	2.07	12.01
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy : 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2000 kg/ha	75500.00	85000.00	9500.00	1.12	5.66
Surjya Kumar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy : 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4400 kg/ha	101000.00	210500.00	109500.00	2.08	12.02
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy : 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Balendra Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti	Paddy : 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 7000 kg/ha	99600.00	204500.00	104900.00	2.05	11.68

			Maize: DA61A	Maize: 0.016 ha	Maize:10th to 25th December,2018	Maize: 4100 kg/ha					
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy : 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Rabi Charan Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ ha Maize: 4400 kg/ha	103160.00	212250.00	109090.00	2.05	12.12
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Sabita Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.56 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6000 kg/ ha Maize: 4500 kg/ha	103010.00	195000.00	91990.00	1.89	11.14
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.56 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	12000.00	1.25	-
Rama Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.32 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th	Paddy: 7000 kg/ha Maize: 4300 kg/ha	103650.00	208500.00	104850.00	2.01	11.91

					December,2018						
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.32 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2000 kg/ha	80500.00	100000.00	19500.00	1.24	6.66
Alen Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.24 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4500 kg/ha	99500.00	212500.00	113000.00	2.13	12.14
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2300 kg/ha	76200.00	91000.00	14800.00	1.19	6.06
Badharai Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.32 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6200 kg/ha Maize:4600 kg/ha	103100.00	200500.00	97400.00	1.94	11.45
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha Maize: 2100 kg/ha	77000.00	102000.00	25000.00	1.32	6.8

Tarit Kumar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ ha Maize: 4500 kg/ha	97500.00	214250.00	116750.00	2.19	12.24
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	13000.00	1.27	-
Abhijit Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4300 kg/ha	99700.00	208500.00	108800.00	2.09	11.91
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	46700.00	60000.00	13300.00	1.28	-
Rebati Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4000 kg/ha	99200.00	206000.00	106800.00	2.07	11.77
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3200 kg/ ha Maize: 2000 kg/ha	75700.00	88000.00	12300.00	1.16	5.86
Anjurani	Treatment	Paddy-	Paddy:	Paddy:	Paddy: 15th to	Paddy:	99766.00	212000.00	112234.00	2.12	12.11

Debbarma	/ demo	Maize	Gomoti Maize: DA61A	0.64 ha Maize: 0.16 ha	20th June,2018 Maize:10th to 25th December,2018	7200 kg/ha Maize: 4300 kg/ha					
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.4 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3400 kg/ ha Maize: 2300 kg/ha	77100.00	105500.00			6.46
Hiralal Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.96 ha Maize: 0.32 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4500 kg/ha	97500.00	216000.00			12.34
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.96 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00			-
Sarubala Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.8 ha Maize: 0.32 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4600 kg/ha	100620.00	214500.00	113880.00	2.13	12.25
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.8 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3100 kg/ ha Maize: 2400 kg/ha	75500.00	94500.00	19000.00	1.25	5.84

Fulrani Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6200 kg/ha Maize: 4000 kg/ha	100500.00	188500.00	88000.00	1.87	10.77
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	4000 kg/ ha	48000.00	60000.00	13000.00	1.27	-
Mitra Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6000 kg/ ha Maize:4300 kg/ha	99500.00	191000.00	91500.00	1.91	10.91
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2000 kg/ha	74500.00	100000.00	25500.00	1.34	6.66
Sunil Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.96 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4200 kg/ha	105450.00	206500.00	101050.00	1.92	11.8
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.96 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	13000.00	1.27	-

Shital Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.8 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ha Maize: 4000 kg/ha	99680.00	204250.00	104570.00	2.04	11.67
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.8 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2400 kg/ha	79000.00	93000.00	14000.00	1.17	6.2
Sukurani Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4200 kg/ha	98350.00	210000.00	111650.00	2.13	12.0
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy; 2600 kg/ ha Maize: 2000 kg/ha	73100.00	79000.00	5900.00	1.08	5.2
Biswajit Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize:	Paddy: 0.64 ha Maize:	Paddy: 15th to 20th June,2018 Maize:10th to	Paddy: 7000 kg/ha Maize:	100168.00	206500.00	106332.00	2.06	11.8

			DA61A	0.08 ha	25th December,2018	4200 kg/ha					
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	13000.00	1.27	-
Biraja Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6100 kg/ ha Maize: 4000 kg/ha	99500.00	186750.00	87250.00	1.87	10.67
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3600 kg/ ha Maize: 2100 kg/ha	79000.00	96000.00	17000.00	1.21	6.4
Purnimala Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4300 kg/ha	101096.00	208500.00	107404.00	2.06	11.91
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.64 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	13000.00	1.27	

Amrish Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4300 kg/ha	98696.00	212000.00	113304.00	2.14	12.11
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2000 kg/ha	75000.00	85000.00	10000.00	1.13	5.66
Arun Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.24 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6200 kg/ha Maize: 4000 kg/ha	100200.00	188500.00	88300.00	1.88	10.77
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2100 kg/ha	73500.00	87000.00	14000.00	1.18	5.8
Malen Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6700 kg/ ha Maize: 4500 kg/ha	99500.00	207250.00	107750.00	2.08	11.84

	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Maize: 4000 kg/ ha Maize: 2400 kg/ha	81000.00	108000.00	27000.00	1.33	7.2
Birmohan Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4100 kg/ ha	98000.00	204500.00	106500.00	2.08	11.68
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 3000 kg/ ha	46900.00	60000.00	13100.00	1.27	-
Sanjit Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6800 kg/ha Maize: 4100 kg/ ha	100500.00	201000.00	100500.00	2.0	8.78
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy; 3900 kg/ ha Maize: 2400 kg/ha	80500.00	106500.00	26000.00	1.32	7.1

Samprai Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ha Maize: 4500 kg/ha	101500.00	216000.00	114500.00	2.12	12.34
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2300 kg/ha	81600.00	106000.00	24400.00	1.29	7.06
Baijanti Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4000 kg/ha	100000.00	202500.00	102500.00	2.02	11.57
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3800 kg/ ha Maize: 2100 kg/ha	78500.00	99000.00	20500.00	1.26	6.6
Sayati Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.72 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6500 kg/ ha Maize: 4500 kg/ha	103500.00	203750.00	100000.00	2.22	11.64

	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.72 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	13000.00	1.27	-
Parendra Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.8 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ha Maize: 4600 kg/ha	101500.00	214550.00	113050.00	2.11	12.25
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.8 ha	Paddy: 15th to 20th June,2018	Paddy: 3900 kg/ ha	40500.00	58500.00	18000.00	1.44	-
Nikhil Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6000 kg/ha Maize: 4600 kg/ha	99000.00	197000.00	98000.00	1.98	11.25
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2400 kg/ha	79200.00	93000.00	13800.00	1.17	6.2
Bamrai Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.8 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th	Paddy: 6800 kg/ha Maize: 4500 kg/ha	99500.00	209000.00	109500.00	2.10	11.94

					December,2018						
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.8 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2300 kg/ha	81500.00	106000.00	24500.00	1.30	7.06
Srimati Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6300 kg/ha Maize: 4200 kg/ha	100500.00	194250.00	93750.00	1.93	11.1
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2400 kg/ha	80000.00	93000.00	13000.00	1.16	6.2
Sudhanya Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ ha Maize: 4100 kg/ha	99505.00	204500.00	104995.00	2.05	11.68
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize:	Paddy: 0.48 ha Maize: 0.0.4 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th	Paddy: 3100 kg/ ha Maize: 2100 kg/ha	78500.00	88500.00	10000.00	1.12	5.9

			Local		December,2018						
Sulekha Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ ha Maize: 4100 kg/ha	102000.00	206250.00	104250.00	2.02	11.78
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	48000.00	60000.00	13000.00	1.27	-
Adhinkanya Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize:0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6800 kg/ ha Maize: 4400 kg/ha	980000.00	207000.00	109000.00	2.11	11.82
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2100 kg/ha	80500.00	102000.00	21500.00	1.26	6.8
Annarani Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th	Paddy: 7000 kg/ ha Maize: 4500 kg/ha	101000.00	212500.00	111500.00	2.10	12.14

					December,2018						
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2300 kg/ha	81500.00	106000.00	24500.00	1.30	6.62
Bishu Kumar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.12 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6000 kg/ ha Maize: 4500 kg/ha	100000.00	195000.00	95000.00	1.95	11.14
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.08 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2100 kg/ha	82000.00	102000.00	20000.00	1.24	6.8
Niran Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ ha Maize: 4600 kg/ha	101000.00	218000.00	117000.00	2.15	12.45
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize:	Paddy: 0.64 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th	Paddy: 4000 kg/ ha Maize: 2200 kg/ha	79000.00	104000.00	25000.00	1.31	6.93

			Local		December,2018						
Mantu Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7200 kg/ ha Maize: 4300 kg/ha	100500.00	212000.00	111500.00	2.10	12.11
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2000 kg/ha	81500.00	100000.00	18500.00	1.22	6.66
Usharani Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.64 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7100 kg/ ha Maize: 4000 kg/ha	100500.00	204250.00	103750.00	2.03	11.67
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.64 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3000 kg/ ha Maize: 2200 kg/ha	78000.00	89000.00	11000.00	1.14	5.93
Arjun Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize:	Paddy: 0.48 ha Maize:	Paddy: 15th to 20th June,2018 Maize:10th to	Paddy: 6900 kg/ ha Maize:	99500.00	202750.00	103250.00	2.03	11.58

			DA61A	0.16 ha	25th December,2018	4100 kg/ha					
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.48 ha	Paddy: 15th to 20th June,2018	Paddy: 4000 kg/ ha	47500.00	60000.00	12500.00	1.26	-
Amit Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.32 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ ha Maize: 4200 kg/ha	99500.00	206500.00	107000.00	2.07	11.8
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.32 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3200 kg/ ha Maize: 2100 kg/ha	79500.00	90000.00	10500.00	1.13	6.0
Upendra Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.32 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6700 kg/ ha Maize: 4400 kg/ha	98000.00	205250.00	107250.00	2.09	11.72
	Farmer's practice	Paddy	Paddy: MTU 7029	Paddy: 0.32 ha	Paddy: 15th to 20th June,2018	Paddy: 3800 kg/ ha	45600.00	57000 .00	11400.00	1.25	-

Sishu Kumar Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 6700 kg/ ha Maize: 4500 kg/ha	103500.00	207250.00	103750.00	2.00	11.84
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 4000 kg/ ha Maize: 2300 kg/ha	81200.00	106000.00	24800.00	1.30	7.06
Nirmal Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 7000 kg/ ha Maize: 4100 kg/ha	102000.00	204500.00	102500.00	2.00	11.68
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3900 kg/ ha Maize: 2200 kg/ha	82000.00	102500.00	20500.00	1.25	6.83
Chitta Debbarma	Treatment / demo	Paddy-Maize	Paddy: Gomoti Maize: DA61A	Paddy: 0.48 ha Maize: 0.16 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th	Paddy: 6900 kg/ ha Maize: 4000 kg/ha	107500.00	200750.00	93750.00	1.86	11.47

					December,2018						
	Farmer's practice	Paddy-Maize	Paddy: MTU 7029 Maize: Local	Paddy: 0.48 ha Maize: 0.04 ha	Paddy: 15th to 20th June,2018 Maize:10th to 25th December,2018	Paddy: 3600 kg/ ha Maize: 2300 kg/ha	82000.00	100000.00	18000.00	1.21	6.66

On an average the farmers got an average yield of 11.63 t/ha REY (Rice Equivalent Yield) with a gross returns of Rs. 200711.00 ha /year. The increase in productivity could get possible due to the adaptation of various interventions with integrated Crop Management. Moreover, after this successful intervention many of the farmers of nearby villages are also coming in huge number to adopt scientific crop management practice in paddy-maize sequence to improve their economic status.

Conclusion:

Through all these successful interventions in Paddy and Maize, the productivity and profitability of the farmers increased significantly. Mr. Charan Debbarma, one of the progressive farmer of North Pulinpur ADC village has been awarded with Prestigious ICAR Pandit Deen Dayal Upadhaya Antodaya Puruskar, 2018 based on his farming activity on efficient utilization of natural resources

This successful technology is now horizontally spreading to the nearby villages having similar Agro-climatic Condition. By convergence with other line departments this successful model can be replicated to the many other villages of Tripura having similar Agro climatic and socio economic condition.

7

IMPACT OF CUSTOM HIRING CENTRE ESTABLISHED UNDER NICRA

Table 1: List of the Farm implements procured under NICRA for CHC since the inception of the programme

Sl. No.	Name of the equipment	No.	Rental charges (Rs/hr or Rs/day)	Cost of the equipment
1	RPT	1	Rs1875/ha	2,48,960.00
2	Power Tiller	1	Rs 2187.5/ha	18,0000.00
3	Knap Sac Sprayer	10	Rs 20/day	2950.00/piece
4	Power Sprayer	3	Rs. 30/day	3500.00/piece
5	Pump set	2	Rs 100/hr	12,400.00/piece
6	Solar Nano Pump	1	Rs. 200/year	31,503.00
7	Power Thresher	1	Rs1875/ha	1,75000.00
8	Wheel Hoe	1	Rs 10/day	2327.00
9	Weed Cutter	1	Rs 3/day	28,520.00
10	Water cane	25	Rs 3/day	250.00
11	Khurpi	25	Rs 3/day	275.00
12	Hand Transplanter	25	Rs 10/day	150.00
13	Hand fork weeder	25	Rs 3/day	650.00
14	Cono Weeder	8	Rs 3/day	1990.00
15	Aerotor	1	Rs. 500.00/year	31,503.00

I. Impact of Custom Hiring Centre

1. Machinery inventories in NICRA village:

Name of Machineries	Before CHC (No.)2011	After CHC establishment (as on December 31, 2021)
No. of tractors		
No. of power tillers	10	13
1. Drum seeder	-	1
1. Any other (specify) 2. RPT 3. Hand Transplanter	- -	1 - 25
Type and no. of weeding Implements		
1. Manual wheel hoe		1
Weed cutter	-	1
Hand fork weeder	10	25
Cono weeder	-	1
Type and no. of sprayers		
1. Manual operated (Knapsack sprayer)	12	70
2. Power operated	3	4
Type and no. of harvesting equipment		
Sickle	700	840
Rake	-	2
Type and no. of threshers		
Crop specific thresher	-	1

2. Impact of CHC on Expansion of Mechanized Area in the Village

Parameters	Before CHC	After CHC establishment
Total cultivable area (ha)	200 ha	250 ha

Irrigated (ha)	51 ha	175 ha
Rainfed (ha)	200 ha	250 ha
Labour availability (nos.)	5 nos. /Day	2 nos. /Day

3. Area Covered By Each Implement (Year Wise Details):

Implement and operation	**Crop**	**Total Area covered (both *kharif* and *rabi*) (in ha)**							
		2012-13	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Power Tiller **Operation:** Ploughing	Paddy, Maize, Bitter gourd, Cucumber, Brinjal	15.52	5.54	15.36	20.04	2.08	6.08	21.16	11.2
Pump set **Operation:** Irrigation	Maize, Bitter gourd, Cucumber, Brinjal	2.56	1.28	0.16	-	-	-	-	-
Weeder **Operation:** Weeding	Paddy	4.48	6.88	0.48	4.56	0.64	-	3.2	0.8
Water cane **Operation:** Irrigation	Maize, Bitter gourd, Cucumber, Brinjal	6.4	1.92	0.8	0.48	1.12	-	2.2	2.72
Sprayer **Operation:** Spraying	Paddy, Maize, Bitter gourd, Cucumber, Brinjal	3.36	5.6	0.64	2.64	0.48	-	-	-
Nano Pump **Operation:** Irrigation	Maize, Bitter gourd, Cucumber, Brinjal	-	-	-	-	-	1.04	13.6	15.2
		Revenue generated (Rs.)							
		2012-	**2013-**	**2014-**	**2015-**	**2016-**	**2017-**	**2018-19**	**2019-**

		13	14	15	16	17	18		20
Power Tiller	Paddy, Maize, Bitter gourd, Cucumber, Brinja	34125.00	33960.00	43200.00	61625.00	6500.00	15290.00	75640.00	50020.00
Pump set	Maize, Bitter gourd, Cucumber, Brinjal	2400.00	3100.00	-	-	-	-		-
Weeder	Paddy	560.00	730.00	-	550.00	80.00	-	200.00	280.00
Water cane	Maize, Bitter gourd, Cucumber, Brinjal	45.00	150.00	230.00	50.00	-	-	200.00	100.00
Sprayer	Paddy, Maize, Bitter gourd, Cucumber, Brinjal	440.00	610.00	120.00	150.00	40.00	-		-
Nano Pump	Maize, Bitter gourd, Cucumber, Brinjal	-	-	-	-	-	-	600.00	900.00
		No. of farmers accessing CHC							
		2012-13	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Power Tiller	Paddy, Maize, Bitter gourd, Cucumber, Brinja	36	35	22	22	6	50	29	41
Pump set	Maize, Bitter	18	8	1	-	-		-	

	gourd, Cucumber, Brinjal								
Weeder	Paddy	21	16	1	9	2	-	7	9
Water cane	Maize, Bitter gourd, Cucumber, Brinjal	19	3	3	2	2	-	17	7
Sprayer	Paddy, Maize, Bitter gourd, Cucumber, Brinjal	24	17	6	7	2	-	-	
Nano Pump	Maize, Bitter gourd, Cucumber, Brinjal	Nil	Nil	Nil	Nil	Nil	3	42	35

4. Improved Crop Management Practices Adopted:

Crop	**Type of implement used**	**Type of improved practice adopted by farmers (fill with number as given)** Residue incorporation (1) Zero till drill (2) Ridger (3) Bed planting (4) Direct paddy seeding (5) Drum seeder (6) Mulching (7) Conservation furrow (8) Herbicide application (9) Intercropping (10) Any other (specify)	**No. of farmers adopted (as on date)**	**Total area covered (ha) (as on date)**	**Benefits in terms of saving resources or inputs/ timely operation**
Lentil, Field pea	Power tiller, Sprayer	Zero till drill (2)	13 nos.	5.4 ha	Timely sowing, Irrigation management,

					weed management, Adequate drainage management.
Potato	Power tiller, Water cane, Sprayer	Ridger (3)	57 nos.	13.36 ha	Timely sowing, Irrigation management, weed management, Adequate drainage management.
Paddy	Power tiller, Sprayer	Bed planting (4)	292cnos.	168.4 ha	Timely nursery raising and transplanting operations, Irrigation management, weed management, Adequate drainage management.
Bitter gourd	Power tiller, Water cane, Sprayer	Mulching (7)	362 nos.	86.38 ha	Timely sowing, Irrigation management, weed management, Adequate drainage management.
Maize	Power tiller, Water cane, Sprayer	Conservation furrow (8)	197 nos.	79.5 ha	Timely sowing, Irrigation management, weed management, Adequate drainage management.
Maize, Lentil, Rapeseed and Mustard, Off Season Radish Crop, Potato,	Power tiller, Water cane, Sprayer	Crop diversification	60 nos.	4.208 ha	Timely sowing, Irrigation management, weed management, Adequate drainage management.

Tapioca					
Garden pea	Power tiller, Water cane, Sprayer	Contingency crop	35 nos.	3.38	Timely sowing, Irrigation management, weed management, Adequate drainage management.
Dhaincha	Power tiller	Green manuring	17 nos.	1.84 ha	Increasing nitrogen fixation, Increasing organic matter and soil humus, prevention of soil erosion, protection of the soil surface.

5. Amount Spent on Repair and Maintenance of Implements Kept at Chcs Till Date:

Name of implement	Problem encountered	Amount spent (Rs.) on repair and maintenance	Total (Rs.)
Power Tiller	Repair, Damage of Parts	41060.00	41060.00
Power Thresher	Repair , Damage of parts	4065.00	4065.00
Sprayer	Repair , Damage of parts	1250.00	1250.00
Weeder	Repair , Damage of parts	780.00	780.00
Pumpset	Repair , Damage of parts	500.00	500.00
Any person specifically employed to look maintain CHC (Yes/No)	No	NA	NA
If yes, salary/honorarium to the person (Rs/year)	NA	NA	**NA**
Housing of CHC	Permanent/temporary; Individual property/ Community or village property	Temporary	

Accessibility of CHC	Centrally located/ not centrally located; Accessible to all communities/ Not accessible to all	Centrally Located	
Whether log book maintained and updated regularly	Yes/No	Yes	

6. Implements Kept Aside or Not Being Used

Name of implement	Reason
RPT (Paddy Transplanter Machine)	Small land holding of the farmers made it difficult for the farmers to use RPT.
Power Thresher	Farmers have using conventional methods of paddy threshing manually by animals, power tiller and other vehicles.
Wheel Hoe	Farmers are using their own.
Khurpi	Farmers are using their own
Hand Transplanter	Farmers are using their own.
Sickle	Farmers are using their own.
Rake	Farmers are using their own.
Aerotor	Lack of water during dry season not allowed the farmers to use Aerotor

7. List of Five Problems Encountered By the VCRMC While Running the CHC

1. Lack of machineries.
2. Damages of machinery spare parts.
3. Labour crisis.
4. Lack of irrigation.
5. Poor agricultural marketing facilities.
6. Lack of knowledge about modern agricultural mechanization

8. Suggestion For Strengthening/Improving The Success Rate Of CHC:

Permanent protected shelter shed is essential under the project for protection of instruments as well as daily maintenance to improve the performance of CHC. Demonstration on implements which save the other input like fertilizer or chemical. More training and exposure are required to increase farmer's interest. Required more nos. of like Power Tiller, Cono weeder, Spray Machine, Pump set.


Custom Hiring Centre


REFF CHART

8

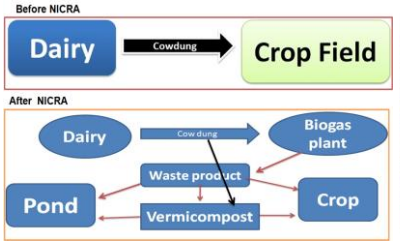
IMPACT OF CLIMATE RESILIENT TECHNOLOGICAL INTERVENTIONS DEMONSTRATED THROUGH NICRA AT NORTH PULINPUR ADC VILLAGE

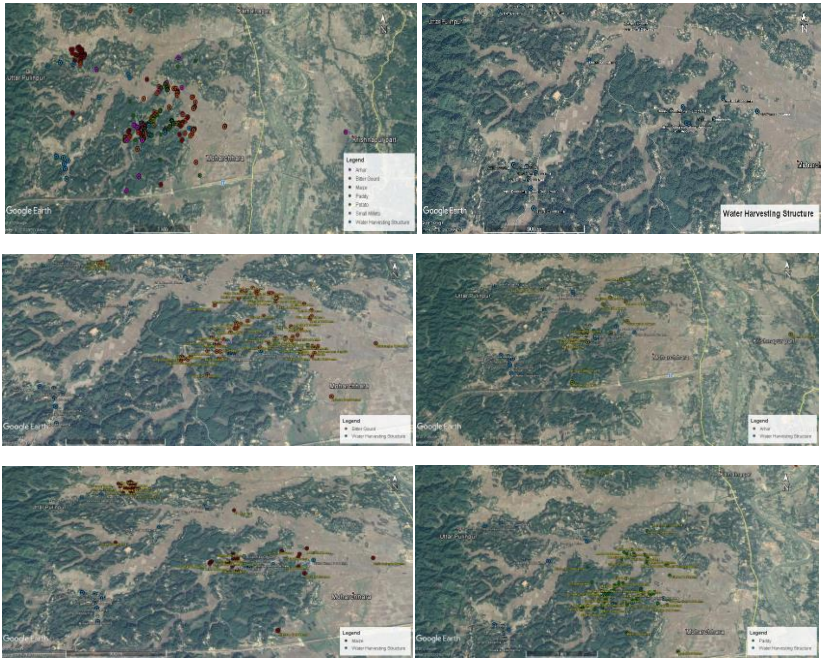
S. No	Impact indicator	Value of the impact indicator (Kg/ha, l/animal/ day, number, area (ha), cubic meters , other value as per indicator)	
		Before adoption of the village	Present value (after total years of adoption)
1.	Community water harvesting structures (All put together)	55 nos.	60 nos.
2.	Percolation tanks	Nil	Nil
3.	Check dams	Nil	Nil
4.	Sand bag checkdams	Nil	Nil
5.	Ahars/pynes	Nil	Nil
6.	Jal Kund	Nil	3 Nos.
7.	Farm ponds	111 nos.	136 nos.
8.	Others (Specify)		
9.	No of bore wells present	NA	3 nos.
10.	No of open wells present	Nil	Nil
11.	Artificial recharge structures for bore wells	NA	NA
12.	No of bore wells that got recharged due to NRM interventions	Nil	3
13.	No of open wells that got recharged due to NRM interventions	Nil	NA
14.	Rain water harvesting potential created in the village (m3)	Not Recorded	26187 m3
15.	No. of days taken for flood water to recede	NA	NA

16.	Number of farmers having access to irrigation water	45	203
17.	Area brought under irrigation (during kharif) Ha	NA	10.2
18.	Area brought under irrigation (during rabi) Ha	NA	175
19.	Area brought under irrigation (during summer) Ha	Nil	Nil
20.	Average depth of ground water (meters) during rainy season	0.3	0.2
21.	Cropping intensity of the village (%)	116 %	170%
22.	Area under double cropping (ha)	40	175
23.	Area under in-situ moisture conservation technologies	0	122.78
24.	Area under improved sowing / planting methods- SRI	0	249.44
25.	Area under crop residue management (ha)	0	122.78
26.	Area under micro-irrigation (drip, sprinkler etc.) ha	0	0
27.	Area under soil nutrient management technologies (ha)	0	164.67
28.	Area under horticultural crops (ha)	12	135
29.	Net sown area of the village (ha)	250	425
30.	Net irrigated area of the village (ha)	40	175
31.	Names of field crops grown in the village (List out)	Paddy	Paddy,Maize,Arahar
32.	Names of horticultural crops grown in the village (List out)	Bittergourd	Bitter Gourd,CowPea,Potato
33.	Area under a diversified/ introduced crop grown in the village (ha)	40	175
34.	Area under abiotic stress tolerant (drought / cold/flood/salt) crop varieties	0	249.44
35.	Productivity of two important crops Crop 1	Paddy Productivity:3.7 ton/ha	Paddy Productivity:6.2 ton/ha
36.	Productivity of two important crops Crop 2	Bitter Gourd Productivity:52 q/ha	Bitter gourd and Maize Bitter Gourd:97 q/ha Maize: 52 q/ha
37.	Area under improved cropping	40	425

	systems- Inter cropping etc. (ha)		
38.	Quantity of seed of improved varieties produced in the village (q)	0	Paddy (Variety: Tripura Nirog) 2.3 Quintal, during 2017-18
39.	Area under annual green fodder (ha)	Nil	0.08
40.	Area under perennial green fodder (ha)	Nil	0.48
41.	Quantity of silage produced / year (q)	Nil	Nil
42.	Quantity of green fodder available during lean months (q)	Nil	Nil
43.	No. of farm families with Back Yard Poultry	55	220
44.	No. of farm families with fisheries component	72	145
45.	Number of families having livestock component (cattle, small ruminants, BYP and fisheries put together)	1050	1930
46.	Number of farm families having access to veterinary care	250	1150
47.	Number of disease epidemics in cattle/year	2	1
48.	% mortality among cattle	10%	2%
49.	Number of disease epidemics in small ruminants/year	2	1
50.	% mortality in small ruminants	10%	2%
51.	Number of disease epidemics in poultry/year	2	1
52.	% mortality in poultry	15%	5%
53.	Number of disease epidemics in piggery/year	1	1
54.	% mortality in piggery	10%	2%
55.	Rate of conception among cattle	50%	70%
56.	Period of lactation in cattle	5 months	7 months
57.	Number of farm implements related to crop residue management available in the village	70	125
58.	Total mechanized area (ha)	200	250
59.	Irrigated mechanized area (ha)	0	175

60.	Rainfed mechanized area (ha)	200	250
61.	No. of farmers having access to farm machinery	125	575
62.	Number of farm families having access to weather based agro-advisories	Nil	127
63.	Number of farm families having access to institutional credit	45	159
64.	Number of farm families having availed crop insurance schemes	0	48
65.	Number of community-based organization functional in the village	25	35






Google Earth
Water Harvesting Structure

9

CONCLUSION

Climate change pertains to increase in atmospheric concentration of carbon di oxide and global warming. Present day atmospheric carbon di oxide level hovers around 397 ppm which is significant increase over the pre-industrial level of 280 ppm. It is anticipated that the concentration level will double by the end of this century. A consequence of increased green house gas emissions is the entrapment of heat within the earth"s atmosphere leading to an alarming rate of global warming. Global average increase in mean annual temperature is estimated 0.8 degree Celsius till now. An increasing rate of warming has taken place across the globe over the last 25 years. For example 11 of the 12^{th} warmest years on record have occurred in the 1996-2005 period. Global mean temperatures are likely to witness of 4 degree Celsius towards the end of this century. Between the seasons warming in the rainy season will be less pronounced than the winter months in India (IMD, 2010). Another climate change features significantly influencing agro-ecosystems is the change in seasonal rainfall patterns. Increased frequency in occurrence of extreme weather events such as cyclones, heat wave, cold wave, frost and hail storm over short period exert adverse influence on crop performance.

Farmers need to intelligently adapt to the changing climate in order to sustain crop yields and farm income. Traditionally technology transfer in agriculture has aimed to increase the farm productivity. However, in the context of climate change farmers need to adapt quickly to enhance their resilience to increasing threats of climatic variability such as droughts, floods and other extreme weather events. Over the years an array of practices and technologies have been developed by researchers towards fostering stability in agricultural production against the onslaught of seasonal variation. Adoption of such resilient practices and technologies by farmers appears to be more a necessary than an option. Therefore, a reorientation in technology transfer approach is necessary.

Under the National Innovations in Climate Resilient Agriculture (NICRA) Project KVK, Khowai has mainly worked to meet the following objectives:

- Increasing water storage capacity for irrigation.
- Sustainable soil health management
- Assimilation of better agronomical and horticultural practices to sustain farm profit.
- Crop diversification.
- Development of integrated farming system.
- Providing nutritional security.
- Capacity building of the farmers to adopt with changing climate.

Before implementation of NICRA project to North Pulinpur ADC village, most of the areas remain dry during rabi season. After the intervention, approximately 26187 ft^3 rainwater had been harvested covering an area of about 135.0 ha for winter vegetables and rabi maize cultivation and during dry period. In addition to this, a total area of about 1 ha waste land had been converted to paddy land using water from community bund. Ponds were also used for composite fish culture with average yield of 30 q/ farmer/ year/ ha during 2018-19

KVK, Khowai has successfully introduced TPS presently known as Hybrid Potato Seed (HPS) technology which was previously unknown to the farmers of North Pulinpur as comparatively less irrigated second crop after *Aman* paddy with the provision of irrigation from the rejuvenated pond or newly excavated pond under NRM intervention of NICRA. Similarly, after kharif paddy fallow land is now successfully utilized by introduction of second crops like maize var. HQPM, vegetable pea var. Arkel as short duration variety, lentil var. WBL 77 as relatively drought tolerant variety, bitter gourd with mulching practice to conserve soil moisture and by using irrigation water through nano pumps introduced under NICRA.

These water reservoir structures are also using for table fish production. Adaptation of SRI in paddy by the farmers could minimize the losses due to water shortage in paddy cultivation. Keeping in mind cluster demonstration on SRI paddy cultivation using high yielding variety of Paddy var. Gomoti, Tripura Chikon Dhan, Tripura Nirog Dhan was demonstrated at an area of 89 ha. Second crop for winter season after kharif paddy could also be grown earlier or in time if medium duration paddy varieties are grown instead of long duration commonly grown variety Ranjit that takes about 140-150 days

for harvesting. Through all these successful interventions on crop diversification, the cropping intensity of the village has been increased from 115 to 170 % within 7 years only. Besides this, all the successful climate resilient technologies are horizontally spreading to the nearby Village like Duski, Moharpara having similar Agro-climatic Condition. Lack of adequate proper climate resilient technology, reluctance among the beneficiaries to adopt climate resilient new technology and lack of coordination, interest for social service and proper understanding among the members of VCRMC are the major constrains facing during implementation of various interventions. These problems could be solved by introduction of adequate technology related to climate and institutional intervention like VCRMC which can easily solve farmer's problem in participatory mode involving local PRI body also. Collaboration with other related departments while demonstrating technologies creates greater impact.

Annexure-IV:

Newspaper coverage of NICRA Programme

Date/ year	Newspaper/media	Title
19.10.2011	Newspaper	Krishi unnayane bishesh udyog
13.09.2011	Newspaper	Krishir paribartan cheye krishak karmashala
11.07.2011	Newspaper	KVK organizes program
10.09.2012	Newspaper	Duskite krishi o jalabhao bishayee karmashala 12th
02.04.2012	Newspaper	Abahaowa paribartan o pranir rog sangkranta sachetanatamolak sibir
15.09.2012	Newspaper	Duskite Krishi Bishayak Karmashala Anoshthita
10.12.2014	Newspaper	KVK conducts field day on SRI
04.01.2014	Newspaper	KVK holds programme on livestock health camp
03.01.2015	Newspaper	KVK holds programme on livestock health camp
05.01.2015	Newspaper	Rajyeer BPL sankhabere chalaunnayan niyeprashna tullen Rajyapal
04.01.2015	Newspaper	Unnata Jelahote hole souineer khuthaai ante hobe BPL: Rajyapal
05.01.2015	Newspaper	Royal Regime is Gone: Governor
21.02.2015	Newspaper	NICRA implemented by KVK
05.01.2015	Newspaper	DivyodayKrishiVigyanKendreRajyapalKrishiNirbarDesheKrishakderUnnayan Agee chai
05.01.2015	Newspaper	Unnatihayethaklepratibatshar BPL paribarbar chekenaa, Khowai –a Rajyapal
12.07.2015	Newspaper	KVK organizes method demonstration program

08.04.2016	Newspaper	Pradhan Mantri Fasal Bima Yojana niyee krishakder Divyodayer class
08.04.2016	Newspaper	Krishi Vigyan Kendre Karmashala Fasal Bima Yojanar Gorata
22.06.2016	Newspaper	SRI Padhatite Chas, Krishakder Niyee Sachetanta Sibir
26.06.2016	Newspaper	Divyodayer Pathshalai SRI Padhatite Krishakder Class
23.05.2018	Newspaper	Fasal Bima Yojana Duskite Alochanachakra
17.05.2018	Newspaper	Krishi khetre sarbocha sanman Khowai Divyodaya kendrer
13.05.2018	Newspaper	Fasal Bima Yojana: Alochanachakra Divyodaye
13.05.2018	Newspaper	Pradhan Mantri Fasal Bima Yojana Duskite Alochanachakra
02.04.2018	Newspaper	Krishi Vigyan Kendrer Prashikhan Sibir Pulinpure
18.05.2018	Newspaper	Divyoday clinches top position in NE
12.05.2018	Newspaper	Fasal Bima Alochanasabha
23.05.2019	Newspaper	Botta Chaser upar karmashala
12.08.2019	Newspaper	Kartabe ek Nisthai puraskrita Divyodayeer Krishi Vigyani
2020	Newspaper	Lockdown samaye Divyodayeer Karmacharira Jinish Bitaran
2020	Newspaper	Duski bazare Sitkalin Sabji Chaser Prashikhan
2021	Newspaper	Krishakdeer Niye Sachetanata Sibir


SRI