5th Six-Month Report
April to October 2020

INTERNATIONAL RICE RESEARCH INSTITUTE
(IRRI)

ASSAM AGRIBUSINESS & RURAL TRANSFORMATION PROJECT
(APART)

INCREASING PRODUCTIVITY AND PROFITABILITY OF SMALL AND MARGINAL FARMERS IN RICE-BASED CROPPING SYSTEMS

WORLD BANK FINANCED

CONTRACT FOR TECHNICAL ADVISORY SERVICE

CONTRACT AGREEMENT NO: ARIASS/APART/106/2016

Date of submission of report: Oct 16, 2020

ARIAS Society
GOVERNMENT OF ASSAM
Assam Rural Infrastructure and Agricultural Services Society

ASSAM AGRICULTURAL UNIVERSITY

অসম চৰকাৰ
GOVERNMENT OF ASSAM

IRRI

In the succession of ARIASP and AACP, the Assam Agribusiness and Rural Transformation Project (**APART**) is the third-generation project from World Bank, since 1995. While the previous projects (ARIASP and AACP) focused on production/productivity enhancement, the APART focuses on climate-resilience, market-led production, post-harvest management, agro-processing, and agribusiness with its effectiveness from 17th January 2018 by World Bank. Knowledge Partnership Agreements signed with four international agencies, including the International Rice Research Institute (IRRI), on 16th March 2018, APART is being administered and coordinated by the Assam Rural Infrastructure and Agricultural Services (ARIAS) Society. The ARIAS Society is an autonomous body of the Govt. of Assam and acts as the Project Coordination Unit (PCU) for APART.

http://www.arias.in/apart.html

Email: spd@arias.in

Increasing productivity and profitability of small and marginal farmers in rice-based cropping systems

Acronyms

AAU	Assam Agricultural University
AEA	Agricultural Extension Agent
AFT	Axial Flow Thresher
AGDP	Agriculture Gross Domestic Product
ANLD	Anisotropic Non-Linear Diffusion
APART	Assam Agribusiness & Rural Transformation Project
APS	Assistant Project Scientist
ARIASS	Assam Rural Infrastructure and Agricultural Services Society
ARSAC	Assam Remote Sensing Application Centre
ASCL	Assam Seed Corporation Limited
ASDMA	Assam State Disaster Management Authority
ASSCA	Assam State Seed Certification Agency
ATM	Assistant Technology Manager
ATMA	Agriculture Technology Management Agency
AWD	Alternate Wetting and Drying
AWP	Annual Work-Plan
BINA	Bangladesh Institute of Nuclear Agriculture
BLB	Bacterial Leaf Blight
BMP	Best Management Practice
BPH	Brown Plant Hopper
BTAD	Bodoland Territorial Area Districts
BTM	Block Technology Manager
BVZ	Barak Valley Zone
CBVZ	Central Brahmaputra Valley Zone
CFT	Cool Farm Tool
DoA	Department of Agriculture
DRR	Directorate of Rice Research
DSR	Direct Seeding of Rice
EA & EM	Environmental Assessment & Environmental Management
EC	Emulsifiable Concentrate
EDA	Extrapolation Domain Analysis
FDP	Fertiliser Deep Placement
FPC	Farmer Producer Company
FPO	Farmer Producer Organization
FV	Farmer's Variety
GDP	Gross Domestic Product
GeM	Government e-Marketplace
GHG	Green House Gas
GIS	Geographic Information System
GPS	Global Positioning System
GRD	Ground Range Detected
GT	Ground Truth

GWP	Global Warming Potential
Ha	Hectare
HRS	Horticultural Research Station
HYV	High Yielding Variety
HZ	Hills Zone
ICMD	Integrated Crop Management Demonstration
ICT	Information and Communication Technology
IMD	India Meteorological Department
INM	Integrated Nutrient Management
INR	Indian Rupee
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
ISARC	IRRI South Asia Regional Centre
ITK	Indigenous Technical Knowhow
IWM	Integrated Weed Management
KCC	Kisan Credit Card
KVK	Krishi Vigyan Kendra
LA	Learning Alliance
LBVZ	Lower Brahmaputra Valley Zone
LCD	Learning Centre Demonstrations
LED	Light Emitting Diode
LST	Land Surface Temperature
MODIS	Moderate Resolution Imaging Spectro-radiometer
MOP	Muriate of Potash
MOT	Mitigation Option Tool
MSP	Minimum Support Price
MT	Master Trainer
MTPR	Mechanical Transplanting of Rice
NARES	National Agricultural Research and Extension System
NAS	Network Attached Storage
NASA	National Aeronautics and Space Administration
NBPZ	North Bank Plain Zone
NDVI	Normalized Difference Vegetation Index
NDWI	Normalized Difference Water Index
NESAC	North Eastern Space Application Centre
NEH	North East Hills
NER	North Eastern Region
NGO	Non-Government Organization
NRSC	National Remote Sensing Centre
ODT	Open Drum Thresher
OFAD	On-Farm Adaptive Demonstration
OLI	Operational Land Imager
OLM	Outcome Logic Model

PCA	Principal Component Analysis
PCU	Project Coordination Unit
PHM	Postharvest Mechanization
PIPA	Participatory Impact Pathway Analysis
PQR	Premium Quality Rice
PRM	Portable Rice Mill
PSC	Private Seed Company
PTR	Puddled Transplanted Rice
QSP	Quality Seed Production
RARS	Regional Agricultural Research Station
RCC	Reinforced Cement Concrete
RCM	Rice Crop Manager
RKB	Rice Knowledge Bank
SAR	Synthetic Aperture Radar
SBD	Solar Bubble Dryer
SHG	Self Help Group
SMAP	Soil Moisture Active Passive
SP	Service Provider
SRTM	Shuttle Radar Topographic Mission
STRV	Stress-Tolerant Rice Variety
TB	Tera Byte
ToT	Training of Trainers
UBVZ	Upper Brahmaputra Valley Zone
UPS	Uninterruptible Power Source
WUE	Water-Use Efficiency

Preface

Rice, the most important staple food crop of India, holds the key to the country's food security. It is grown in 44.5 million ha in India, and with an annual production of 172.6 million tons of paddy, is only next to China. In Assam, Agriculture is of subsistence nature, and a principal means of livelihood for more than 70% of the population, engaging 53% of the workforce for their livelihood. About 89% of rice in Assam is grown as rainfed in the basins of Brahmaputra and Barak rivers receiving heavy rainfall.

In Assam, rice is grown in ~ 2.5 million ha during three distinct seasons, i.e., *Sali* (winter), *Boro* (summer rice), and *Ahu* (Autumn). However, the productivity of rice in the state is only 3386 kg/ha, which is relatively low and unstable because of prevalent biotic and abiotic stresses, attributed mainly to the unpredictable and uneven distribution of rainfall. Besides, poor access to appropriate cultivars, non-availability of quality seed, lack of knowledge and access to information, and poor agronomy including late sowing/planting of inappropriately aged seedlings, limited availability of irrigation water, poor weed- and nutrient-management, add on the low productivity affecting the production.

Flood and drought are ubiquitous in Assam, causing a severe loss in the production, and the farmers face these mishaps year after year. Records show that the average annual area affected by the flood is 9.31 lakh ha in Assam, of which almost half (4.5 lakh ha) is chronically flood-prone. The flash-floods recur in different flushes, at different crop growth stages, for the different duration and variable depth of standing water. Sometimes, the early-season flood leaves deposits of eroded silt debris burying the fledging seedlings in the nursery or inundates newly transplanted crop, while at times, the flood persists for a longer period at nursery stage, forcing farmers for delayed transplanting using overaged seedlings

Dwindling resources, including land, water, energy, and rising environmental footprints, are the prime concerns challenging the sustainability of rice production. Rice productivity in Assam can be increased by accelerated adoption of stress-tolerant rice varieties (STRVs), growing healthy nurseries, transplanting healthy and appropriate-aged seedlings, improved management of soil, weed, water, nutrients and insect-pests, increasing cropping intensity, adopting mechanized crop establishment methods, and other crop management operations reducing harvest- and post-harvest losses, and rice value addition.

International Rice Research Institute (IRRI), a premier institute of rice science, with its primary mission to eradicate poverty, malnutrition, and hunger, protect health and environmental sustainability, strives to improve the livelihood of farmers. IRRI has a main goal to innovate for the global rice sector, catalyze the impact at a scale for people, and transform the rice-based cropping system. IRRI has developed several STRVs by implanting the Sub1 gene in the popular mega varieties in different regions, in collaboration with National Agricultural Research and Extension System (NARES) partners, including Assam Agricultural University (AAU), that are typically very much suitable for rainfed flood-prone areas of Assam.

Under Assam Agribusiness and Rural Transformation Project (APART), the contract on 'Increasing Productivity and Profitability of Small and Marginal Farmers in Rice-based Cropping Systems' was signed between Assam Rural Infrastructure and Agricultural Services Society (ARIASS), and IRRI on March 16, 2018. As one of the major international technology partners in APART, IRRI is providing technical support to the Department of Agriculture (DoA)-Agriculture Technology Management Agency (ATMA), and AAU centres including Krishi Vigyan Kendras (KVKs), Regional Agricultural Research Stations (RARSs) and Horticultural Research Station (HRS) for implementation of APART around following specific objectives:

I. Strengthening seed systems and adoption of high yielding stress-tolerant rice varieties
II. Raising productivity, profitability and resource-use efficiencies of rice-based cropping systems in Assam through improved crop- and natural resource- management, and scale-appropriate mechanization, and supporting a service-economy
III. Strengthening postharvest management by introducing improved practices including postharvest mechanization and a supporting service-economy to reduce losses, increase efficiency and profitability, and improve rice value-chain
IV. Developing extrapolation domain of cropping systems for efficient targeting of technologies in low-productivity rice-fallows and stress-prone areas
V. Developing knowledge materials, fostering strategic partnership, and capacity development of the various stakeholders (public, private, and developmental partners) of extension functionaries in Assam.

Executive Summary

Since the end of March 2020, the last seven months had been rough weather for the project due to COVID-19 pandemic, when a sudden national shutdown was clamped on March 24, resulting into instant stalling of all commercial and transport activities. It was a crucial time for rice farmers of Assam who had grown *Boro* paddy or preparing for transplanting the *Ahu* season crop. In the course of time, the government granted relaxation for completing the agricultural operations with prior permission, and the farmers could manage to harvest their *Boro* paddy, though the losses were huge in the agriculture and horticulture sectors due to lack or delay in input use, unripe harvest, and improper drying before storage. The occurrence of early floods in May-June hurled a double blow to the farmers growing paddy in *Ahu* season as their standing crop was severely damaged due to flood, forcing them to harvest before maturity. The early harvesting of immature crop attracted increased moisture in the grains which, when stored, were infested with the insect-pests causing qualitative and quantitative losses. The current COVID-19 pandemic scenario, intensified by the flooded situation in the state, signifies the role of mechanisation to help make good the losses and add value to rice, to a certain extent.

During 2020, in APART, the *Boro*/early *Ahu* season transplanting was completed in February, and at the time when the lockdown was imposed, the crop was at vegetative /grand-growth phase set for peak input (nutrient, water) use, that was severely affected due to sudden shutdown. But afterwards, due to the relaxation granted by the governments on the agricultural operations, farmers could manage their already sown crops. Consequently, the implementing partners, AAU and DoA, and IRRI joined together to tide over the situation and have achieved hundred per cent of their targets for the activities planned in the Annual Work Plan (AWP) 2019-20 for the *Boro* season 2020, and AWP 2020-21 for the *Sali* season 2020.

A total of 38,983 demonstrations with climate-resilient technology involving 45,341 beneficiaries covering 11,575 ha area were executed across all 23 districts of APART till *Sali* season 2020-21. In the current year, the APART has covered 4,066 ha area under 13,224 demonstrations and reached 15,368 beneficiaries during the *Sali*, 2020. Under objective-I, 'Strengthening seed system', the target of planned demonstrations with AAU, including dealer network demonstrations, cluster demonstrations, and head-to-head (H2H) was 100% achieved, whereas the 16 minikits were short, due to some delay in seed supply by the vendor at Cachar. Minikits planned by DoA-ATMA were achieved 100% during *Sali* season 2020. In *Boro*/early *Ahu* season 2019-20, targets of 650 H2H and 3,000 minikits were planned, of which 2990 minikits and 229 H2H demonstrations were achieved with AAU and DoA-ATMA, respectively, using BINA Dhan11 and DRR Dhan 44. The corresponding deficit (of 10, 421 nos.) in the above demonstrations happened due to short supply of seed by the vendor under objective I, that was made up in the following *Sali* season, 2020. The crop-cut data of *Boro* season 2019-2020 from 5% minikits, and all H2H demonstrations were collected by the technical teams of implementing partners located at KVKs/RARSs/HRS and DoA-ATMA centres and were shared with the IRRI for further analysis. After lockdown, the flood at the time of *Boro* season harvesting, hampered the crop cutting operation and data collection became difficult from the demonstration sites.

The analysis of the data revealed that STRVs BINA Dhan11 and DRR Dhan 44 were immensely superior to the local rice varieties in all districts during *Boro* season 2019-20 with an average yield of 6.0 t/ha, that was 1.0 t/ha higher than the traditional rice varieties. In 2020, the monsoon commenced a bit earlier than the normal, with devastating floods in May and June wrecking the young seedlings in the nurseries. But the Sub1 varieties responded marvellously by surviving the early season flood at the nursery to the early vegetative stage, which would further set off demand for their seeds in the time ahead. Besides, two cafeterias, each with 24 varieties, were planned and conducted at two respective locations, KVK Nagaon and RARS Titabar, during the current *Sali* season 2020.

Under objective II, 300 Integrated Crop Management Demonstrations (ICMDs) with STRVs and 50 ICMDs with Premium Quality Rice (PQR) were conducted with AAU. In addition to this, 2000 ICMDs with STRVs and 100 ICMDs with PQR were conducted with DoA-ATMA. Learning Centre Demonstrations (LCDs) numbering 120 on STRVs, and 40 on PQR were conducted with AAU. The alternative crop establishment

demonstrations including Wet-Direct Seeding of Rice (Wet-DSR) numbering 60, Dry-Direct seeding of rice (Dry-DSR) numbering 39 (1 short of target) and Mechanical Transplanting of Rice (MTPR) numbering 40 were conducted by AAU during *Sali* season 2020. For estimation and mitigation of GHGs, a deep fertiliser placement (FDP) experiment has been started with AAU, Jorhat. Besides, other sustainability measures such as emission of methane (CH_4), nitrous oxide (N_2O), and Global Warming Potential (GWP) of rice-based cropping systems, were measured using the Mitigation Option Tool (MOT)/Cool Farm Tool (CFT). Significantly higher GHG emission was estimated in the traditional puddled transplanted compared to mechanized direct-seeding and machine transplanting methods of establishment in rice in Assam.

Training and capacity building for handholding of different stakeholders, including farmers, extension functionaries, service providers, farmer producer organizations, farmer producer companies, private agri-input suppliers/dealers, were carried out through different programs. In the last 2 and a half years, 1151 activities, including trainings, exposure visits, and field days were organised involving 37,464 beneficiaries. Many of these trained persons are actively serving as master trainers in different training programs with AAU and DoA-ATMA. In the current *Sali* season 2020-21, a total of 206 activities including trainings on quality seed production (QSP) of rice, awareness meetings, dealer meetings, one-, two-, and three-day trainings, season-long trainings, post-harvest and rice value chain training/demonstrations were organized in twenty-three districts involving 5,504 beneficiaries. Under the objective I, a total of 30 QSP trainings, 4 awareness meetings and 3 dealers' meetings, were completed till Sep 30, 2020. Whereas under objective-II, during 2020-21, 31 one-day trainings, 10 two-day trainings, 2 three-day trainings, 2 season-long trainings, and 12 one-day trainings on mat-type nursery have been completed till Sep 30, 2020. A total of 13 field days on LCDs and alternative crop establishment methods with climate-resilient varieties DRR 44 and BINA Dhan11, were also organized at the maturity stage of *Boro*/early *Ahu* season crop in June and July 2020.

Women play an important role in Assam agriculture, so we ensure at least 1/3rd participation of women in the capacity building activities. A slight drop in women participation was observed in the capacity building activities due to COVID-19 pandemic during *Sali* season 2020, yet 27.4% participation of women was ensured under different capacity building activities across all objectives. Most of the key episodes of the field activities were adequately covered by local print media, and published in different Assamese and English newspapers. Some of the programs were broadcasted on local TV news channels. The project facilitated the sale of 3793.6 MT of paddy produced by the beneficiary farmers at Rs 1815/q, against the prevalent market price of ~ Rs 1400/q. The procurement process for *Sali* season harvest commenced from January 2020 to March 2020, when PPCs purchased around 1485.5 MT of paddy from farmers at MSP of Rs 1815/-. Similarly, the paddy procurement for the *Boro* season 2020 has commenced from July 1, 2020, till Sep 15, 2020. The procurement of paddy under APART was actuated with the procurement of 120 MT of BINA Dhan11 during *Boro* 2018-19, with the motive to enhance farmers' income.

The preparations for launching of Assam Rice Knowledge Bank (RKB), are almost in the final stage, the technical bids having already been evaluated by the technical committee of IRRI and AAU, the website may be launched and handed over to AAU by the end of December 2020. A total of 115 factsheets and 4 manuals were developed, and 79 factsheets have been shared for the printing in Assamese and English in the year 2020-21. In addition to this, during *Sali* season 2020, 3 RKB training programs on the usage of β-version of the Assam RKB portal were organized with 81 beneficiaries to facilitate easy access of information on rice production technology accessible at www.rkbassam.in. Realising the farmers' problem in timely identification and controlling the rice pests due to poor access to extension functionaries in the aftermath of COVID-19 lockdown, an App-based diagnostic tool - Rice Doctor, that provides an accurate and timely diagnosis of rice problems along with management recommendations, was proposed, and the ARIAS Society approved its budget. This App would help in the instant diagnosis of nearly 80 rice problems, including insect-pests, diseases, nutrient deficiencies, toxicities, etc. Based on IRRI and AAU's vast pool of knowledge, RKB Assam highlights on the step-by-step production technologies of rice from pre-planning to post-production management, varieties, resources, procurement processes, marketing services, different e-learning decision tools and agronomy guides, to help people make informed-decisions on farming. It was evaluated that for the current β-version of RKB, there are about 750 users per month.

Postharvest management and rice value-chain are the critical components in APART, and IRRI as a technical partner has suggested many viable mechanized alternatives to reduce drudgery and address the labour availability and cost issues in post-harvest operations. During the harvesting season of *Boro* 2020-21, most of the postharvest activities were completed, and thus a total of 29 postharvest trainings and 30 demonstrations, 7 rice value-chain trainings and 23 demonstrations, have been accomplished till Sep 30, 2020. For capacity building of different extension functionaries, farmer producer organizations/companies, self-help groups (SHGs) and progressive farmers, 3 two-day and 2 three-day trainings were completed. ten custom hiring centres at Nalbari, Morigaon, Jorhat, Sivasagar, Karbi Anglong (2), Darrang, Lakhimpur, Barpeta and Cachar have been initiated with the provision of transferring all machines procured by AAU at KVKs/RARSs under APART for one to two year. Private service providers have been created at district Cachar and Lakhimpur for Axial Flow Thresher (39) and Reaper (8). A total of 143 capacity building activities were accomplished till September 30, 2020, under the post-harvest component of IRRI under APART.

Under objective-IV, during the last six months, the major focus of the Image Processing and Geographic Information System (GIS) team of APART was equipping themselves with all the available tools and learning the latest methodologies for efficiently using this technology for various applications. A one-day training was organized at Guwahati with WorldFish team to locate the identified potential areas for paddy-fish farming under the rice-value chain. With the use of remote sensing data available from satellites, detailed maps and statistics were generated using image processing and GIS techniques for the year 2018-19 and 2019-20. To efficiently target the potential areas of Assam with available technologies, and to improve the cropping intensity, characterization of existing cropping systems was achieved by creating maps of cropping systems, cropping intensity, rice area, rice-fallow, soil moisture, crop suitability, and identifying the potential paddy-fish areas. For value addition, primary data

collection from ground surveys was initiated with the help of the Department of Fisheries to trace the paddy-fish potential areas. The secondary data were also collected from various sources to compare the satellite images. The analysis of the results of black gram demonstrations revealed that farmers got an additional income between Rs 5,000 and Rs 29,000 from rice-fallow areas by inserting an additional crop in the system with efficient soil-moisture utilization and increased cropping intensity. Besides these, a well-equipped GIS facility has been inaugurated and started functioning at AAU campus, Jorhat. A majority of the required instruments have already been procured, and the remaining items to be procured at the AAU level, are in the final stage of procurement. 3-day training on the procured software was imparted to the GIS team to acquaint them of the latest changes in the GIS domain. A GIS and RS based Atlas is in the final shape and will be ready for printing by the end of Oct 2020.

Table 1: Executive summary of physical targets and achievements during AWP 2020-21

Activities	Unit	Target	Achievement	Remarks
Objective I: Strengthening seed systems and the adoption of high yielding stress-tolerant rice varieties				
Minikit- AAU	No.	3000	2984	The shortfall of sixteen numbers were due to late seed supply by the vendor, to be accomplished in *Boro* season 2020-21
Minikit- ATMA	No.	5000	5010	10 shortfalls of *Boro* were accomplished in Sali season 2020
On-farm adaptive demonstration	No.	-	-	
Cluster demonstration	No.	350	350	
Demonstration through the dealer network	No.	400	400	
Head to head (*Sali*)	No.	800	800	
Head to head (*Boro 2019-20, Sali 2019-20 shortfall*)	No.	421	421	
Client-oriented crop cafeteria	No.	2	2	
Trainings on quality seed production	No.	30	30	
Awareness creation meetings at the district level, engaging multiple stakeholders*	No.	8	4	Activities are already planned, will be completed by Nov 2020
Dealer meetings*	No.	6	3	Activities are already planned, will be completed by Nov 2020
Stakeholders' meet*	No.	1		Planned in December 2020
Linkages for production and supply of BS and FS with public and private seed corporations	No.	3	3	

Data collection and analysis/ report writing/ hiring of short-term consultant	No.	1		
Extension materials/brochures/seed training material	000 INR	350	350	
Objective II: Raising productivity, profitability, and resource-use efficiencies of rice-based cropping systems in Assam through improved crop- and natural resource- management				
ICMDs for transplanted rice (*Sali*)	No.	2300	2300	
ICMDs for transplanted rice (*Boro*)	No.	-	-	
ICMDs for transplanted PQR	No.	150	150	
Learning centre demonstrations for transplanted rice (*Sali*)	No.	120	120	
Learning centre demonstrations for transplanted rice *(Boro*)	No.	-	-	
Learning centre demonstrations for transplanted PQR	No.	40	40	
Dry DSR	No.	40	39	1 short due to short supply of seed, to be accomplished in *Boro* season 2020-21
Wet DSR	No.	60	60	
MTPR	No.	40	40	
Capacity building				
Roundtable meetings for the promotion of service-economy/ handholding support to SPs and impact pathway assessment	No.			
One-day training	No.			
AAU	No.	12	11	Activities are already planned, will be completed till Nov 2020
ATMA	No.	22	21	
Two-day training (AAU)	No.	12	10	
Three-day training (AAU)	No.	2	2	
Season-long training (AAU)	No.	2	2	
Exposure visit	No.			
Within district	No.	6		Activities are already planned, will be completed till Nov 2020
Within Assam	No.	2		
Outside Assam	No.	1		

Training expenses/fees of extension functionaries at the institute of national and international importance	No.			
Within country	No. of person	15		To be completed with prior permission after analysing the situation of COVID -19
Outside country	No. of person	5		To be completed with prior permission after analysing the situation of COVID -19
Design, preparation, printing, and dissemination of outreach materials	000 INR			
IPM				
Demonstrations of improved IPM modules superimposed on OFADs in farmers' fields	No.	160	160	The IPM is superimposed on the dealer demonstrations
Supporting IPM with cluster demos	No.	350	350	
Rice Knowledge Bank (RKB)	No.			
Stakeholder workshops	No.	3		Activities are already planned, will be completed by Nov 2020
Video production	No.	12		The selected vendor was unable to deliver, therefore retendering is under process
Website development	No.			Beta version has already been released, vendor selection for the final version of RKB website is under process by the implementing partner. IRRI has provided all necessary inputs including the evaluation of the technical presentation made by the bidders to AAU on time.
RKB usage training	No.	12	5	Activities are already planned, will be completed by Nov 2020
Field testing of RKB	No.	1		

Management and maintenance of RKB	No.	8		Activities are planned, to be conducted after launch of final version of website.
Objective III: Strengthen postharvest management by introducing improved practices, including post-harvest mechanization and a supporting service economy to reduce losses, increase efficiency and profitability, and improve the rice value chain				
Demos of postharvest machineries for support and development of entrepreneurs at commercial level	No.	30	30	
Training of postharvest machineries for support and development of entrepreneurs at commercial level	No.	30	30	
Rice value chain related machinery training through entrepreneur with KVKs	No.	10	7	Activities are already planned, will be completed by Nov 2020
Rice value chain related machinery demonstration through entrepreneur with KVKs	No.	30	25	Activities are already planned, will be completed by Nov 2020
Round table meeting to enhance linkage of manufactures and service providers with policy-makers and other stakeholders	No	1		
Exposure Visit	No			
Within district	No	4		Activities are already planned, will be completed by Nov 2020
Within Assam	No	2		
Outside Assam	No			
Two-day trainings	No	5	3	Activities are already planned, will be completed by Nov 2020
Three-day trainings	No	5	2	
Preparation and dissemination of communication material	No	5	5	
Annual review and planning meeting	No	0		
Objective IV: Developing extrapolation domain of cropping system for efficient targeting of technologies in low-productive rice-fallows and Stress-prone areas				
Development of spatial database for developing extrapolation domains	%	7	7	
Acquisition planning for satellite data and procurement	%	20	20	
Pre-processing of satellite data and image classification, purchase of secondary data sets, high resolution multispectral sensor satellite and SAR data	%	9	9	

Creation of geo-spatial thematic layers, setting up needed thresholds for each parameter	%	25	25	
Site-wise collection of geo-referenced data to qualitatively validate classified outputs from 16 districts (including travel and associated costs)	%	16	16	
Preparation of decision rules and decision tree for mapping suitability domains of tested technologies	%	8	8	
Geo-spatial modelling for developing extrapolation domain maps for 4 innovative cropping systems (including travel and associated costs)	%	25	25	
Generation of extrapolation domain maps and qualitative validation (including travel and associated costs)	%	20	20	
Reports & maps prepared and shared with state partners for validation and use		15	15	
Development, framework and design of WebGIS	%	20	20	
Development of atlases, brochures, promotional and awareness creation material, and detailed reports and publications	%	40	40	
Multi-location farmer-participatory demonstrations to be conducted using extrapolation domain, cropping system maps including seed cost of pulses to target in rice-fallows	%	13	13	

Chapter 1: Detailed Report

1.1 APART reach

Assam, a state with a geographical area of 78,438 km^2, forms about 2.4% of the country's total geographic area and is the core of the North Eastern Region (NER) of India. It is situated in the South of the eastern Himalayas, between 89°42′ E to 96°E longitude and 24°8′ N to 28°2′ N latitude. It comprises three broad natural divisions, namely the Brahmaputra valley, the Barak valley, and the Hill range. The Brahmaputra valley is the largest long strip of plain land extending from the West to North-East in the northern part of the state. The river is the main source of life for the people of Assam and a contributing factor for the fertile agricultural land of the state. Adding quality to alluvial soil, the river Brahmaputra is a perennial source of water for the state. The southern part of the state is another valley with the river Barak passing through it, known as the Barak valley. This region is relatively small and accounts for only about 9% of the area of the state, accommodating about 12% of the state's population. The hilly range of Karbi Anglong and North Cachar lies in the middle of the state, separating the two valleys.

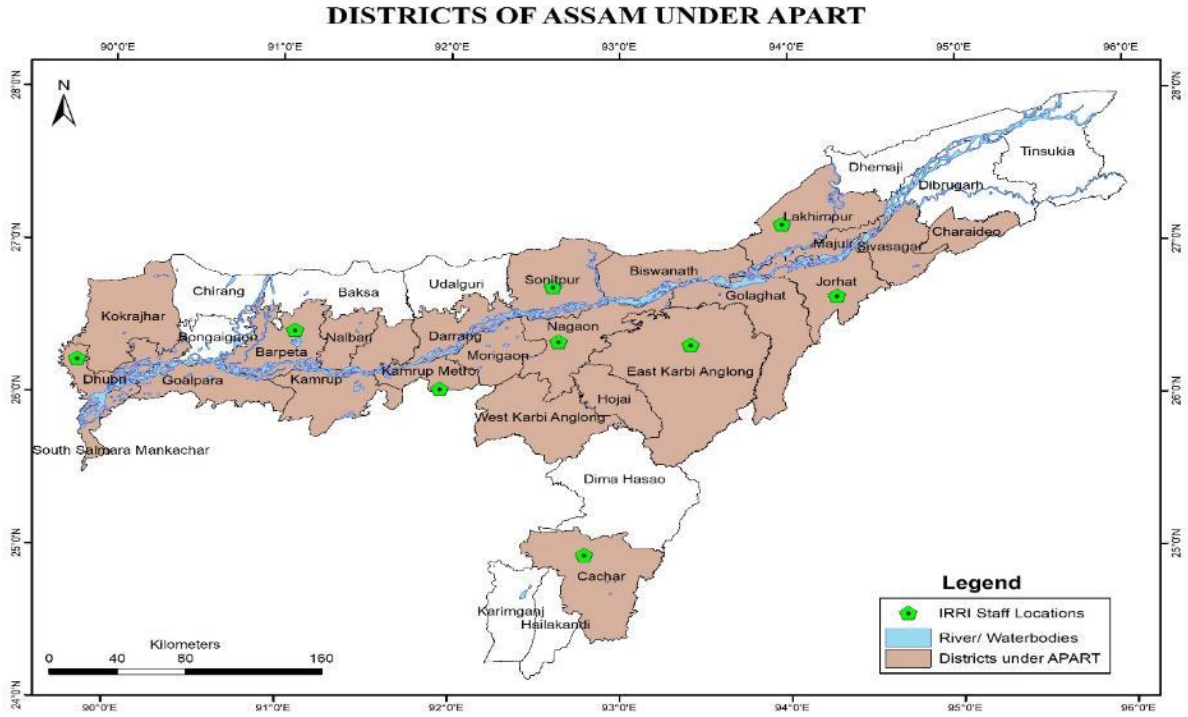


Fig. 1. Districts of Assam under APART

For rice program under APART, with the technical support of IRRI, twenty-three districts of Assam namely; Kamrup (R), Kamrup (M), Goalpara, Darrang, Nalbari, Barpeta, Dhubri, Mankachar, Kokrajhar, Jorhat, Nagaon, Golaghat, Lakhimpur, Sivasagar, East Karbi Anglong, West Karbi Anglong, Sonitpur, Morigaon, Majuli, Hojai, Cachar, Biswanath and Charaideo have been chosen. The selection criteria were based on the relative contribution to Agriculture Gross Domestic Product (AGDP) and physiographic landscape of the state. For better monitoring, efficient delivery, and handholding for implementation of APART activities, IRRI has deployed its team at 8 key locations, i.e., Guwahati, (Kamrup Metro), Cachar, Sonitpur, Jorhat, Dhubri, Lakhimpur, Barpeta and Karbi Anglong.

1.2 Agro-climatic zones

Based on the amount and characteristics of rainfall, temperature, relative humidity, terrain condition (a stretch of land with regard to its natural features), and soil characteristics, Assam has been broadly divided into six agro-climatic regions. They are:

1) The North Bank Plain Zone (NBPZ), comprises of the districts Dhemaji, Lakhimpur, Sonitpur, Udalguri (BTAD), and Darrang, contributing to 18.37% area of Assam.
2) The Upper Brahmaputra Valley Zone (UBVZ), comprises of the districts Tinsukia, Dibrugarh, Sivasagar, Jorhat, and Golaghat, and accounting for 20.40% of the total area of Assam.
3) The Central Brahmaputra Valley Zone (CBVZ) comprises of the districts Nagaon and Morigaon, accounting for only 7.08% of the area of the state. This region is bowl-shaped and often flooded.

4) The Lower Brahmaputra Valley Zone (LBVZ) comprises of the districts Kamrup, Nalbari, Barpeta, Bongaigaon, Kokrajhar, Chirang, Baksa, Dhubri, and Goalpara covering an area of 20,222 km^2, accounting for 25.75% of the area of the state.
5) The Barak Valley Zone (BVZ) comprises of the districts Cachar, Hailakandi, and Karimganj and covers a total area of 6,962 km^2, i.e., 8.9 % area of the state.
6) The Hills Zone (HZ) comprises of two districts Karbi Anglong and North Cachar Hills, encompassing 19.4% of the total state area.

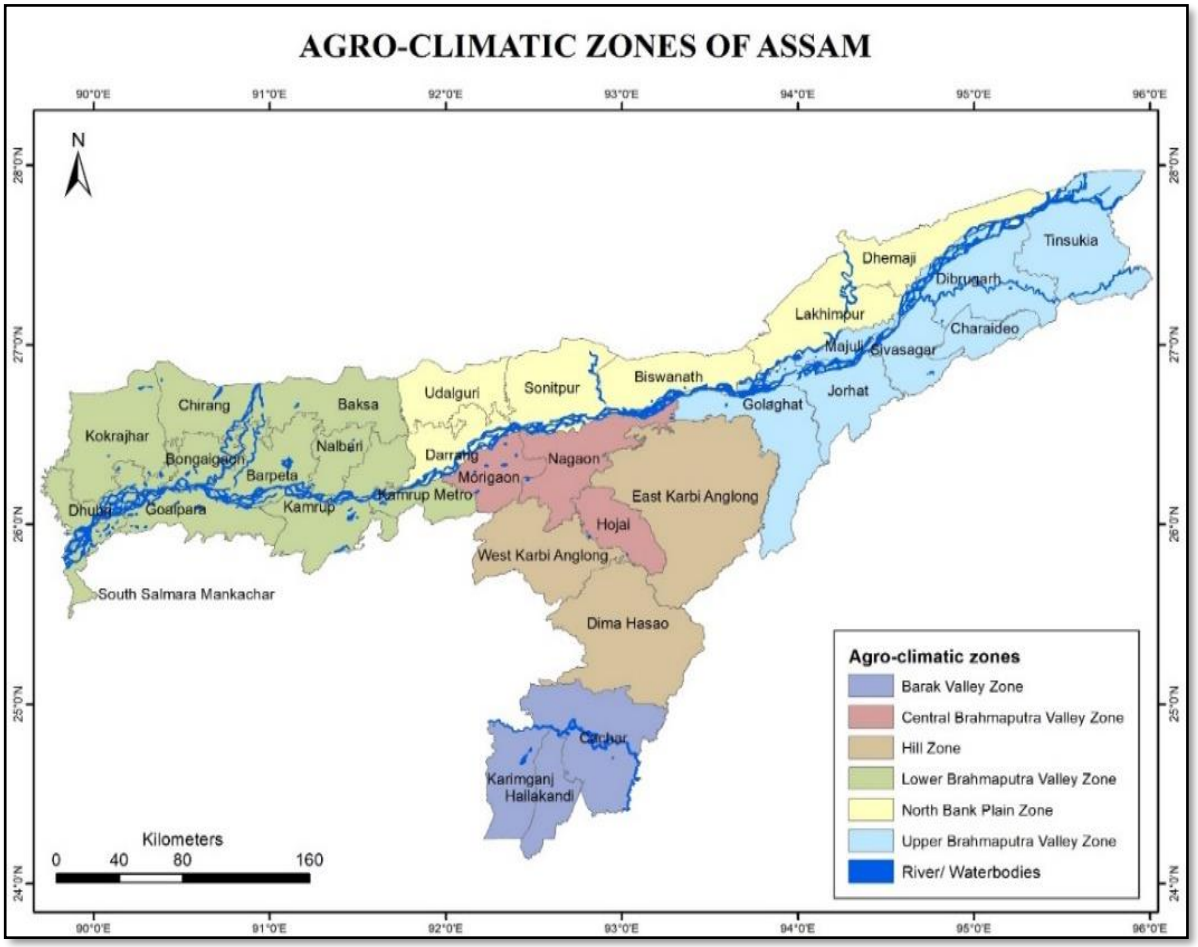


Fig. 2. Agro-climatic zones of Assam

Rice, grown during the wet season (June-Oct/Nov) also called *Sali*/winter rice, has traditionally been the principal crop in all these zones. During the winter months when rainfall is scanty, and the scale of cultivation is also much smaller, the less water requiring crops, such as oilseeds, pulses, potato, and vegetables are traditionally grown in the plains.

1.3. Weather

1.3.1 Temperature

1.3.1.1 Maximum temperature

Maximum temperature plays an important role for raising nursery in January for *Boro/* early *Ahu* crop. When the maximum temperature remains low, the germination of the seed is generally delayed/hampered. The fig. 3 shows the monthly maximum temperature prevailing at various locations in Assam. The analysis of the temperature profile during the cropping season shows that the maximum temperature in Jan remained lowest (21.4°C) in Karbi-Anglong, whereas in other districts it ranged from 22°C (Golaghat) to 24.1°C (Kamrup). The average maximum temperature in Sonitpur that was relatively lower than almost all the districts during rest of the seasons remained static in Jan-Feb, again shot up in March and then underwent a steady increase later in the season with a minor dip down in May. In other districts, it increased steadily with the advancement of crop growth till March, except Jorhat, where a rise after Jan, remained constant in February-March and increased after that. The peaks of maximum temperature in all districts were observed in April, more so in Kahikuchi (35°C), followed by Cachar, Kamrup and Nalbari. After April, the maximum temperature decreased in almost all districts during May, whereas it continued to fall till June in Kamrup and Cachar. After May, the maximum temperature increased in June and reached its maximum in Aug at Kokrajhar, Cachar, Karbi Anglong and Nagaon. The reproductive phase of the early *Ahu* sown crop coincided with the peak maximum temperature during April and June at Kahikuchi, Cachar Kamrup and Nalbari, compared to other districts.

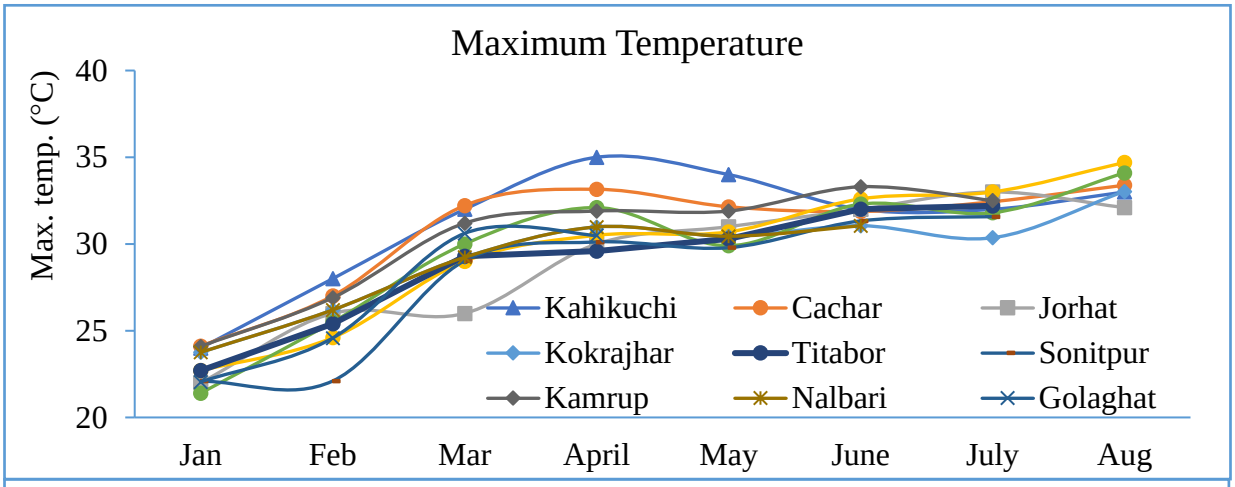


Fig. 3: Maximum temperature variation among districts (January-August, 2020)

1.3.1.2 Minimum temperature (°C)

The minimum temperature in Jan 2020 was below 10°C in Titabor (7.9°C), Sonitpur (8.2°C), Nagaon (8.7°C), Nalbari (9.2°C), and Kokrajhar (9.2°C). In contrast, in Kamrup Metro, Jorhat, Cachar and Kahikuchi, it ranged from 11°C to 15°C at the time of rice nursery sowing for the late *Boro*/early *Ahu* season. The minimum temperature increased at a steady rate after Jan with the advancement of the cropping season. It reached to the peak in June 2020, which coincided with the harvesting of late *Boro*/early *Ahu* season in almost all the districts. In Jorhat, the minimum temperature of March was lower than Feb, but after that, it steadily increased up to 25.4°C in Aug 2020. The highest (31°C) minimum temperature in July was recorded at Titabor,

while in Aug it was recorded higher than July except at Cachar where it was slightly lower than July. The nursery sowing of *Sali* season was started from June onward when the minimum temperature was between 22.4°C and 26°C at various locations of Assam. The fig. 4 shows the progress of minimum temperature from January to August at various locations.

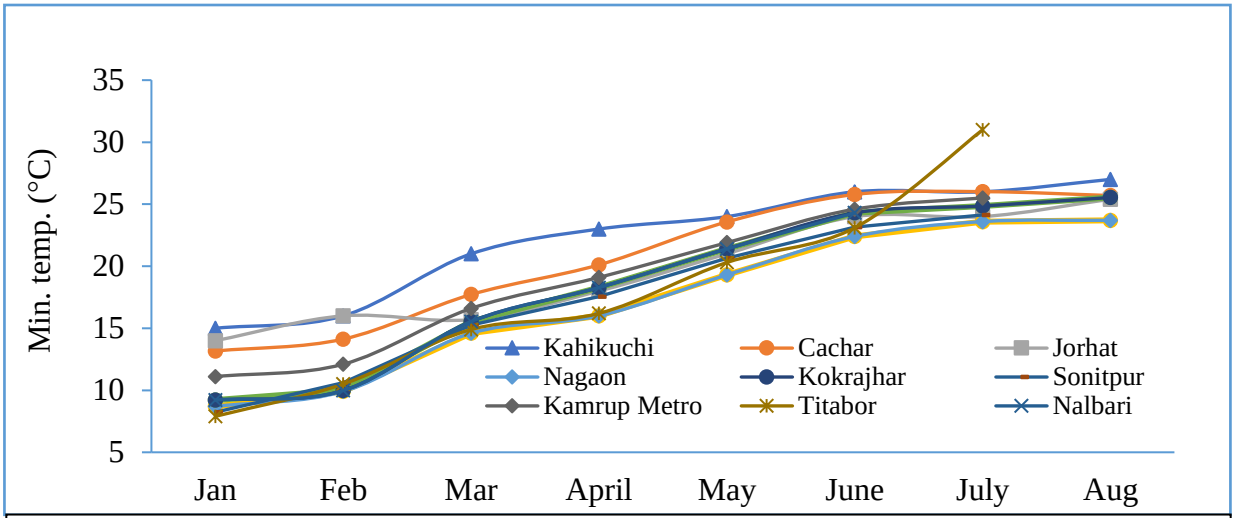


Fig. 4: Minimum temperature variation among districts (January-August, 2020)

1.3.2 Rainfall (mm)

The total rainfall (Jan-Aug, 2020) during the *Boro*/ early *Ahu* season varied among districts and was recorded the highest in Kokrajhar (4205 mm), followed by Kahikuchi (3893 mm), Lakhimpur (2370 mm) and Cachar (2202 mm), whereas the districts of Darrang (748 mm), Nagaon (1201 mm), Karbi Anglong (1136 mm) and Jorhat (1854 mm) received comparatively lower rainfall during the crop season till Aug 2020. In general, the highest rainfall was received in the month of June and July, particularly at Kokrajhar, Kahikuchi, Lakhimpur, Cachar, Jorhat, Titabor, Sonitpur, Nagaon, Karbi Anglong and Darrang, respectively. Most of the districts received sufficient rainfall during April and May also. Some of the districts, due to heavy rainfall in May and June, faced difficulties in the harvesting of *Boro*/*Ahu* season crops due to early-season floods. The floods continued till July and early August, causing severe losses in the nurseries and early transplanted paddy of *Sali* season 2020. In the current year, the farmers faced three phases of flood during May, June and July, affecting 8 lakh ha area of paddy in these three months.

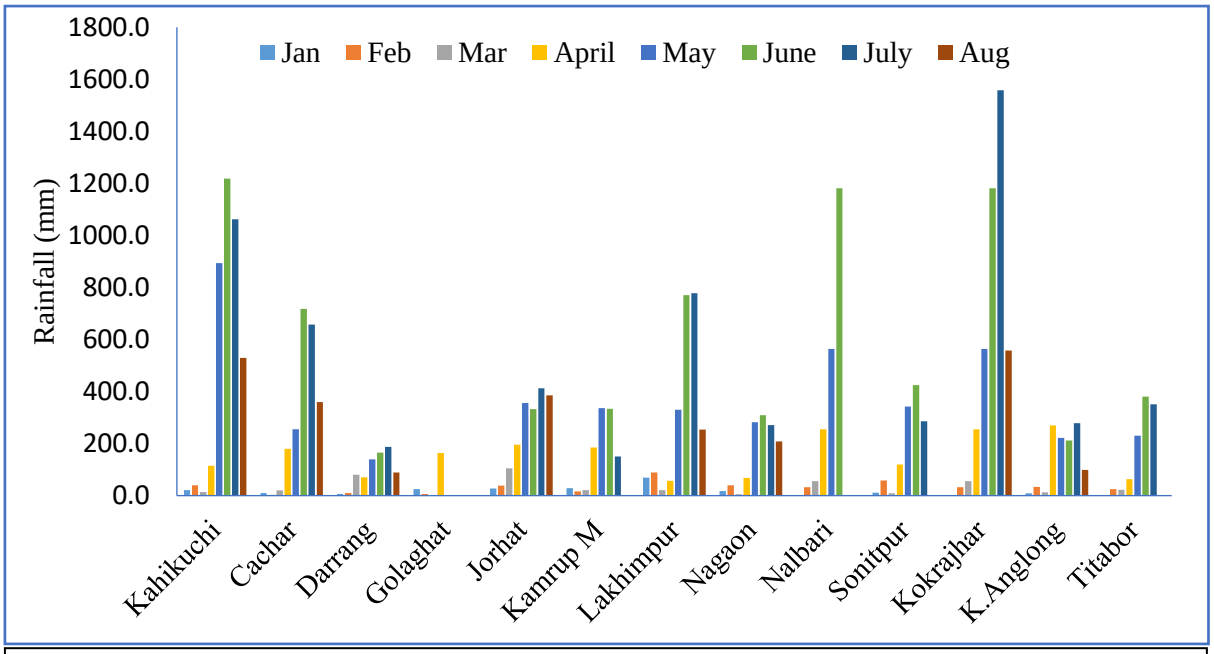


Fig. 5: Rainfall in various districts and RARS centres during different months

1.3.3 Relative humidity (%)

The relative humidity in Assam was maximum in June, July and August at Kokrajhar, Cachar, Kahikuchi, Jorhat, Titabor, Sonitpur, Nagaon, Karbi Anglong and Nalbari. Considering the *Boro*/early *Ahu* season extending up to June-July, the relative humidity across the districts was maximum in July followed by June and May. The relative humidity was recorded minimum during March followed by Feb and Jan, respectively across all the locations in Assam.

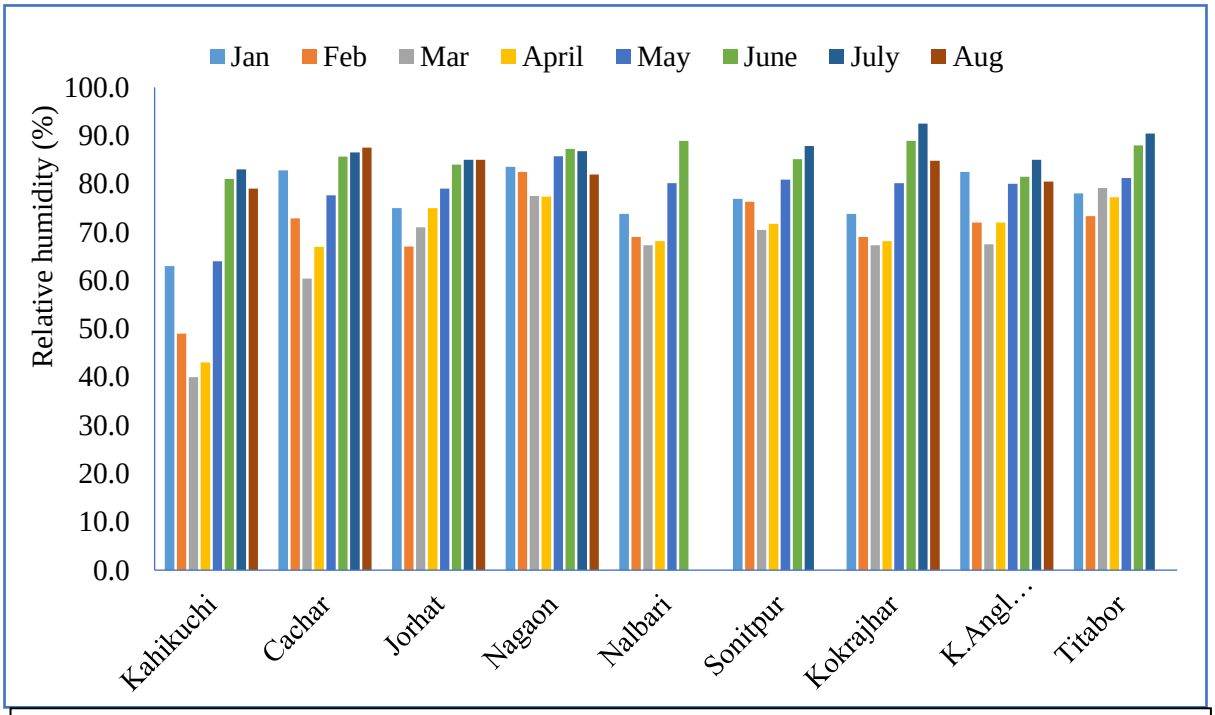
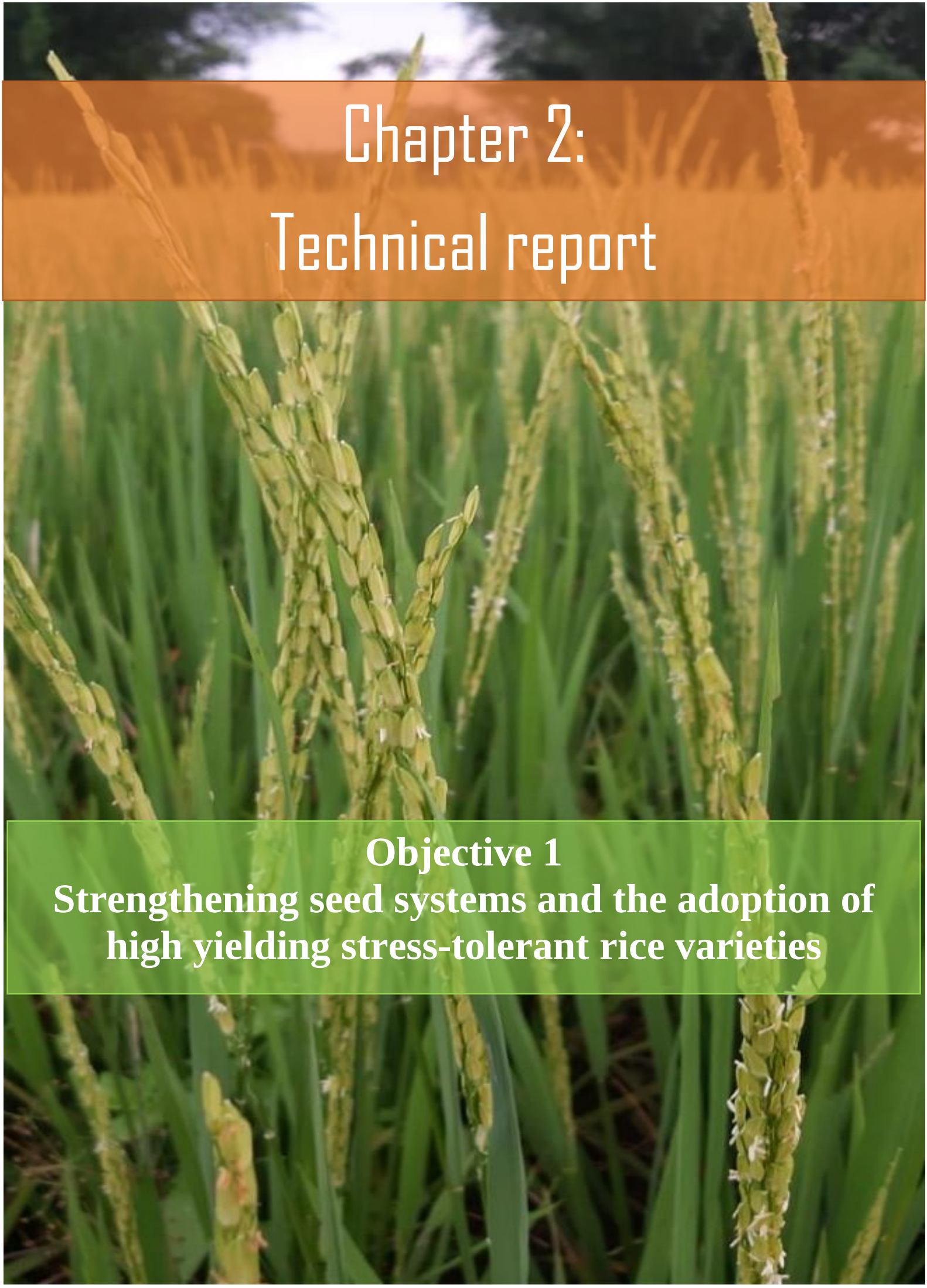


Fig. 6: Relative humidity (%) of selected locations in Assam



Chapter 2:
Technical report

Objective 1
Strengthening seed systems and the adoption of high yielding stress-tolerant rice varieties

2.1 Objective I: Strengthening seed systems and the adoption of high yielding stress-tolerant rice varieties (STRVs)

2.1.1 Demonstrations

During *Sali* season 2020, the demonstrations were planned in 23 districts and implemented by Assam Agricultural University (AAU) and Department of Agriculture (DoA) in six agro-ecological zones of Assam under APART.

2.1.1.1 Minikit demonstrations

The minikit demonstrations are accelerating informal dissemination of seed from farmer to farmer through the introduction, exposure, experience, for acceptance of new varieties. These minikits would help farmers and other stakeholders to grow, observe and experience the performance of the introduced variety and develop learning for self and the associated community. This intends to create awareness in the region and thereby producing demand and a market for the variety for the future. The district-wise details of minikits conducted in *Boro*/early *Ahu* season 2019-20 and *Sali* season 2020 are given in **Table 2**

Table 2: Progress of minikits with AAU and DoA-ATMA in *Boro*/early *Ahu* season 2019-20 and *Sali* season 2020

Location	Minikits – AAU			Minikits – DOA-ATMA						
	Sali season 2020			*Boro*/early *Ahu* season 2019-20				*Sali* season 2020		
KVKs/ATMAs	T	A	Benf.	T	A	Benf.	Def. (T-A)	*Boro* def. + *Sali* T	A	Benf.
Kamrup	184	184	184	210	210	210	-	366	366	366
Morigaon	177	177	177	280	280	280	-	162	162	162
Darrang	191	191	191	270	270	270	-	198	198	198
Nalbari	187	187	187	50	40	40	10	192	192	192
Barpeta	190	190	190	280	280	280	-	366	366	366
Dhubri	192	192	192	200	200	200	-	300	300	300
Kokrajhar	193	193	193	260	260	260	-	162	162	162
Cachar	186	170	170	50	50	50	-	390	390	390
Jorhat	181	181	181	50	50	50	-	198	198	198
Nagaon	183	183	183	200	200	200	-	432	432	432
Golaghat	190	190	190	50	50	50	-	270	270	270
Lakhimpur	190	190	190	260	260	260	-	300	300	300
Sivasagar	182	182	182				-	186	186	186
Sonitpur	198	198	198	160	160	160	-	270	270	270
Karbi-Anglong	202	202	202				-	174	174	174
Goalpara	-	-	-	280	280	280	-	234	234	234
Hojai	-	-	-	80	80	80	-	156	156	156
Bishwanath	-	-	-	120	120	120	-	192	192	192
West Karbi-Anglong	-	-	-				-	96	96	96

Kamrup Metro	-	-	-	70	70	70	-	96	96	96
Mankachar	-	-	-	80	80	80	-	90	90	90
Charaideo	-	-	-				-	102	102	102
Majuli	-	-	-	50	50	50	-	78	78	78
RARSs/HRS										
RARS, Jorhat	-	-	-		-	-	-		-	-
RARS, Nagaon	-	-	-	-	-	-	-	-	-	-
RARS, Lakhimpur	-	-	-	-	-	-	-	-	-	-
RARS, Karbi Anglong	-	-	-	-	-	-	-	-	-	-
RARS, Kokrajhar	-	-	-		-	-	-		-	-
HRS, Kahikuchi*	174	174	174		-	-	-		-	-
Total	3000	2984	2984	3000	2990	2990	10	5010	5010	5010
Note: *T-target, A- achievement, Def. – Deficit, Benf.- beneficiaries,* * HRS, Kahikuchi organise the activities in Goalpara										

A total of 2990 minikit demonstrations with STRVs, including BINA Dhan11 and DRR Dhan 44 through DoA-ATMA, were conducted during *Boro*/early *Ahu* season 2019-20, covering an area of 286.25. During *Sali* season 2020, a total of 3000 minikit demonstrations for STRVs Ranjit-Sub1, Bahadur-Sub1, Swarna-Sub1, and BINA Dhan11 through AAU, and 5010 demonstrations with above-said STRVs through DoA-ATMA including 10 leftovers of preceding *Boro*/early *Ahu* season, were conducted. Based on crop-cut data, the district-wise performance of BINA Dhan 11 during *Boro*/early *Ahu* season 2019-20 in the minikit demonstrations led by DoA-ATMA is presented in **fig. 7**. The grain yields among the districts varied from a minimum of 4.88 t/ha in Morigaon to a maximum of 6.57 t/ha in Kokrajhar with an overall average of 5.52 t/ha. A high amount of rainfall and maintenance of lower maximum and minimum temperatures during the growing season might be responsible for higher yield in Kokrajhar.

A total of 82 rice cluster/block were covered under minikits in *Boro/*early *Ahu* season 2019-20.

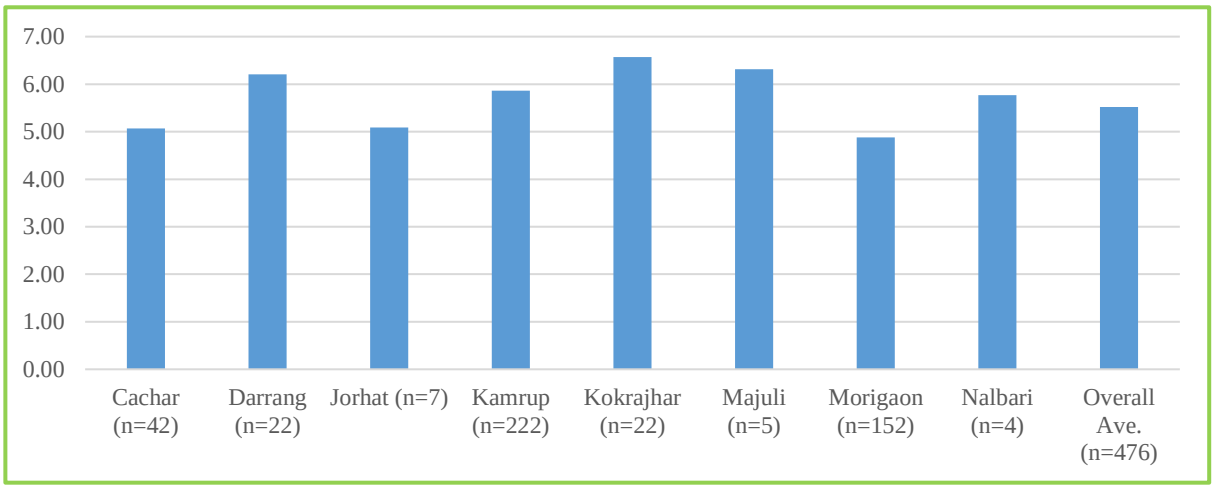


Fig. 7: District-wise performance of BINA Dhan 11 under minikit demonstrations with AAU during *Boro*/early *Ahu* season 2019-20

Economic analysis of minikit demonstrations conducted during *Boro*/early *Ahu* season 2019-20

The overall average yield of minikit demonstration was estimated at 5.52 t/ha. Considering Rs 57,180/ha as cost of cultivation STRVs, the gross income obtained was estimated as Rs 139104/ha in *Boro*/early *Ahu* season 2019-20 at an average paddy price of Rs 1400/q in Assam, with the resultant net benefit of Rs 81924/ha and benefit-cost (BC) ratio of 2.43 from the STRVs.

2.1.1.2 Head-to-head demonstrations

The purpose of AAU-led head-to-head demonstrations is to enable the farmers to compare the performance of the existing farmer's variety against the newly introduced STRV with available technologies, resources, and constraints**.** These demonstrations are carried out through farmers, FPOs, seed agro-vets and millers, and linked with farmers' service centres for increasing the awareness and adoption of new rice varieties and their management practices. For *Sali* season 2020, the district-wise achievements of this intervention against the planned targets are presented in **table 3**. In the *Boro*/early *Ahu* season 2019-20, a total of 650 head-to-head demonstrations for STRVs BINA Dhan11 and DRR Dhan 44 were planned through AAU, but only 229 could be laid out due to short supply of seed by the vendor. The total area covered under H2H demonstration was 57.25 ha during the season. The deficit of 421 head to head demonstrations were planned and carried over to the succeeding *Sali* season 2020. The World Bank mission visiting Assam in September 2019 suggested to reduce the types of demonstrations, so the target of 200 on-farm adaptive demonstrations was merged with 600 head to head demonstrations of *Sali* season 2020. During the *Sali* 2020, a total of 1221 head-to-head demonstrations for STRVs *viz.* Ranjit-Sub1, Bahadur-Sub1, Swarna-Sub1, and BINA Dhan 11 were conducted including a deficit of last season.

Table 3: Progress of H2H demonstration with AAU in *Boro*/early *Ahu* season 2019-20 and *Sali* season 2020

Location	Head to head – AAU						
	***Boro* season 2019-20**				***Sali* season 2020**		
KVK	**T**	**A**	**Benf.**	**Deficit (T-A)**	***Boro* deficit + *Sali* target**	**A**	**Benf.**
Kamrup	54	54	54	-	80	80	80
Morigaon	60	60	60	-	80	80	80
Darrang	39	-	-	39	80	80	80
Nalbari	31	-	-	31	80	80	80
Barpeta	54	-	-	54	80	80	80
Dhubri	54	12	12	42	80	80	80
Kokrajhar	31	-	-	31	0	0	0
Cachar	10	-	-	10	80	80	80
Jorhat	19	-	-	19	0	0	0
Nagaon	40	40	40		0	0	0
Golaghat	21	-	-	21	80	80	80
Lakhimpur	20	-	-	20	0	0	0
Sivasagar	-	-	-	-	80	80	80
Sonitpur	41	-	-	41	70	70	70
Karbi-Anglong	-	-	-		0	0	0
RARS/HRS							
RARS, Jorhat	-	-	-	-	64	64	64
RARS, Nagaon	51	51	51	-	86	86	86
RARS, Lakhimpur	39	-	-	39	80	80	80
RARS, Karbi Anglong	-	-	-	-	61	61	61
RARS, Kokrajhar	36	-	-	36	70	70	70
HRS, Kahikuchi	50	12	12	38	70	70	70
Total	650	229	229	421	1221	1221	1221
***Note:** T-target, A- achievement, Benf.- beneficiaries*							

During *Boro*/early *Ahu* season 2020, the data revealed that the performance of STRVs under H2H was variable but better than the farmers' variety in the districts (**fig. 8).** Among different districts, the grain yield of BINA Dhan 11 ranged from a minimum of 4.68 t/ha in Kamrup to a maximum of 6.43 t/ha in Goalpara. The average yield of BINA Dhan 11 and farmer variety was 6.0 t/ha and 5.0 t/ha, respectively. The overall yield advantage of BINA Dhan 11 over farmer's variety was 1.0 t/ha. Total 20 rice cluster/block were covered under H2H demonstration in *Boro*/early *Ahu* season 2019-20.

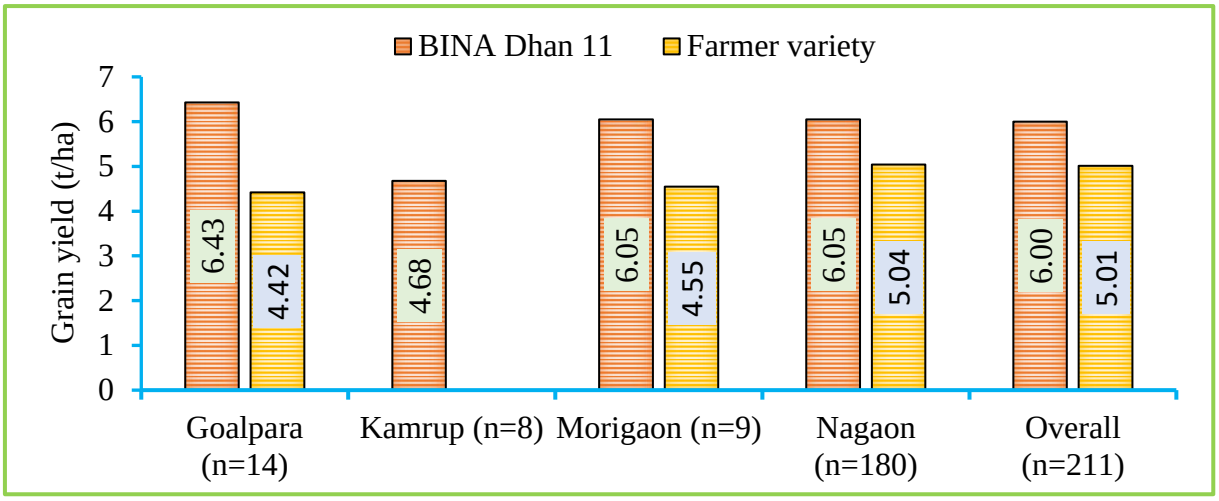


Fig. 8: District-wise performance of BINA Dhan 11 vs Farmer's variety (FV) under head to head demonstrations with AAU during *Boro*/early *Ahu* season 2019-20

Sub1 varieties survive flood at the early seedling stage and tillering stage: A significant learning

Early season floods often destroy seedlings in the nursery, which compel the farmers for reseeding of rice nursery, leading to delayed transplanting resulting in poor yield. During *Sali* season 2020, flood recurring in three phases from May to July, inundated a large number of the rice nurseries, when Sub1 varieties with improved nursery management ensured better survival of seedlings. In a few selected districts, data on the effect of the flooding on farmers' nursery survival were collected and analysed. In all the flood-affected districts, the survival of seedlings after flood recession was better with Sub1 varieties, irrespective of varying durations of inundation. It was observed that during to 6-8 days of flood incidence, the survival rates of STRVs and farmer's variety were 65.7% and 4.43%, respectively. This is evidenced by a success story of flood incidence in Ranjit-Sub1 vs Kunkuni Joha, and Ranjit-Sub1 vs black rice at nursery stage of an H2H demonstration at village Tetelisara grant, of Kathiatali block in Nagaon district conducted by RARS, Nagaon. The flood occurred on July 2, 2020, receded on July 9, 2020, and recovery of the nursery after the flood was visible on July 12, 2020. After 7-day inundation, varieties Kunkuni Joha and black rice were completely damaged, whereas the nursery-seedlings of submergence-tolerant Ranjit-Sub1 and Bahadur-Sub1, survived. The field view of flood incidence at nursery stage is presented in **fig. 9.** It was interesting to note that the non-Sub1 varieties which usually are not much affected when inundated for less than a week at the vegetative stage, were grappled by floods in the nursery stage, and the survival of their young and tender seedlings conspicuously plummeted down.

Fig. 9: Flood incidence of H2H nursery Ranjit-Sub1 vs Kunkuni Joha and Bahadur-Sub1 vs Black rice at RARS, Nagaon during *Sali* season 2020

The flood incidence at the tillering stage of paddy crop is a common feature in Assam. In a few selected districts, information on the effect of the flood on tillering stage survival of STRVs and farmer's varieties were collected and analysed. The results showed that Sub1varieties were better in survival than farmer's variety at tillering stage after the recession of flood across the districts, irrespective of the duration of the flood **(Fig. 10).**

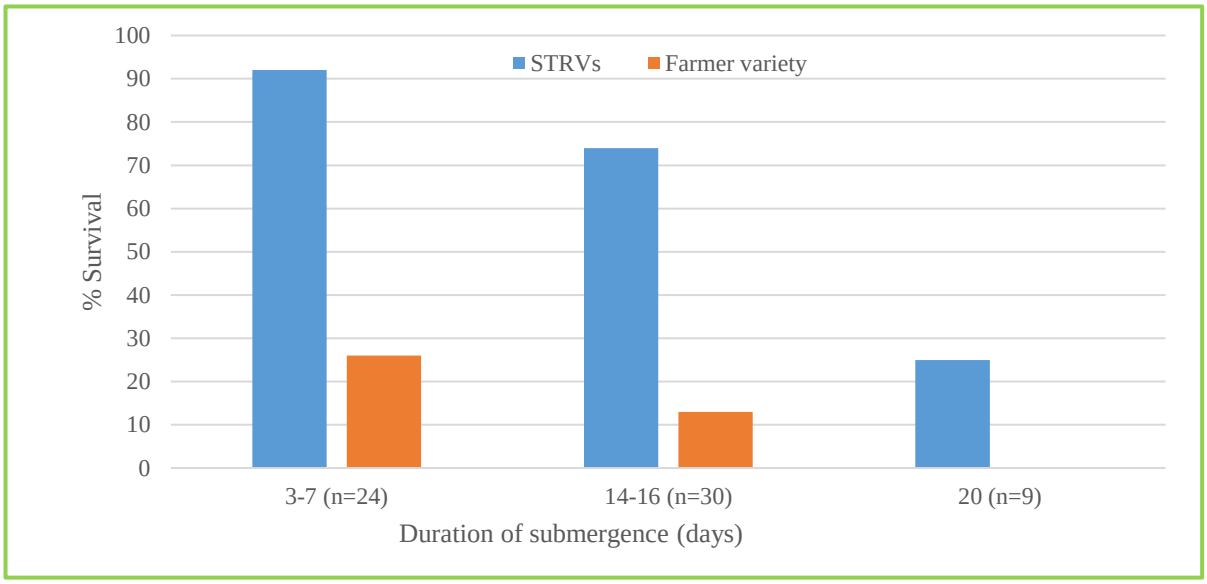


Fig. 10: Survival percentage of stress tolerant rice varieties (Sub1) vs farmer's variety (non-Sub1) at tillering stage under varying duration of submergence

Economic analysis of H2H demonstration during *Boro*/early *Ahu* season 2019-20

The economic analysis with the common market price of paddy @ INR 1400/q, found that the net benefit of BINA Dhan 11 was Rs. 26,820/ha and that of farmer's variety was Rs. 12,960/ha. The cost of production for both the varieties was kept similar @ Rs 57,180/ha. The benefit-cost ratios of BINA Dhan 11 and farmer's variety were 1.47 and 1.23, respectively. The edge in net income of BINA Dhan 11 over farmer's variety was INR 13,860/ha (**fig. 11).**

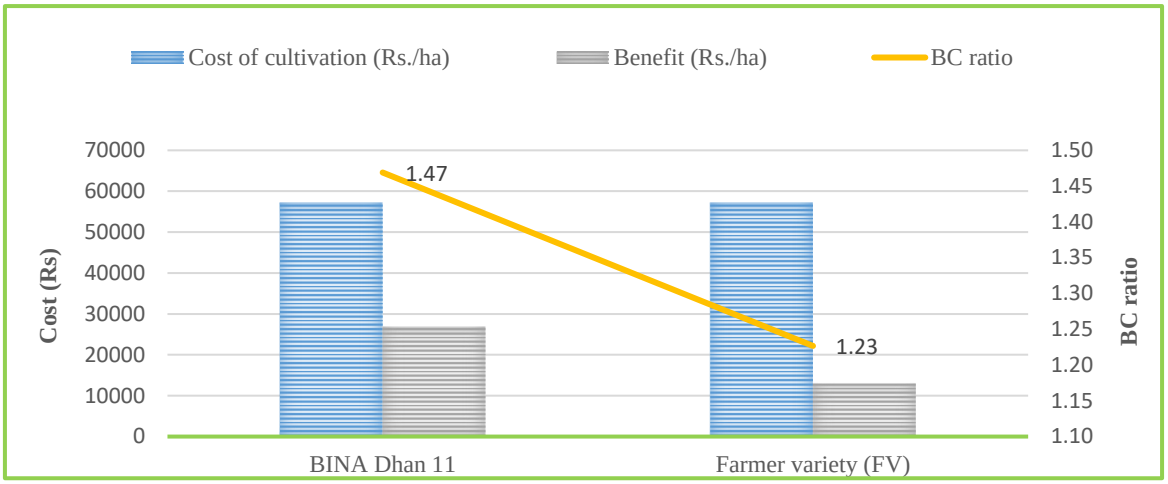


Fig. 11: Cost of cultivation, gross income and BC ratio of BINA Dhan 11 vs farmer's variety under H2H during *Boro*/early *Ahu* season 2019-20

2.1.1.3 Cluster demonstrations

The cluster demonstrations were conducted by AAU to create proof about the varieties on a considerable scale covering diverse geographies/ localities, to generate mass visibility of new STRVs for adoption by informal seed dissemination across neighboring villages, and to foster linkage and awareness among key seed-value-chain stakeholders for the new STRVs. The achievements of intervention against the planned target across the districts in *Sali* season 2020 are presented in **table 4.** A total of 350 cluster demonstrations for STRVs (Ranjit-Sub1, Bahadur-Sub1, Swarna-Sub1 and BINA Dhan 11) were planned through AAU during the *Sali* season 2020, and all of them were superimposed with the recommended IPM module.

2.1.1.4 Dealer network demonstrations: These demonstrations conducted through AAU were aimed to engage private players viz., seed dealers/sellers, farmer producer organizations (FPOs) to trigger varietal promotion by creating demand and assured supply, and thereby better adoption through capacity building. The achievements of intervention against the planned target across the districts in *Sali* season 2020 are presented in **table 4.** A total of 400 dealer network demonstrations for different STRVs (Ranjit-Sub1, Bahadur-Sub1, Swarna-Sub1, and BINA Dhan11), were planned during the *Sali* season 2020 and only 160 of them were superimposed with IPM. Out of total 0.25-ha area of one dealer network demonstration, 0.15ha area was superimposed with IPM, and 0.10 ha area was kept as the control without IPM.

Table 4: Progress of cluster and dealer network demonstrations of AAU during *Sali* season 2020

Location	**Cluster demonstration**			**Dealer network demonstration**		
	***Sali* season 2020**					
KVKs	**T**	**A**	**Benf.**	**T**	**A**	**Benf.**
Kamrup	20	20	215	25	25	25
Morigaon	15	15	112	25	25	25
Darrang	20	20	143	25	25	25
Nalbari	20	20	163	25	25	25
Barpeta	20	20	159	25	25	25
Dhubri	20	20	301	25	25	25
Kokrajhar	10	10	139	25	25	25

Cachar	20	20	155	25	25	25
Jorhat	15	15	176	25	25	25
Nagaon	13	13	50	25	25	25
Golaghat	20	20	137	25	25	25
Lakhimpur	10	10	88	25	25	25
Sivasagar	20	20	382	25	25	25
Sonitpur	22	22	79	25	25	25
Karbi Anglong	10	10	70	25	25	25
RARSs/HRS						
RARS, Jorhat	10	10	40			
RARS, Nagaon	15	15	15			
RARS, Lakhimpur	15	15	129			
RARS, Karbi Anglong	15	15	30			
RARS, Kokrajhar	15	15	109			
HRS, Kahikuchi	25	25	249	25	25	**25**
Total	**350**	**350**	**2941**	**400**	**400**	**400**
Note: *T-target, A- achievement, Benf. –beneficiaries*						

2.1.2 Crop cafeteria during *Sali* season, 2020

The primary objective of hosting a crop cafeteria is to demonstrate a diverse basket of varietal choices for multiple stakeholders to carry participatory observation, make the selection for the region, and influence key institutions and actors to uptake new and potential varieties. Keeping these points in view, two crop cafeterias were laid out, one each at RARS, Titabar and KVK, Nagaon. It served as a platform to involve all stakeholders/farmers to select a rice variety suited to their preferences in a particular region/agro-climatic zone. Many of the varieties were new to the environment, and their flowering time was not known as per the local agro-ecological condition. Therefore, IRRI scientists in consultation with the scientists at RARS, Titabar and KVK, Nagaon decided to raise staggered nursery sown on three dates based on previous reported flowering time. Crop cafeteria was laid out, keeping in consideration the following objectives:

- To accelerate the uptake and sustainable adoption of the stress-tolerant rice varieties (STRVs), and premium quality rice (PQR) at selected key locations
- To engage private- and public-sector players in seed system, and their market channels like distributors, dealers, FPOs, associated agro-vets /extension agents, millers in the evaluation process of different varieties against STRVs and PQR
- To create linkages in mainstream seed-system
- To strengthen learning and adoption behaviour by systematic evaluation of multiple varieties in laid-out crop cafeteria
- To create mass awareness about different STRVs and PQR, their characteristics and performances
- To promote the seed and varietal replacement for improving the productivity of rice in the region
- To help generate seed demand for multiple varieties

IRRI provided technical guidance, seed-source information, and details of the implementation plan for both the trials. The two crop cafeterias carried out at Jorhat and Nagaon, during *Sali* season 2020, were closely monitored by the IRRI team. The respective cafeterias at both the locations, independently, were subjected to uniform management practices including, spacing, fertilizer, irrigation, weedicide, pesticide, and other cultural management across varieties, transplanting dates and replications. The row x plant spacing of 20 cm x 20 cm was maintained in individual plots, each of 12 m^2 size at Jorhat and 15 m^2 size at, Nagaon. Based on duration, the varieties will be exhibited and evaluated by organizing a participatory varietal evaluation event at each location at crop maturity by a group of formal and informal seed stakeholders as per their preference and suitability to agro-ecological environment. It is an effective tool to strengthen the formal and informal seed system of Assam, expeditiously.

2.1.2.1 Crop cafeteria at KVK, Nagaon

The nursery of 24 rice varieties included 14 STRVs, 6 PQR, 2 HYVs and 2 local/popular varieties collected from various locations. Based on the reported durations, the different varieties were grouped in three batches for staggered sowing in the nursery. The first-, second- and third-batches containing different varieties were sown in the nursery on June 8, June 15 and July 7, of 2020, respectively, at KVK, Nagaon so that all varieties flower at the same time. Subsequently, the first-, second- and third- batch of different varieties were transplanted on July 13, July 16 and July 30, 2020, respectively. The representative pictures of sowing, nursery stage, and main-field

Fig. 12: The sowing, nursery stage and main field at KVK, Nagaon in *Sali* season 2020

crop at KVK, Nagaon in *Sali* season 2020, are given in **fig. 12.**

The field views of the ortho-imagery map of rice varieties of crop cafeteria at KVK, Nagaon in *Sali* season 2020 is presented in **fig. 13**

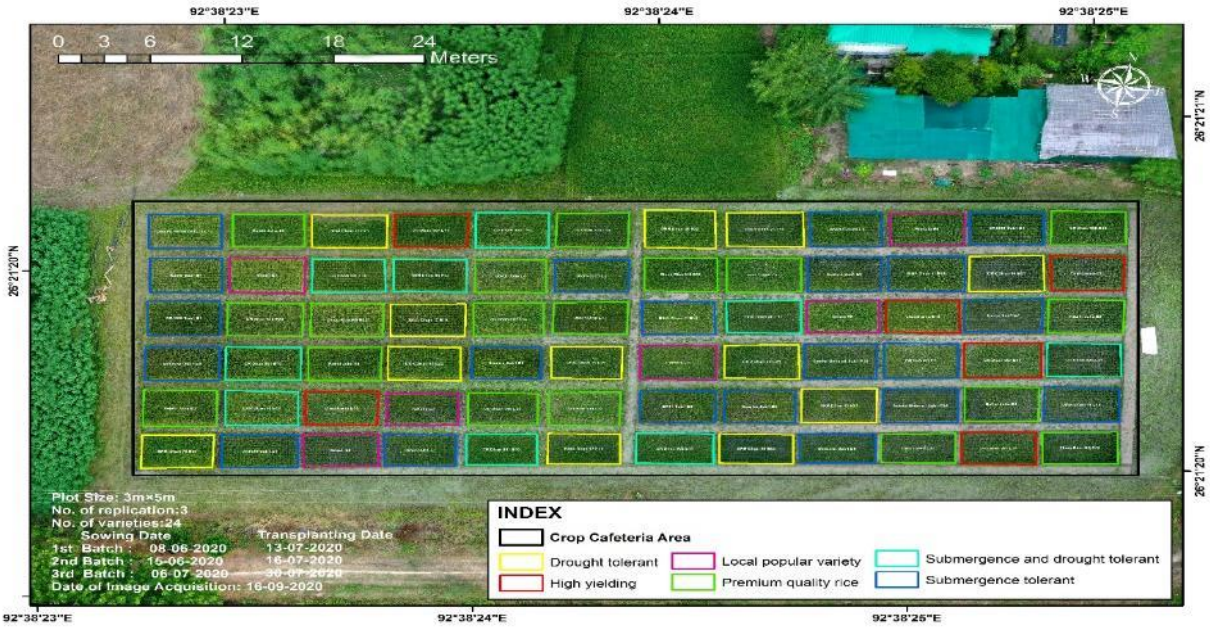


Fig. 13: Ortho-imagery map of rice varieties of crop cafeteria at KVK, Nagaon in *Sali* season 2020

2.1.2.2 Crop cafeteria at RARS, Titabar, Jorhat

The nursery comprising of 24 rice varieties included 14 STRVs, 5 PQR, 2 HYVs and 3 local /popular rice varieties, collected from various locations. Based on the reported durations, the different varieties were grouped in three batches for staggered sowing in the nursery. The first-, second- and third- batch of different varieties were sown in the nursery on June 11, June 19 and July 10, of 2020, respectively, at RARS, Titabar, and the transplanting of different varieties in the corresponding batches was done on July 21, July 22 and Aug 10, of 2020, respectively. The representative pictures of seed sowing, nursery stage, and main field crop at RARS, Titabar, Jorhat in *Sali* season 2020 are presented in **fig. 14**

Fig. 14: The seed sowing, nursery stage and main field crop at RARS, Titabar, Jorhat in *Sali* season 2020

The field views of ortho-imagery map of rice varieties of crop cafeteria at RARS, Titabar, Jorhat in *Sali* season 2020 is presented in **fig. 15**

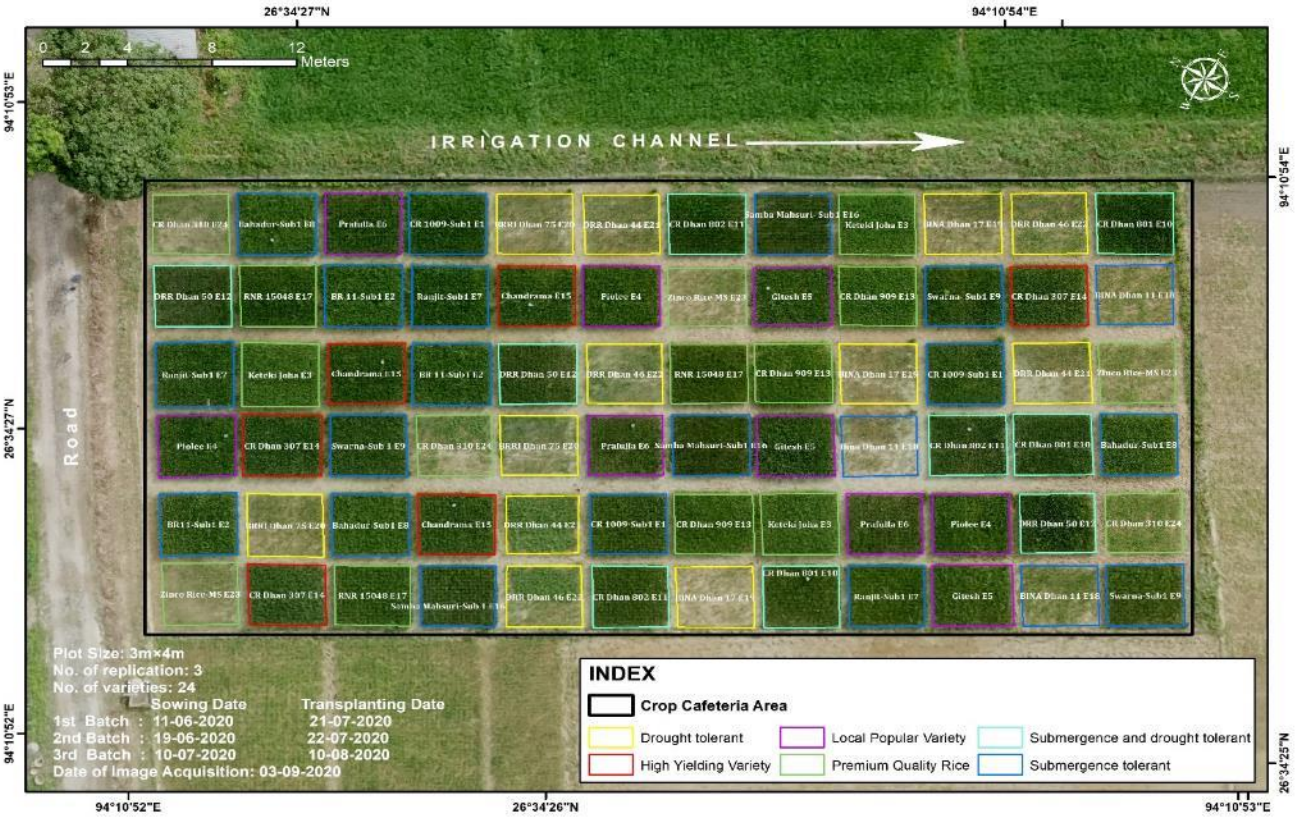


Fig. 15: Ortho-imagery map of rice varieties of crop cafeteria at RARS, Titabar, Jorhat in *Sali* season 2020

After completion of the experiment, results will be submitted to the DoA, and especially to state seed certification agency (ASSCA) as per guidelines. Score cards indicating the performance of different varieties according to the likings of evaluating participants in crop cafeteria events, are to be endorsed by AAU and DoA, for future use in seed indent and introduction /release of new STRV's and PQR in the state. The results of actual agronomic data, farmer's score sheets and formal seed-system stakeholders' score sheets are pooled to arrive at the final decision.

2.1.3 Trainings/meetings on production and processing of good quality seed

Under objective I, QSP training, dealer's meeting, awareness meeting and stakeholders' meeting were planned for capacity building of rice growers, seed dealers/sellers, extension officers, and FPOs on production practices, processing, and storage of seed, and to create awareness and understanding of STRVs amongst rice farming communities aiming to establish small enterprises, improving the status of seed system in Assam and linking them with state seed corporations/private seed growers/FPOs, besides improving quality of farmer-saved seed.

For the *Boro*/early *Ahu* season 2019-20, 20 QSP trainings were completed as per target. For gender equity, ensuring women's participation during QSP trainings was considered a priority, and 141

women were benefited among a total of 546 participants. The summary of QSP trainings organized during *Boro/*early *Ahu* season 2019-20, is presented in **table 5**.

Table 5: Summary of trainings organized by AAU under objective I in *Boro/*early *Ahu* season 2019-20

S. No.	Activity	Target (No.)	Achieved (No.)	Beneficiaries (Number)						
				Gender		Social category				
				Male	Female	Gen	OBC	SC	ST	Total
1	Quality seed production training	20	20	405	141	234	154	38	120	546

In the *Sali* season 2020, all of 30 QSP trainings planned, were completed. Efforts were put by both the implementing partners to ensure gender equity in training participants. Of the total 715 training participants, 242 were women in QSP trainings. Besides this, 8 awareness meetings, 6 dealer meetings and 1 stakeholder meeting were planned, out of which 4 awareness meetings and 3 dealers meetings were organized with the participation of total 255 beneficiaries having 78 females. The summary of QSP trainings/awareness programs/meetings organized in the *Sali* season, 2020 is given in **table 6.**

Table 6: Summary of trainings organized by AAU under objective I in *Sali* season 2020

Sr. No.	**Activity**	**Target (No.)**	**Achieved (No.)**	**Beneficiaries (Number)**						
				Gender		**Social category**				
				Male	**Female**	**Gen**	**OBC**	**SC**	**ST**	**Total**
1	Quality seed production training	30	30	473	242	301	260	16	138	715
2	Dealers meeting	6	3	59	35	27	11	5	51	94
3	Awareness meeting	8	4	118	43	63	72	19	7	161

The summary of the overall progress of different demonstrations during *Boro/*early *Ahu* season 2019-20 and *Sali* season 2020 is presented in **table 7.**

Table 7: Summary of the overall progress of demonstrations under objective I during *Boro*/early *Ahu* season 2019-20 and *Sali* season 2020

Type of demonstration	**Implementing Agency**	***Boro/*Early *Ahu* season 2019-20**			***Sali* season 2020**		
		Target	**Achieved**	**Benf.**	***Sali* Target + *Boro* deficit**	**Achieved**	**Benf.**
Mini-kit demonstration	AAU	-	-	-	3000	2984	2984
	DoA-ATMA	3000	2990	2990	5010	5010	5010
Cluster demonstration	AAU	-	-	-	350	350	2941

Dealer network demonstration	AAU	-	-	-	400	400	400
Head-to-head demonstration	AAU	650	229	229	1221	1221	1221
***Note**: **Benf.:** beneficiaries (number)*							

Quantity of seed supplied for various demonstrations during *Boro*/early *Ahu* 2019-20

Variety-wise seed distribution by AAU and DoA-ATMA under various demonstrations during *Sali* season 2020 is presented in **table 8**.

Table 8: Variety-wise seed distributed under different demonstrations in *Sali* season 2020

Rice variety	AAU (kg)	DoA-ATMA (kg)	Total AAU + DoA-ATMA (kg)	% of individual varieties
STRVs				
Ranjit-sub1	58,454	24,588	83,042	51
Bahadur-sub1	21,648	9,360	31,008	19
Swarna-Sub1	12,030	4,842	16,872	10
BINA Dhan 11	23,079	10,260	33,339	20
Total STRVs	**1,15,211**	**49,050**	**1,64,261**	**100**
PQR				
Joha rice (Keteki/Bokul/Kola)	2200	1200	3400	100
Total PQR	**2200**	**1200**	**3400**	**100**

2.1.4 Linkage for breeder and foundation seed supply

It is essential to supply breeder and foundation seed of STRVs to local and formal seed system for strengthening the seed system in Assam. This approach helps ensure the seed availability of targeted STRV(s) as per demand based on the performance under different demonstrations. To ensure local seed-supply and encourage local entrepreneurship in the seed business, IRRI has initiated linking of national partners/allied research institutes to supply the breeder and foundation seed of STRVs, with the public and private stakeholders engaged in formal and informal seed systems of Assam, for further seed multiplication. The progress made in this regard is given in **table 9**

Table 9: Institutional linkage for strengthening STRV seed supply to different seed stakeholders in Assam

Name of the Institution	Variety name	Category of seed linked (Breeder/ Foundation)	Quantity of seed linked (kg)
Poohar Agro Producer Company Limited, Borchala (Patuakata), Morigaon, Assam, India. PIN: 782106	Ranjit-Sub1	Breeder	15
		Foundation	120
	Bahadur-Sub1	Foundation	400

Sankar Azan Agro Producer Company Limited, M. Azad Road, Bara Bazar, Nagaon, Assam, India. PIN: 782001	BINA Dhan 11	Foundation	520
	DRR Dhan 44	Foundation	60
	Ranjit-Sub1	Foundation	500
	Swarna-Sub1	Foundation	560
Allied Crop Care Pvt. Ltd., Guwahati, Assam, India	Ranjit-Sub1	Breeder	300
	Bahadur-Sub1	Breeder	100
	Swarna-Sub1	Breeder	30
		Foundation	200
	Keteki Joha	Breeder	920
	Bokul Joha	Breeder	660
Asomi Polyseed Pvt. Ltd., GS Road, Near Poddar Car World, Samannay Path, Khanapara, Guwahati-781022, Assam, India	Ranjit-Sub1	Breeder	200
	Bahadur-Sub1	Breeder	200
	Swarna-Sub1	Breeder	100
Duarbagori Cooperative Society Ltd.; Village-Kuthari, District-Nagaon, Assam, India	BINA Dhan 11	Foundation	260
	DRR Dhan 44	Foundation	400
	Ranjit-Sub1	Breeder	500
	Swarna-Sub1	Foundation	180
	Samba Mahsuri-Sub1	Foundation	60

In *Sali* season 2020, 1445 kg breeder seed (BS) and 3260 kg foundation seed (FS) of STRVs (Ranjit-Sub1, Bahadur-Sub1, Swarna-Sub1, BINA Dhan 11 and DRR Dhan 44), besides 1580 kg BS of PQR varieties (Keteki Joha and Bokul Joha) was linked with different institutions.

2.1.5 Challenges/Learnings

- Seed tender process needs to be expedited, and the timely final payments to the suppliers should be ensured
- Contingency plan for fast-track procurement needs to be evolved in case of emergency or when vendor or supplier withdraws from supplying the desired quantity in a definite time period.
- Availability of certified seed of targeted varieties, and fulfilling their demand in Assam, needs a strong linkage of Public as well as Pvt. seed firms in Assam with key NARES partners beyond Assam
- Procurement of inputs, such as fertilizers and pesticides must be made along with the seed to facilitate timely sowing
- More coordination, ownership, and accountability from all stakeholders, implementing partners across districts is needed to ensure timely outreach to farmers
- A proper seed-storage facility in Assam is limited; therefore, a systemic level infrastructure support at a larger scale needs to be created.
- Super bags have been provided at the KVKs/RARS/HRS for further distribution at farmers for seed storage. IRRI can also help in providing the other storage options like cocoon having bigger storage capacity.

- KVKs/RARSs/HRS/DoAs must have advance contingent seed plan for short-duration varieties to overcome emergent seed-demand arising from damage/failure of demonstrations due to flood incidence.

Objective 2

Raising productivity, profitability, and resource-use efficiencies of rice-based cropping systems in Assam through improved crop- and natural resource- management, and scale-appropriate mechanization with a supporting service economy

2.2. Introduction

In APART, two major growing seasons, *i.e.*, *Sali* and *Boro/*early *Ahu*, are being targeted for increasing productivity and profitability of Assam farmers to transform their livelihood. In the last *Boro/*early *Ahu* season 2019-20, the integrated crop management demonstrations (ICMDs) and learning centre demonstrations (LCDs) were laid out with BINA Dhan11 and other promising short-duration high yielding varieties recommended for the region. Along with these demonstrations, alternative resource-efficient crop establishment methods, i.e. DSR and MTPR, were demonstrated through selected AAU and DoA-ATMA (only ICMDs) centres. The best management practices (BMPs) were followed across all demonstrations.

2.2.1. Activity 1. Out-scaling of integrated crop management practices and scale-appropriate mechanization through demonstrations, learning centres, and capacity building to support knowledge dissemination

2.2.1.1. Integrated crop management demonstration (ICMD)

For scaling up and rapid adoption of improved crop management practices during *Boro/* early *Ahu* season 2019-20, a large number of ICMDs with transplanted rice (0.25 ha each) were conducted in all the selected districts through DoA-ATMA and AAU. The major interventions introduced were best-management practices, including seed treatment, and management of nursery, weeds, water, nutrients, insect-pests and diseases, of STRVs/HYVs.

A total of 101 ICMDs for STRVs were conducted with AAU during the *Boro/*early *Ahu* season 2019-20, with an outreach of 101 beneficiaries (Table 10). In *Sali* season 2020, AAU-led 300 ICMDs with STRVs and 50 with PQR were conducted reaching out to 306 and 50 beneficiaries, respectively.

Based on crop-cut data in AAU-led ICMDs, the yield performance of BINA Dhan11 during *Boro/*early *Ahu* season 2019-20 was found superior to the locally grown varieties. The yield of ICMDs ranged from 4.18 t/ha in district Kamrup to 6.55 t/ha in Morigaon with an average of 5.18 t/ha, as depicted in fig. 16.

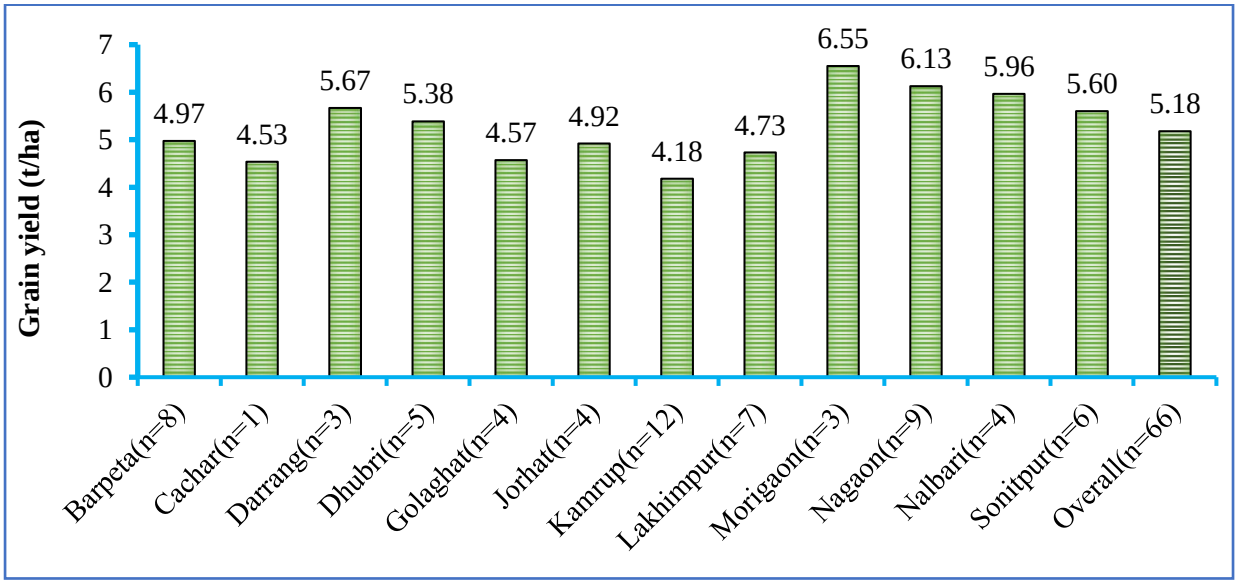


Fig. 16: District-wise grain yield under ICMDs with AAU during *Boro/*early *Ahu* season 2019-20

Table 10. Physical targets vis-a-vis achievements of ICMDs (STRVs and PQR) through AAU

Location	ICMD – STRVs						ICMD – PQR		
	Boro/early *Ahu* season 2019-20			*Sali* season 2020			*Sali* season 2020		
KVK	T	A	Benf.	T	A	Benf.	T	A	Benf.
Jorhat	4	4	4	20	20	20			
Sivasagar				15	15	15	6	6	6
Golaghat	4	4	4	15	15	15	8	8	8
Nagaon	10	10	10	20	20	20			
Sonitpur	10	10	10	25	25	25			
Lakhimpur	6	6	6	25	25	25			
Karbi Anglong				20	20	20			
Kokrajhar	6	6	6	20	20	20			
Dhubri	10	10	10	15	15	15	6	6	6
Barpeta	10	10	10	15	15	15	8	8	8
Nalbari	6	6	6	20	20	20			
Darrang	4	4	4	20	20	20			
Morigaon	10	10	10	20	20	20			
Kamrup	10	10	10	15	15	21	8	8	8
Cachar	4	4	4	15	15	15	7	7	7
RARSs/HRS									
RARS, Kokrajhar							7	7	7
HRS, Kahikuchi	7	7	7	20	20	20			
Total	**101**	**101**	**101**	**300**	**300**	**306**	**50**	**50**	**50**

Note: T-target, A-achievement, Benf. - beneficiaries

In *Boro/*early *Ahu* 2019-20, 300 ICMDs were conducted at 23 DoA-ATMA centres in selected APART districts. Whereas in *Sali* 2020, 2000 ICMDs with STRVs, and 100 ICMDs with PQR were conducted in targeted 23 APART districts through DoA-ATMA (Table 11).

Yield estimation of DoA-ATMA centres, based on the crop-cut data received from 11 centres during *Boro/*early *Ahu* season 2019-20, revealed that the STRV yields varied from 4.56 t/ha in district Darrang to 6.74 t/ha in district Sonitpur, with an overall average yield of 5.74 t/ha across the districts (Fig. 17).

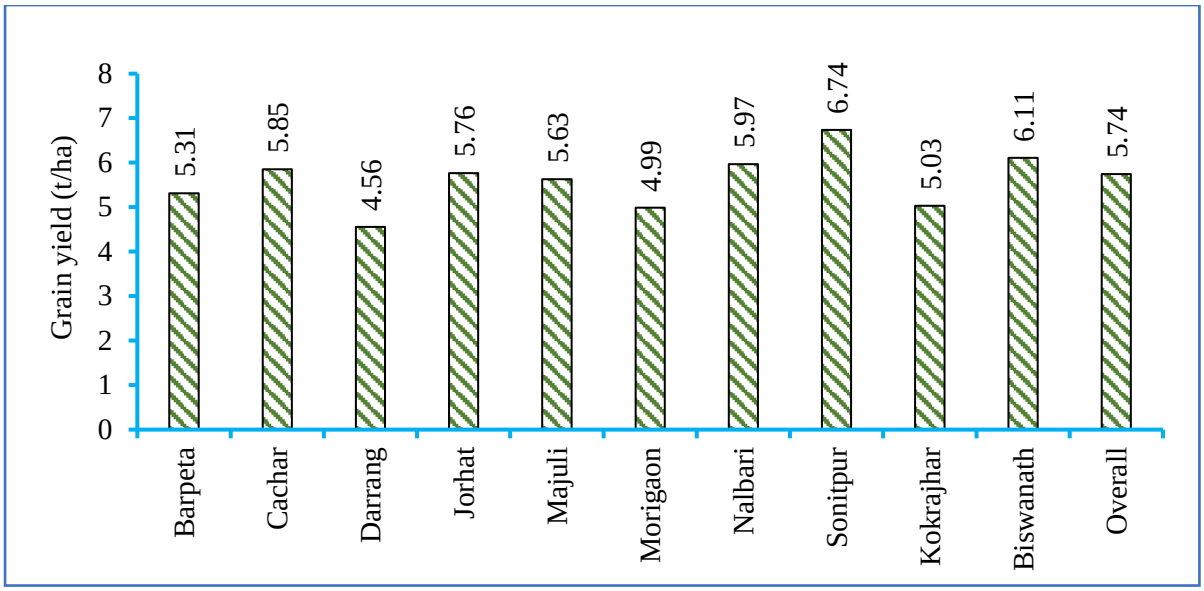


Fig. 17: District-wise grain yield of STRVs under ICMDs through DoA-ATMA during *Boro*/early *Ahu* season 2019-20

Table 11. Physical targets vis-a-vis achievements of ICMDs with STRVs and PQR through DoA-ATMA during *Boro*/early *Ahu* season 2019-20 and *Sali* 2020

Location	ICMD – STRVs						ICMD – PQR		
	Boro/early *Ahu* season 2019-20			*Sali* season 2020			*Sali* season 2020		
District	T	A	Benf.	T	A	Benf.	T	A	Benf.
Jorhat	10	10	10	76	76	76			
Sivasagar				80	80	80	16	16	16
Golaghat	15	15	15	100	100	100	14	14	14
Nagaon	25	25	25	164	164	164			
Sonitpur	18	18	18	106	106	106			
Lakhimpur	20	20	20	104	104	104			
Karbi Anglong				100	100	100			
Kokrajhar	20	20	20	82	82	82	16	16	16
Dhubri	25	25	25	100	100	100	14	14	14
Barpeta	25	25	25	106	106	106	16	16	16
Goalpara	25	25	25	104	104	104			
Nalbari	10	10	10	72	72	72			
Darrang	20	20	20	66	66	66			
Morigaon	25	25	25	68	68	68			
Kamrup	20	20	20	106	106	106	10	10	10
Cachar	10	10	10	140	140	140	14	14	14
Hojai	5	5	5	78	78	78			
Biswanath	12	12	12	66	66	66			
West Karbi Anglong				56	56	56			
Kamrup Metro	5	5	5	56	56	56			
Mankachar	5	5	5	50	50	50			
Charaideo				66	66	66			
Majuli	5	5	5	54	54	54			
Total	300	300	300	2000	2000	2000	100	100	100

Note: T-target, A-achievement, Benf.-beneficiaries

2.2.1.2. Learning centre demonstrations

The learning centre demonstrations (LCDs) were conducted through AAU with integrated crop management practices in transplanted rice on 1.0 ha area each. The main intent of the LCDs was to showcase the technology among the various groups of innovative and progressive farmers. At the crop maturity stage, one field event was organised at each learning centre to disseminate the technology to fellow farmers.

During *Boro*/early *Ahu* 2019-20, a total of 80 LCDs with STRVs/HYVs were conducted wherein 80 farmers were benefited (Table 12). During *Sali* season 2020, 120 LCDs with STRVs, and 40 LCDs with PQR, were conducted involving 210 beneficiaries.

Based on the crop-cut data received from 14 AAU centres during *Boro*/early *Ahu* 2019-20, it was noticed that STRV yields varied from 4.17 t/ha in district Goalpara to 6.72 t/ha in district Sonitpur, with an overall average of 5.68 t/ha across the districts (Fig. 18).

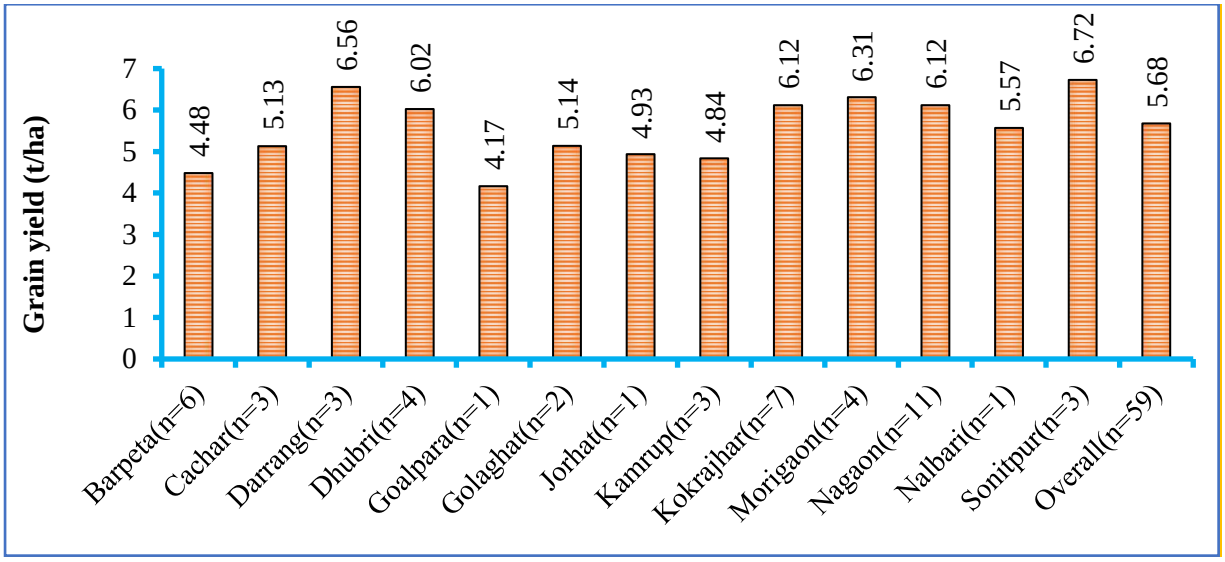


Fig. 18: District-wise grain yield of STRVs under LCDs with AAU during *Boro*/early *Ahu* season 2019-20

Table 12. Physical targets vis-a-vis achievements of LCDs (STRVs & PQR) through AAU

Location	LCD-STRVs						LCD – PQR		
	Boro/early *Ahu* season 2019-20			*Sali* season 2020			*Sali* season 2020		
KVK	T	A	Benf.	T	A	Benf.	T	A	Benf.
Jorhat	2	2	2	8	8	8			
Sivasagar				5	5	5	6	6	5
Golaghat	2	2	2	5	5	5	6	6	6
Sonitpur	5	5	5	8	8	8			
Dhubri	8	8	8	5	5	5	6	6	6
Barpeta	8	8	8	5	5	5	6	6	6
Nalbari	3	3	3	8	8	8			

Darrang	3	3	3	8	8	8			
Morigaon	3	3	3	8	8	19			
Kamrup	3	3	3	5	5	25	6	6	21
Cachar	3	3	3	5	5	5	5	5	5
Jorhat				6	6	6			
Nagaon	10	10	10	10	10	10			
Lakhimpur	10	10	10	10	10	10			
Karbi Anglong				8	8	8			
Kokrajhar	10	10	10	6	6	9	5	5	7
HRS, Kahikuchi	10	10	10	10	10	10			
Total	**80**	**80**	**80**	**120**	**120**	**154**	**40**	**40**	**56**

Note: T-target, A-achievement, Benf.- beneficiaries

2.2.1.3 Resource-efficient alternative crop establishment methods

Introduction and scaling out mechanization in Assam is the prime focus of APART. Substantial interventions have been planned and are being executed to sensitize the farmers for innovative technologies and motivate them to adopt mechanised farm operations. The project is also focalizing on strengthening the service economy so that mechanised intervention may reach the masses. This will also help address the issues of consistent labour-scarcity and production-cost involved in traditional methods of rice production. From *Sali* season 2020 onwards, it was planned to introduce the resource-efficient alternative crop establishment methods, such as mechanical transplanting using rice transplanter, dry direct-seeding of rice (DSR) using seed-cum-fertilizer drill, and wet-DSR using drum-seeder. These interventions are being implemented through respective AAU centres. The details on the procurement of targeted farm machineries under objective II are given in table 13.

Table 13. Procurement status of machineries under objective II

Sr. No.	Machinery / Items	Year 1		Year 2		Total procured
		Target	Achievement	Target	Achievement	
1.	Seed-cum-fertilizer drill	16	16	16	Paddy transplanter will be put to e-tendering process, and purchase orders for other machines have been issued, and the machines are being supplied	16
2.	Paddy transplanter	16	16	16		16
3.	Drum seeder	100	100	100		100
4.	Battery-operated power sprayer	120	120	120		120
5.	Power weeder	16	16	16		16
6.	Power-tiller operated inclined-plate planter	4	4	4		4

During *Boro*/early *Ahu* season 2019-20, 40 demonstrations on wet-DSR using STRVs/HYVs were conducted on 40 farmers' fields through AAU. Crop-cut data from *Boro*/early *Ahu* season 2020 shows that the paddy grain yield of wet-DSR varied from 4.11 t/ha in Lakhimpur district to 5.30 t/ha in Nagaon district (Fig. 13).

During *Sali* season 2020, 60 demonstrations on wet-DSR using STRVs were planned with 100 % achievement, whereas Dry-DSR was demonstrated at 39 sites with a deficit of one, caused due to short seed supply (Table 14).

Table 14. Physical targets vis-a-vis achievements for demonstrations on resource-efficient alternative crop establishment methods Wet-DSR and Dry-DSR through AAU

Location	Wet-DSR			Dry-DSR			Wet-DSR		
	Boro/early *Ahu* season 2019-20			*Sali* season 2020			*Sali* season 2020		
KVK	T	A	Benf.	T	A	Benf.	T	A	Benf.
Jorhat	2	2	2	3	3	3	3	3	3
Sivasagar				3	3	3	3	3	3
Golaghat	3	3	3	2	2	2	3	3	3
Nagaon				5	5	5	3	3	5
Sonitpur	3	3	3	2	2	2	3	3	3
Lakhimpur	3	3	3	4	4	4	3	3	3
Karbi-Anglong				2	2	2	3	3	3
Kokrajhar				3	3	3	3	3	3
Dhubri	3	3	3	2	2	2	3	3	3
Barpeta	3	3	3	3	3	3	3	3	3
Nalbari	3	3	3	2	2	2	3	3	3
Darrang	3	3	3	1	1	1	3	3	3
Morigaon	3	3	3	3	3	6	3	3	4
Kamrup	3	3	3	2	2	2	3	3	3
Cachar	3	3	3	1	0	0	3	3	3
RARSs/HRS									
RARS, Nagaon	2	2	2				3	3	3
RARS, Lakhimpur	2	2	2				3	3	3
RARS, Karbi Anglong							3	3	3
RARS, Kokrajhar	2	2	2				3	3	3
HRS, Kahikuchi	2	2	2	2	2	2	3	3	3
Total	40	40	40	40	39	42	60	60	63

Note: T-target, A-achievement, Benf.- beneficiaries

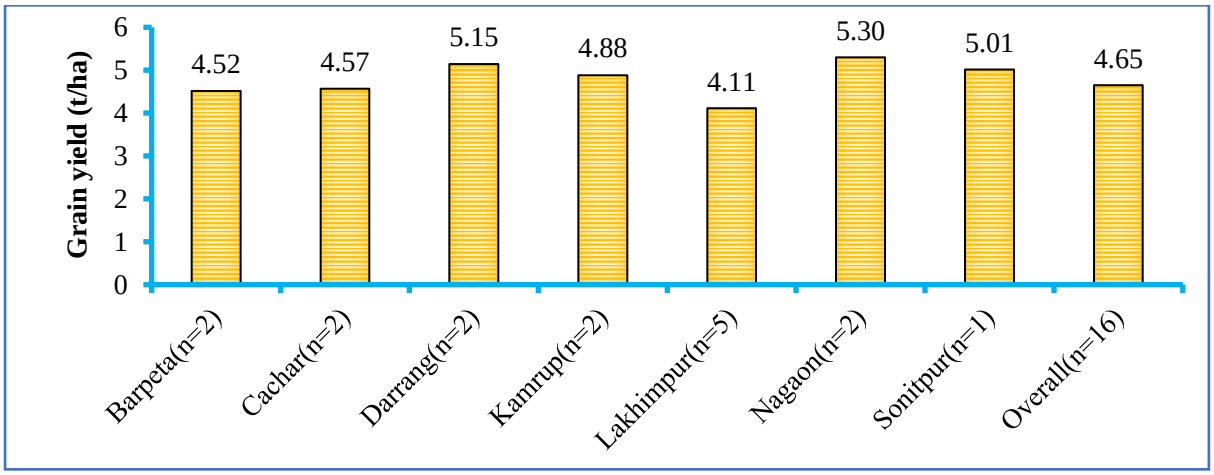


Fig. 19: Grain yield of STRVs under wet-DSR with AAU during *Boro* season 2019-20

During *Boro*/early *Ahu* season 2019-20, 30 demonstrations on MTPR using STRVs/HYVs were conducted on 30 farmers' fields. The analysis of data shows that the paddy yield of MTPR varied from 4.47 t/ha in Barpeta district to 6.80 t/ha in Sonitpur district (Fig. 20) with an average yield of 5.87 t/ha. In *Sali* 2020, 40 demonstrations on MTPR using STRVs were conducted on 47 farmers' fields, as shown in table 15.

Table 15. Physical targets vis-a-vis achievements for demonstrations on mechanical transplanting of rice through AAU

Location	MTPR – STRVs					
	Boro/early *Ahu* season 2019-20			*Sali* season 2020		
KVK	T	A	Benf.	T	A	Benf.
Jorhat				2	2	2
Sivasagar				2	2	2
Golaghat				2	2	2
Nagaon	4	4	4	2	2	2
Sonitpur	4	4	4	4	4	4
Lakhimpur	4	4	4	3	3	3
Karbi Anglong				2	2	2
Kokrajhar	2	2	2	2	2	2
Dhubri	3	3	3	4	4	4
Barpeta	3	3	3	4	4	4
Nalbari	2	2	2	3	3	3
Darrang	2	2	2	2	2	2
Morigaon	2	2	2	2	2	3
Kamrup	2	2	2	2	2	2
Cachar				2	2	2
RARSs/HRS						
HRS, Kahikuchi	2	2	2	2	2	2
Total	30	30	30	**40**	**40**	**41**

Note: T-target, A-achievement, Benf.- beneficiaries

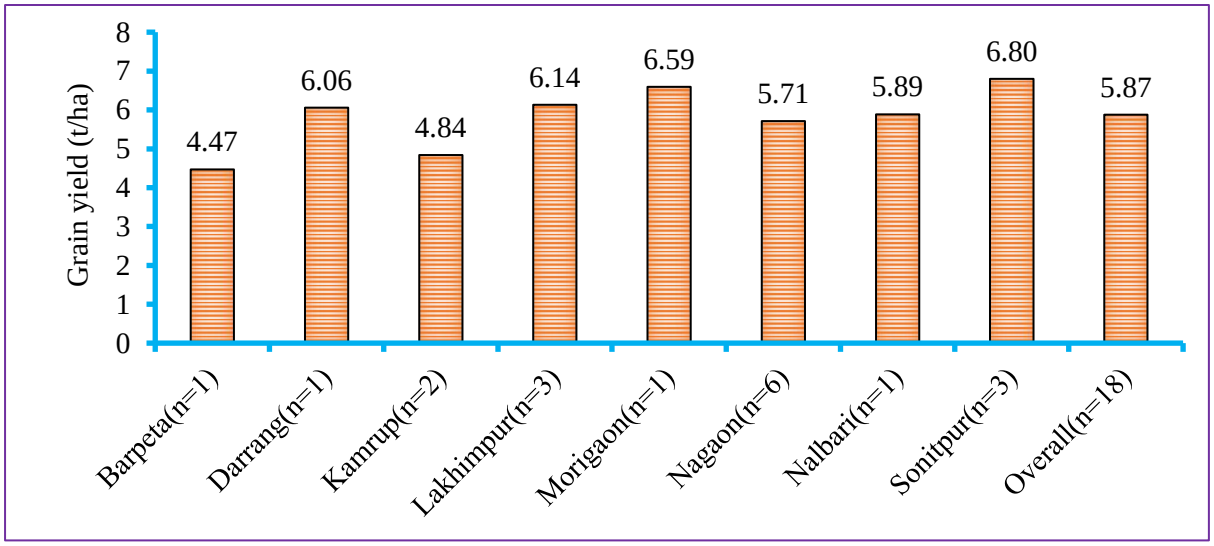


Fig. 20: Grain yield of STRVs under MTPR through AAU during *Boro*/early *Ahu* season 2019-20

During *Boro*/early *Ahu* 2019-20 season, it was observed that the weed management strategies imparted a variable impact on the grain yield of paddy across the districts and locations. The plots

with no weed management, recorded the lowest yield (3.71t/ha), whereas, improved weed management brought maximum yield under chemical weed management (using herbicides) followed by mechanical weeding, and manual weeding (Fig. 21). This shows that the integration of different weed management strategies is one of the best options for effective weed management, rather than adopting any single weed management practice/method.

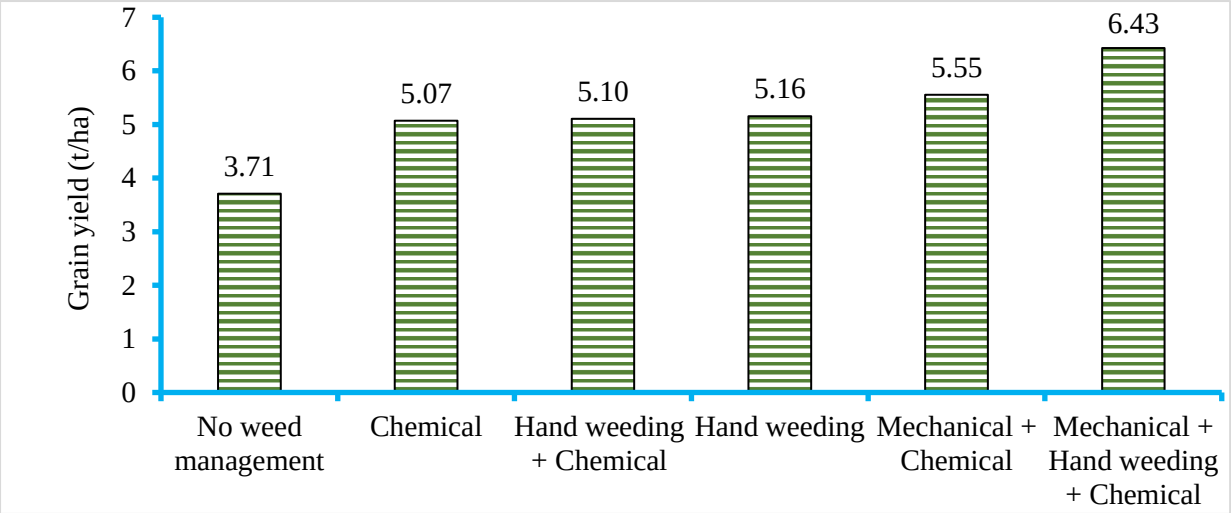


Fig. 21: Effect of weed management practices on grain yield across different demonstrations and locations during *Boro*/early *Ahu* season 2019-20.

Table 16. Summary of the overall progress of demonstrations under objective II

Sr. No.	Intervention	*Boro*/early *Ahu* season 2019-20			*Sali* season 2020		
		T	A	Benf.	T	A	Benf.
1	ICMDs transplanted STRVs						
	AAU	101	101	101	300	300	306
	ATMA	300	300	300	2000	2000	2000
2	ICMDs transplanted PQR						
	AAU	-	-	-	50	50	50
	ATMA	-	-	-	100	100	100
3	Learning Centre Demonstration						
	LCD transplanted STRVs (AAU)	80	80	80	120	120	154
	LCD transplanted PQR (AAU)	-	-	-	40	40	56
4	Resource-efficient alternative crop establishment method (AAU)						
	Wet-DSR by drum-seeder	40	40	40	60	60	63
	Dry-DSR by seed-cum-fertilizer drill	-	-	-	40	39	42
	MTPR	30	30	30	40	40	41

2.2.1.4 Capacity building and training of extension functionaries, service providers, and progressive farmers

For mass awareness and wider adoption of newly introduced technologies, strengthening the capacity of all stakeholders is pre-requisite, and is in progress through a series of training of trainers (ToTs). These hands-on training sessions are having a strong influence on 'learning-by-doing' with action and reflection. Keeping this in mind, the training programs for creating Master Trainers (MTs) is underway by involving multidisciplinary extension functionaries of the DoA-ATMA, AAU and selected farmers interested in learning advance technologies, including farm

mechanization. During the reporting period, 67 extension activities (trainings, field days and exposure visits) were organised on different agronomic practices and farm mechanization, with the active involvement of 1814 stakeholders including extension functionaries (131), dealers (1) and farmers (1682). Of the total 1814 participants, 78% (1418) were males, and 22% (396) were females. The details of capacity building and training of extension functionaries, service providers, and progressive farmers are given in table 17.

Table 17. Summary of different capacity building programs under objective II

Activity	Farmers				ATM/BTM/AEA/ Scientists/ Extension functionaries				Dealers/Others				Gender		Total
	Gen	OBC	SC	ST	Gen	OBC	SC	ST	Gen	OBC	SC	ST	Male	Female	
One-day training (n=28)	345	296	30	72	65	48	2	4	0	0	0	0	705	157	862
Two-day training (n=7)	35	78	5	36	5	3	1	3	0	0	0	0	119	47	166
Three-day training (n=2)	26	18	2	3	0	0	0	0	0	0	0	0	45	4	49
Season-long training (n=2)	20	23	3	1	0	0	0	0	1	0	0	0	43	5	48
RKB-usage training (n=3)	18	63	0	0	0	0	0	0	0	0	0	0	71	10	81
Training on mat-type nursery * (n=12)	145	139	5	13	0	0	0	0	0	0	0	0	215	87	302
Field day in *Boro* crop 2018-19 * (n=13)	249	24	7	26	0	0	0	0	0	0	0	0	220	86	306
Objective II, Total (n=67)	**838**	**641**	**52**	**151**	**70**	**51**	**3**	**7**	**1**	**0**	**0**	**0**	**1418**	**396**	**1814**

2.2.1.5. Measurement of greenhouse gas (GHG) emissions in rice (*Boro*-2020) under APART

GHG emission and grain yield

The GHG emissions from the paddy fields, as methane (CH_4) and nitrous oxides (N_2O), varies with SOM status, land-use and cropping intensity, irrigation water and drainage management practices, soil-microbial populations and their activities, soil properties, and climatic variables. The crop establishment methods such as farmer's practice of puddled transplanting (FP-PTR), learning centre demonstrations with best management practices using STRVs (LCD_STRV), mechanized transplanting of rice (MTPR) and direct-seeded rice in wet condition (Wet-DSR), influenced the amount of CH_4, N_2O and CO_2 emitted to the atmosphere.

Wet-DSR, the practice of direct-seeding in wet condition using drum seeder, instead of farmer's practices, resulted in a 50% reduction in CH_4 emission, which was highly significant. CH_4 emission also reduced with best management practices compared to farmer's practices. Whereas, the impacts of CO_2 and N_2O were found non-significant among all practices. However, grain yield in farmer's practice was found significantly lower than others, probably due to poor crop stand and inadequate input management. It was also observed that the highest grain yield of rice was found in MTPR (5.87 t ha^{-1}). Maximum yield penalty of around 28% was observed for the farmer's practice compared with MTPR. It was reported that during the rice-growing *Boro* season 2020, global warming potential (GWP) was significantly higher in FP-PTR compared to the MTPR, LCD_STRVs and Wet-DSR (fig. 22).

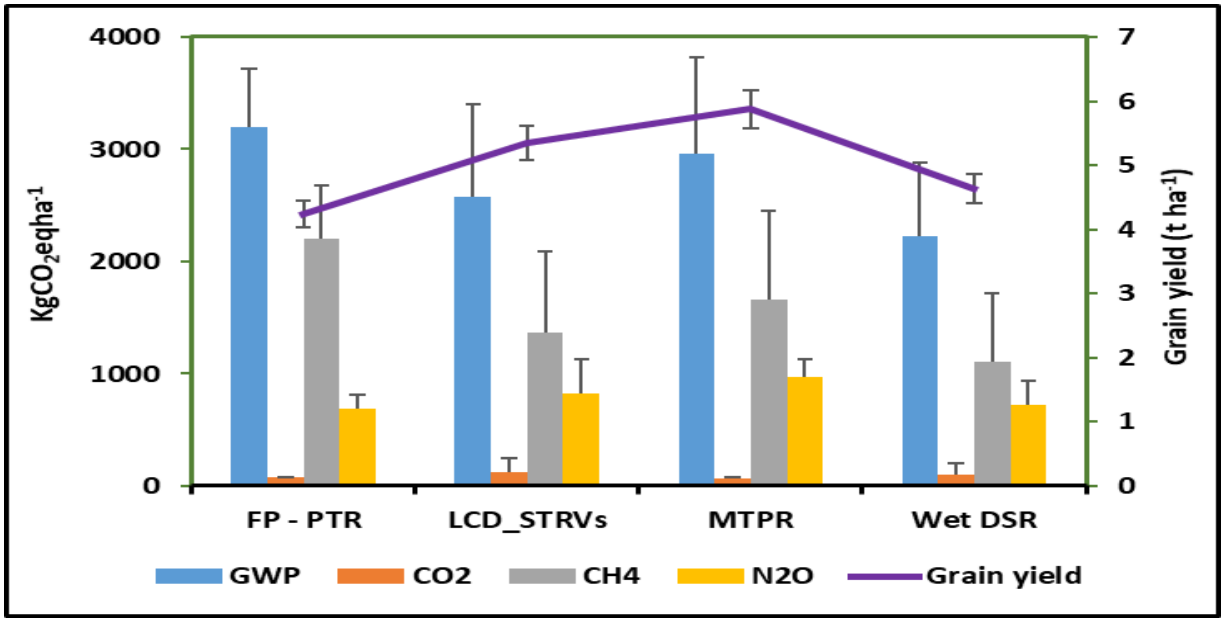


Fig. 22: GHGs emission and grain yield under different practices in *Boro* rice (2020-21)

2.2.2 Activity 2: Dissemination of effective IPM technologies to improve rice productivity

With the aim to help the farmers of Assam to reduce the risk of crop damage caused by insect-pests, diseases, weeds etc., using environmental and economically viable means, APART project is proving to be an important platform. It is helping to showcase the benefits of pest management technologies like IPM to a large number of beneficiaries across most of the districts of Assam and serving as the basis for implementing and hand-holding agencies for proper dissemination of the concept and knowledge of IPM to the farmers. Under objective I of the project, cluster demonstrations and dealer's demonstrations have been earmarked for IPM superimposed activities during *Sali* 2020. Different integrated techniques of pest and disease management in rice (from seed to seed) have been showcased. Based on the demonstration districts and the relevant problems of the particular area, site-specific and need-based pest- and disease-management strategies are employed in each of the six agro-climatic zones of Assam. Through our interventions (demonstrations and trainings), the farmers are shown the benefit of using an integrated approach for pest- and disease management in rice. A number of effective indigenous technical knowledge (ITK) innovations and environment-friendly techniques are also being advised for sustainable pest- and disease-management.

For the on-going *Sali* 2020, IPM activities are superimposed on dealer demonstrations. The total area of a dealer demonstration is 0.25 ha, out of which IPM is superimposed over 0.15 ha, and rest 0.10 ha area is kept as the control for yield comparison. Besides, cluster demonstration covering an area of 5 ha, is intended for mass visibility of the IPM activities among the farmers. The target for IPM superimposed on dealer demonstration for *Sali* season 2020 was 160, which was 100% achieved covering 160 beneficiaries. The target for IPM superimposed cluster demonstrations for *Sali* season was 350 numbers that were fully achieved reaching 3,046 beneficiaries.

Table 18: Demonstration details and beneficiary number of *Sali* season 2020

KVK	IPM superimposed dealer demonstration (0.15 ha)			IPM superimposed on cluster demonstration (5 ha)		
	T	A	Benf.	T	A	Benf.
Jorhat	10	10	10	15	15	174
Sivasagar	10	10	10	20	20	382
Golaghat	10	10	10	20	20	136
Nagaon	10	10	10	13	13	50
Sonitpur	10	10	10	22	22	85
Lakhimpur	10	10	10	10	10	88
Karbi Anglong	10	10	10	10	10	70
Kokrajhar	10	10	10	10	10	139
Dhubri	10	10	10	20	20	301
Barpeta	10	10	10	20	20	165
Nalbari	10	10	10	20	20	161
Darrang	10	10	10	20	20	143
Morigaon	10	10	10	15	15	112
Kamrup	10	10	10	20	20	182
Cachar	10	10	10	20	20	155
RARS/HRS						
RARS, Titabor	-	-	-	10	10	108
RARS, Nagaon	-	-	-	15	15	85
RARS, Lakhimpur	-	-	-	15	15	129
RARS, Karbi-Anglong	-	-	-	15	15	26
RARS, Kokrajhar	-	-	-	15	15	109
HRS, Kahikuchi	10	10	10	25	25	246
Total	**160**	**160**	**160**	**350**	**350**	**3046**
T: Target; **A:** Achieved; **Benf:** Beneficiary numbers						

The COVID-19 related lockdown has negatively affected the timely availability of pesticides, resulting in increased crop-pest attack during the growing season. Reports of incidence of some pests and diseases were received in the current season. Currently, *Gundhi* bug, leaf folder, stem borer and swarming caterpillars are the major concern in all the zones of Assam, especially the Lower Brahmaputra Valley zone (Kamrup, Barpeta and Darrang district) (**Table 19**). Pests like white backed plant hopper, brown plant hopper, green leaf hopper and hispa are in abundance in paddy fields resulting in anticipated crop loss. The farmers are regularly advised to take remedial measures well in time to avoid disease- and pest damage. At many places, APART teams are visiting infested fields for diagnosis and recommendations. Awareness material (leaflets) developed by Assam Agricultural University for extension workers and farmers in APART demonstrations can be consulted to contain the damage.

Table 19: Agro-climatic zone wise incidence of pests and diseases observed in demonstrations during *Sali* 2020

Sl. No.	Agro-climatic Zone	Crop stage	Pest/disease observed
1.	Upper Brahmaputra Valley Zone	Nursery, tillering	Stem borer
		Tillering	Leaf folder, stem borer, hispa, swarming caterpillar, caseworm
		Grain filling	*Gundhi* bug
		Nursery, tillering	Blast, brown spot, bacterial leaf streak
2.	North Bank Plain Zone	Nursery, tillering	Stem borer
		Tillering	Leaf folder
		Grain filling	*Gundhi* bug
		Tillering	Brown spot
3.	Lower Brahmaputra Valley Zone	Nursery, tillering	Stem borer, leaf folder, swarming caterpillar
		Grain filling	*Gundhi* bug
		Tillering, grain filling, flowering	Blast, brown spot
4.	Central Brahmaputra Valley Zone	Nursery, tillering	Stem borer
		Grain filling	*Gundhi* bug
		Nursery, tillering	Brown spot
5	Barak Valley Zone	Tillering	Stem borer
		Grain filling	Gundhi bug
6.	Hills Zone	Tillering, flowering	Stem borer
		Grain filling	*Gundhi* bug

2.2.2.1 IPM interventions proposed to farmers and their status for current *Sali* season, 2020

- Sensitize the farmers about the use of good quality seeds through proper seed selection. It is regularly done through quality seed production trainings.
- Other than chemical pesticides, seed treatment with biocontrol agents (*Trichoderma*) was advised to farmers through all QSP trainings. In addition to this, farmers were encouraged to go for seedling root dip treatment with systemic insecticides (Flubendiamide). Since at first stage of this season, some recommended chemicals were banned by GOI, some farmers were unable to perform this practice in their field.
- Chemical-free management practices of pests and diseases were encouraged among the farmers. Many demonstrations at Lakhimpur, Karbi Angling, Darrang, Nagaon, etc. are using neem products like Azadirachtin, Neem oil, Multineem, Nimbecidine as a spray.

- *Tricho* cards were used in some of the demonstrations to avoid the attack of pests like stem borer. *Tricho* cards numbering 1885 were procured at different KVKs for the management of rice stem borer.
- Installation of pheromone traps was done in the IPM superimposed demonstrations, particularly against stem borer. A total of 14,271 pheromone traps were procured by different KVKs as well as RARS and had been installed in different fields.
- Use of Indigenous Technical Knowhow (ITK) was encouraged amongst the farmers, e.g., clipping of leaf tips to escape the attack of stem borer, and hanging of dead poultry/frog to evade the attack of *Gundhi* bug during grain filling stage.
- Farmers have been advised to use T-bird perches for predatory birds to control the swarming caterpillars and they have readily accepted and adopted the practice in many demonstrations. They are also advised to remove these bird perches at the time of grain filling to harvesting.
- Community-based disease- and pest-management interventions are encouraged in all the meetings with the farmers.

Table 20: Status of procurement of pheromone trap in *Sali* season, 2020

Sr. No.	Station	No. of pheromone traps
1.	KVK Jorhat	620
2.	KVK Sivasagar	1150
3.	KVK Golaghat	800
4.	KVK Nagaon	200
5.	KVK Sonitpur	900
6.	KVK Lakhimpur	420
7.	KVK Karbi Anglong	420
8.	KVK Kokrajhar	400
9.	KVK Dhuburi	2281
10.	KVK Barpeta	800
11.	KVK Nalbari	850
12.	KVK Darrang	820
13.	KVK Morigaon	650
14.	KVK Kamrup	900
15.	KVK Cachar	800
16.	RARS Nagaon	600
17.	RARS Lakhimpur	460
18.	RARS Karbi Anglong	600
19.	RARS Kokrajhar	600
Total		**14271**

Table 21: Status of procurement of *Tricho* cards in the current season

Sr. No.	Station	Quantity procured (nos.)
1.	KVK Barpeta	1000
2.	RARS Nagaon	510

3.	RARS Kokrajhar	375
Total		**1885**

2.2.2.2 Development of Rice Doctor (RD) Assam for accurate and timely diagnosis of rice problems

Considering the COVID-19 related travel restrictions, it became imperative that the farmers diagnose the pests and diseases themselves, even in the absence of visits of extension to their fields, and the timely recommendations is made available at their fingertips so that the dependence on recommendations by persons visiting fields for diagnosis can be minimized.

Rice Doctor Assam is an App-based diagnostic tool that provides an accurate and timely diagnosis of rice problems and gives management recommendations to address the same.

Rice Doctor Assam supports agricultural extension workers and farmers by providing:

- Instant diagnosis of nearly 80 rice problems including insect-pests, diseases, nutrient deficiencies, toxicities, etc.
- Management and prevention options
- An option to upload images of rice problems to get management recommendations from experts

We have already started working on Rice Doctor Assam which will be available as part of the Rice Knowledge Bank (RKB) under the following sequence of stage-wise activities

1. Development of Rice Doctor Assam (English version) and release of beta-version in Google play store
2. Rice Doctor Assam usability testing with extension advisors, farmers and students
3. Development of Rice Doctor Assam (Assamese language) and release of beta-version in Google play store
4. Dissemination and scaling of Rice Doctor Assam in different agro-climatic zones with farmers, extension advisors, etc.
5. Integration of Rice Doctor Assam into ongoing activities of DoA and other appropriate portals (for the sustainability of Rice Doctor Assam)

It is important to generate awareness among the farmers about the wide variety of practices that can be adopted effectively under IPM approaches. A simple, easy to follow IPM module is propagated among rice farming communities through trainings at different fora. A total of 30 QSP trainings, 3 dealers' meeting and 4 awareness meetings were executed under the objective I during Sali season 2020 till September, to cover information on IPM interventions as well. The target of organizing these trainings have already been completed for the previous season, and the current season activities are on-going, and the achievement till Sep 2020, are shown **(Table 22)**.

Table 22: Details of trainings with IPM components under Objective 1 for *Sali* 2020:

S.No.	Activity	Target	Achieved
1	**Quality seed production training**		
	Sali 2020	30	30
2	**Dealers' meeting**		
	Sali 2020	6	3
3	**Awareness meeting**		
	Sali 2020	8	4

2.2.2.3 Development of technical literature/publications

1. Developed 52 factsheets on disease- and pest-management (26 in English and 26 in Assamese) for the IRRI Assam, Rice Knowledge Bank (RKB).
2. Developed brochure on IPM for use of extension functionaries.
3. Contributed to the development of 2 booklets on IRRI supported activities under the climate-resilient technologies and rice value chain interventions (for visiting World Bank Mission).

Seedlings root dip treatment

T- bird perches to control swarming caterpillar

Installed pheromone trap to control stem borer

Visual inspection of a few pest-/ disease-infested fields

Fig. 23: IPM interventions during *Sali* 2020

2.2.3. Activity 3: The Rice Knowledge Bank for Assam

www.rkbassam.in

2.2.3.1 Introduction

Rice Knowledge Bank (RKB) has been one of the major digital tools of knowledge dissemination for IRRI-led rice-based farm technologies. The challenges faced by the end-users of RKB in different regions have been the unavailability of these knowledge-products in local languages with localized content in a downloadable format. Another challenge that extension intermediaries face is the unavailability of a ready-to-use, and offline content-source that they could use for their recommendations, and the one that they could also distribute as a handout.

The RKB initiative for Assam aims to plug this gap by providing ready-to-use district-level content in different formats (*viz.* factsheets, training manuals, and videos) in local languages. Content for RKB is being developed in collaboration with Assam Agricultural University (AAU), Department of Agriculture, Govt. of Assam, and experts available in the region. This is also in line with the standard operating procedures of IRRI for the development of a knowledge bank. The content and data-sets are being customized as per requirements of

districts of Assam. The capacity of end-users will be strengthened to disseminate, and effectively use the knowledge bank resources thereafter.

2.2.3.2 Web Development

The beta version of the RKB, Assam was launched by Hon'ble Vice-Chancellor, AAU on Feb 28, 2019. The beta version of the website can be viewed at www.rkbassam.in. RKB, Assam showcases rice production techniques, agricultural technologies, and best farming practices based on IRRI and AAU's pool of knowledge from research findings, learning, media-resources, and in-country projects.

To facilitate easy access to information, RKB Assam highlights the step-by-step production stages from pre-planning to post-production management, decision tools, and agronomy guides to help people make informed farming decisions. RKB, Assam serves to address the biggest challenge to agricultural development by supporting the fast and effective transfer of technologies from the research laboratory to the farmers' field.

The process of developing the main website in four languages (*viz.* English, Assamese, Bengali, and Bodo) is in progress. The following activities are in progress for the development of the same:

- **Selection of vendor for Web development:** For selecting a Web-development agency, AAU in consultation with IRRI floated a tender *"Agency for design, development and maintenance of web portal and mobile application for Rice Knowledge Bank (RKB) under APART"* on June 3, 2020. The major criteria for the selection process consisted of hosting and maintenance service, technical support, documentation and training, delivery timeline, multi-language support, and development of Web- and mobile-version for both Android and iOS platforms. The short-listed eight vendors presented case-studies and their proposed approach for the technical development of the knowledge portal. The selected Web-development agency will work in coordination with the RKB-Assam development team.
- **Organized a Web data bank:** This serves as the shared drive/data warehouse where all the materials (e.g. photos, content, database, etc.) for the RKB Assam site are housed in preparation for the development.
- **Established Web sitemap:** To present a systematic view, typically hierarchical order of the pages on the Website, the team organized a sitemap using a spreadsheet. These are intended to help Web developers during the development of sitemap.
- **Developed RKB Assam mock-up:** Website mock-up for the RKB Assam website was developed and can be accessed at LINK.

  The site mock-up was developed to act as a guide for the Web development agency. This mock-up has also helped the RKB team to map missing links, source text and images. The site is being reviewed for feedback from the RKB Assam developer group.

- **RKB Assam major Web components:**
  - Marketing

- Variety: Passport data
- Step by step production: Pre-planting, growth, post-production
- Tools: Rice Doctor
- Input provider
- Service provider

2.2.3.3 Content development and training

2.2.3.3.1 Manuals developed

i) Rice Production Manual:

The Rice Production Manual has been localized and customized. The manual includes 7 modules and 25 lessons from pre-planting to post-harvest operation. LINK

ii) Climate Resilient Technologies and Rice Value Chain: IRRI supported activities

This booklet has been published and includes all the technologies promoted under the project in the simplest way. It helps the extension functionaries to explain the technologies to farmers in an easy way.

iii) Dhan Khetir Jolbayu Poriborton Rudhi Projukti

This is a calendar-type manual that was developed in the Assamese language for the extension functionaries with an aim to use in training program for easy understanding of the technologies.

2.2.3.3.2 Factsheets

Factsheets are ready-to-use one-page information sheets that are handy and can be used for training purposes. As a part of the project, the following factsheets (Table 23) have been developed and are available at FACTSHEET

Table 23: Details of factsheets developed

Sl. No	Topic	Name
1	Planning	Financial planning
2	Planning	Brown rice
3	Planning	Paddy quality
4	Planning	Aerobic rice
5	Planning	Crop calendar
6	Planning	Rice-fish ecosystem
7	Planning	Designing effective training interventions
8	Planning	Conflict resolution
9	Planning	Conducting field demonstrations
10	Planning	Creating impact
11	Seed	Rice morphology
12	Seed	Rice ecosystem
13	Seed	Seed definitions
14	Seed	Using good seed
15	Seed	How to produce good seed
16	Seed	Seed production
17	Seed	Seed certification

18	Seed	Seed quality measurement
19	Seed	Measuring seed germination
20	Seed	Measuring seed-lot purity
21	Seed	Measuring varietal purity
22	Seed	Mixed variety
23	Seed	Poor seed quality
24	Seed	Seed quality
25	Seed	Seed rate (high)
26	Seed	Seed rate too low
27	Seed	Seed too deep
28	Variety	Rice races and varieties
29	Variety	Oryza sativa
30	Variety	Rice varieties of Assam
31	Variety	Variety selection
32	Variety	Flood STRV
33	Variety	Drought STRV
34	Crop establishment	Land preparation
35	Crop establishment	Land preparation and tillage implements
36	Crop establishment	Land preparation and puddling tools
37	Crop establishment	Land leveling
38	Crop establishment	System of land leveling
39	Crop establishment	Paddy crop establishment
40	Crop establishment	Paddy nursery and management
41	Crop establishment	Reduced area wet-bed nursery
42	Crop establishment	Manual transplanting
43	Crop establishment	Poor transplanting
44	Crop establishment	Replanted areas
45	Crop establishment	Direct seeding
46	Crop establishment	Wet DSR by drum seeder
47	Crop establishment	Wet direct seeding
48	Crop establishment	AWD
49	Crop establishment	Good water management practices
50	Nutrient Management	Nutrient management
51	Nutrient Management	Essential nutrients
52	Nutrient Management	SSNM
53	Nutrient Management	Application of Azolla in rice
54	Nutrient Management	Azolla
55	Nutrient Management	Sesbania
56	Nutrient Management	Cu deficiency
57	Nutrient Management	Fe deficiency
58	Nutrient Management	Manganese deficiency
59	Nutrient Management	Nitrogen
60	Nutrient Management	P
61	Nutrient Management	K
62	Nutrient Management	Using organic materials and manures
63	Nutrient Management	Zinc
64	Nutrient Management	Nitrogen deficiency

65	Nutrient Management	Phosphorus deficiency
66	Nutrient Management	*Boro*n deficiency
67	Nutrient Management	*Boro*n toxicity
68	Nutrient Management	Ca deficiency
69	Nutrient Management	Fe Toxicity
70	Nutrient Management	Magnesium deficiency
71	Nutrient Management	Manganese toxicity
72	Nutrient Management	Nitrogen excess
73	Nutrient Management	K deficiency
74	Nutrient Management	Silicon deficiency
75	Nutrient Management	Sulphide toxicity
76	Nutrient Management	Sulphur deficiency
77	Nutrient Management	Zinc deficiency
78	Nutrient Management	Aluminum toxicity
79	Weed control	Weed control
80	Weed control	IWM
81	Weed control	Manual weed control
82	Weed control	Cultural weed control
83	Weed control	Mechanical weed control
84	Weed control	Chemical weed control
85	Weed control	Herbicide toxicity
86	Mechanization	Farm power
87	Mechanization	Source of farm power
88	Mechanization	Safe tractor operation
89	Mechanization	Matching equipment to farm size
90	Mechanization	Mat-type nursery
91	Mechanization	MTR
92	Mechanization	Seeder clogged
93	Postharvest	Harvesting
94	Postharvest	When to harvest
95	Postharvest	Paddy drying system
96	Postharvest	Threshing options
97	Postharvest	Threshing
98	Postharvest	Axial flow thresher
99	Postharvest	Open drum Thresher
100	Postharvest	Rice milling system
101	Postharvest	Super bag
102	Postharvest	RCC ring bin
103	Postharvest	Rice quality
104	Postharvest	Custom Hiring Center
105	Abiotic stress	Drought
106	Abiotic stress	Heavy rainfall
107	Abiotic stress	Flooding
108	Abiotic stress	Soil too soft
109	Abiotic stress	Cloddy soils
110	Abiotic stress	Soil crusting
111	Abiotic stress	Crop too dense
112	Abiotic stress	Muddy water
113	Abiotic stress	Poor seed distribution
114	Abiotic stress	Field level (High spot)
115	Abiotic stress	Field level (Low spot)

N.B. the biotic stress factsheets are under review, as most of the presently recommended chemicals are banned. The content developed in English has been translated and is available in Assamese as well.

2.2.3.3.3 E-tutorial video

Scripts for video production are being consolidated. About 8 scripts are in the draft stage that includes varietal selection, land leveling, seed treatment, seed production, crop establishment, fertilizer management, weed management, pest- and disease management, harvesting and custom hiring centre. The RFQ has been sent to AAU for initiating the tendering process for vendor selection. The video topics are listed below**:**

a. Sustainable production practices for rice

1.1 Variety selection

1.2 Seed selection and treatment

1.3 Nursery raising techniques and their management

1.4 Tillage and land preparation

1.5 Crop establishment methods

1.6 Nutrient management

1.7 Integrated weed management

1.8 Water management

1.9 Insect management

1.10 Disease management

1.11 Harvesting and postharvest management

b. Showcasing specific technologies

2.1 Quality seed production

2.2 Flood-tolerant rice varieties

2.3 Drought-tolerant rice varieties

2.4 Premium quality rice varieties

2.5 Post-flood crop management

2.6 Rice-fallow management (*rabi* season)

2.7 Mat-type nursery preparation

2.8 Precision land levelling using laser land leveler

2.9 Mechanical transplanting of rice

2.10 Wet direct-seeded rice

2.11 Dry direct-seeded rice

2.12 Calibration and adjustments of seed-cum-fertilizer drill

2.13 Rice transplanter calibration and adjustment

2.14 Smart water management practices (AWD)

2.15 Integrated pest management

2.16 Mechanized weed management

2.17 Fertilizer spreader

2.18 Sprayers and spraying techniques

2.19 Pesticide handling and safety measures

c. **Postharvest**

2.20 Post-harvest technologies under IRRI supported activity (Part I)

2.21 Post-harvest technologies under IRRI supported activity (Part II)

2.22 Reaper and its working principle

2.23 Combine harvester and its working

2.24 Axial Flow Thresher

2.25 Open drum thresher for women farmer

2.26 Different drying option

2.27 Solar bubble dryer

2.28 Storage system in Assam

2.29 Super bag and its storage principle

2.30 RCC ring bin and its construction

2.31 Different milling systems in Assam

2.32 Portable rice mill and its working

2.33 Rice value chain technologies under IRRI supported activities

2.34 Separation of whole grains from broken grains (Indent cylinder separator)

2.35 Dry grinding machine for women SHG

2.36 Custom Hiring Center Part I

2.37 Custom Hiring Center Part II

2.2.3.3.4 Training

Following trainings and workshop have been planned for the AWP 2020-21. The table 24 depicts the status of training

Table 24: Status of RKB training during *Sali* season 2020 till September 2020

Training details	Target	Status
Stakeholder workshops	6	Yet to start
Video production	12	In progress
Website development	1	In progress
RKB Usage training	24	3 completed
Management and maintenance of RKB	4	After launching of main website
Management and maintenance training	16	After launching of main website
Field testing of RKB	1	After launching of main website

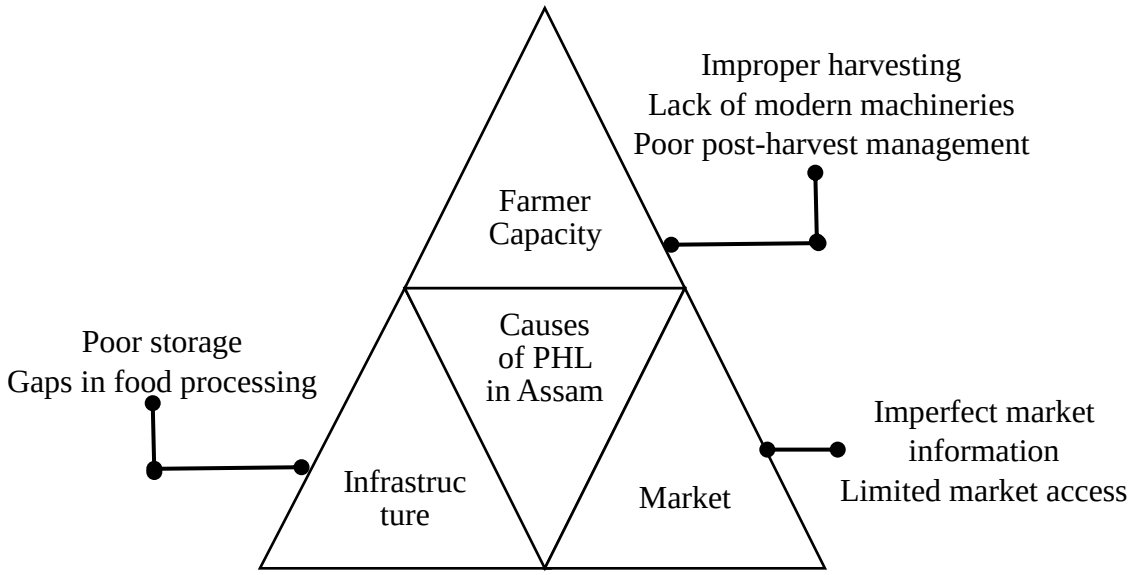
Objective 3:

Strengthening post-harvest management by introducing improved post-harvest mechanization and rice value chain

2.3 Strengthening post-harvest management

2.3.1 Introduction

As per latest estimates by the Associated Chambers of Commerce of India, the nation loses approximately Rs 926 bn (US$ 14.33 bn) on account of post-harvest losses (PHL). [Ref. 1] Crop worth approximately US$ 19.4 mn is wasted in India on a daily basis, only due to rejection at the farm gate and delays in the distribution process. A country-wide study measuring crop losses revealed that 3.9% - 6% cereals were lost during harvesting, post-harvest activities, handling and storage. [Ref. 2,3] Post-harvest losses in India stem from a range of factors as mentioned in the figure below.



Fragmented landholdings and a postharvest value chain that is riddled with inefficiencies, cause considerable post-harvest losses (PHL) to stack up progressively throughout the value chain. Small and marginal farmers, comprising 86.2% of Assam's farming community, are affected by the challenges of fragmentation and value-chain inefficiencies in the form of weak access to markets, low investment in agriculture, low productivity and low income.

Under APART, different types of improved technologies are introduced to address the labour scarcity, timely completion of field operation and drudgery. Reaper and portable harvester are two improved options introduced for the harvesting of paddy. Similarly, axial flow thresher and open drum thresher are meant for mechanical threshing with minimum losses. The mini track-type combine harvester is also one of the better options for Assam to harvest the paddy even in wet field condition, which generally occurs during *Boro* harvest in Assam. The storage loss or quality deterioration is a very sensitive issue, as it depends upon agro-climatic conditions. Super bag and RCC ring bin are some of the improved hermetic methods introduced to store grains. Nowadays, paddy drying using conventional methods is not a feasible practice. The increasing need for grain each year is one of the main factors that push to invent new methods of drying paddy grain. The old method is not useful since it takes up space, needs bright sunshine as the drying media, which consumes a long drying time. One of the

alternatives of drying paddy grain is the use of mechanical dryers such as solar bubble dryer, flatbed dryer, and recirculating batch dryer.

Rice milling is a process of removing the husk and the bran layers, and produce an edible, white rice kernel that is sufficiently milled and free of impurities. Traditional rice-mills in Assam are mostly steel-roller types, having problems of a more broken percentage. Therefore, portable rice mills with rubber-roller could be a better option for having wider adoption by the farmers. Similarly, to add value to rice, the project introduced indent cylinder separator to isolate the whole grain from broken grains. A dry grinding machine can be used to prepare rice powder from these broken grains, which could also be adopted as a business for women farmers. Rice flakes and puff machines are also being introduced in Assam to create entrepreneurship opportunities and to add additional value to some marketing products.

2.3.2 Activities planned under Objective III:

2.3.2.1 Demonstration and dissemination of improved postharvest machineries for large-scale adoption at the farm level

This activity mainly focuses on the demonstration and dissemination of improved post-harvest and rice value chain technologies for the farmers to create awareness on improved machines. A series of demonstrations were carried out at KVKs in all selected districts for introducing farmers to the new machinery.

Why is an improved technology required?

- To obtain the quality paddy, the harvesting of the crop at 22-25% grain moisture level or when 85% of the panicles have turned straw-coloured is recommended. Avoid over-stay of un-threshed paddy bundles in the field for drying that may have a negative impact not only on quality but also on the quantity of harvested paddy. Improved technology, such as the combine harvester for cutting and threshing, and the reaper/crop harvester for cutting, are useful for the timely accomplishment of the operations.
- Similarly, the efficient threshing options, such as the axial flow thresher (AFT), and open drum thresher (ODT) for mechanical threshing, are being introduced in Assam for effective and efficient results.
- Drying of paddy grain is one of the most critical issues for Assam farmers, as there is no such machine available for drying of threshed paddy. The climate during *Boro* paddy harvest is totally un-favourable for drying due to uncertain rainfall. Threshed grains are recommended to dry to 12-14% moisture level for storage as grain, and at 9-12% moisture when stored as seed. We assume that, at present, only about 20-30% of the wet grain in state-depots is mechanically dried by the large rice mills; and the rest has to be sun-dried. The procurement of paddy in the state by PPCs governed by Assam State Marketing Board (ASMB) is very low due to high moisture content in the grain. Many of the traditional rice millers have informed that farmers often bring paddy to the mill at a moisture level of 19-20%. Therefore, Solar Bubble Dryer (SBD) and Recirculating Batch Dryer (RBD), both being proven technologies, are the potential solutions for the drying problem, and help avert weather risk, alleviating losses and maintaining rice quality

- Under this project, the farmers are being acquainted of the benefits of IRRI's hermetic Super bags by demonstrating grain and seed storage for maintaining moisture at the desired level to retain seed quality and preventing an insect-pest attack. Apart from this, the AAU-designed RCC ring-bin is also one of the storage options for small and marginal farmers.

2.3.2.2 Demonstration and dissemination of rice value chain technologies for large-scale adoption at the farm level

The value chain is analysed from production to the distribution of rice into inner markets (local village and state-level retail markets), comparing the performance of an upgrading scenario to the current situation. The rice value chain starts with the production of a primary commodity, i.e., paddy (with farmers), and it ends with the consumption of the final product (rice and associated by-products), including all the economic activities undertaken between these phases such as processing, delivery, wholesaling, and retailing.

- Out of several parameters that affect the value of rice in the market, the percentage of broken grains in the milled rice is one of the important determinants. The rice mills currently available in Assam, are mostly the steel-roller types, which produce 30-50% broken grains, resulting in a milled product with low head-rice recovery. Moreover, the farmers have to incur high operational cost, as they are bound to carry their paddy to a far-placed miller. The milling of rice can be improved by introducing a tractor-operated portable two-stage rubber-roller type rice mill which brings down the broken percentage to 1-2% and can be used as a business for progressive farmers.
- The project has introduced portable rice mill to serve consumers and farmers in remote areas and is providing training on how to use mobile rubber-roller mills. As the existing steel-roller type rice mills produce a mix of whole grain and broken grains, therefore to add more value to rice, indent cylinder separator is introduced for separating whole grains from the broken grains. An additional dry grinding machine can be used for making rice powder, and the women SHGs can use this machine to start a small-scale business in their area. Rice puff and flakes are two additional by-products that add value to the milled rice.

2.3.2.3 Procurement of different machine

Different types of machinery for improved postharvest management were procured under the project and delivered to respective KVKs/RARSs/HRS. The details of these machineries are given in table below.

Table 25. Status of procurement of PH machinery till October 2020

S. No	Machines	Year 1		Year 2		Total	
		Target	Procured	Target	Procured	Target	Procured
1	**Reaper**	9	9	10	10	**19**	**19**
2	**Thresher**						
	Axial flow thresher (AFT)	9	9	8*	0	**17**	**9**
	Open drum thresher (ODT)	22	0#	18	18	**40**	**18**
3	**Combine harvester (mini)**	2	2	1	0	**3**	**2**

4	**Dryer**						
	Solar bubble dryer	2	2	2*	0	**4**	**2**
	Recirculating batch dryer	1	0#	1@	0	**2**	**0**
5	**Storage**						
	Super bag	8,000	8000	7,000*	0	**15,000**	**8000**
	RCC ring bin	74	74	74@	0	**148**	**74**
6	Portable rice mill	10	10	8*	0	**18**	**10**
7	Indent-cylinder separator	4	4	4*	0	**8**	**4**
8	Dry grinding machine	4	4	4*	0	**8**	**4**
9	Rice puffing machine	4	0#	4@	0	**8**	**0**
10	Rice flake machine	1	0#	1@	0	**2**	**0**

*Purchase order released and delivery of machine is pending due to COVID-19 lockdown

Order has been placed to the vendor, but machines were not supplied, therefore, total target has been carried over to AWP 2020-21

@ Not received desired number of quotations, therefore retendering will be done soon

$Desired no. of quotations were not received; therefore, the total target has been carried over to AWP 2020-21

2.3.2.4 Training and demonstration of technologies for post-harvest and rice value-addition at the farm level for dissemination and large-scale adoption

A total of eighty-nine demonstrations and trainings were organized with the help of KVK/RARSs/HRS at the district level in order to create awareness for different post-harvest and rice value-chain machineries among the rice farming communities during *Sali* season 2020 (table 26). The remaining *Sali* season 2020 activities will be completed before November 2020. The execution of post-harvest activities was started late as the initial phase of national lockdown due to COVID-19 pandemic coincided with the peak harvesting season of *Boro*/early *Ahu* 2020.

Table 26. Physical targets vis-a-vis achievements for demonstrations and trainings on post-harvest and rice value-chain through AAU

Location	Postharvest Machinery						Rice Value Chain					
	Training (No.)			Demonstration (No.)			Training (No.)			Demonstration (No.)		
	T	A	Benf.	T	A	Benf.	T	A	Benf.	T	A	Benf.
Jorhat	2	2	53	2	2	48	1	1	24	2	2	45
Sivasagar	1+1*	1+1*	37+28*	1	1	30				1	1	29
Golaghat	2	0	0	2	1	25	1	1	26	2	0	0
Nagaon	2	2	38	2	2	50	1	0	0	2	0	0
Sonitpur	2	2	53	2	2	54	1	1	35	2	2	53
Lakhimpur	2	2	40	2	2	40	1	0	0	1	1	20
Karbi Anglong	1	1	28	1	1	28				2	2	57
Kokrajhar	2	2	60	2	2	60				2	0	0
Dhubri	1	1	30	1	1	34	1	0	0	2	0	0
Barpeta	2	2	52	2	2	52	1	1	25	1	1	26
Nalbari	1	1	24	1	1	24				2	0	0
Darrang	2	2	51	1	1	31				1+1*	1+1*	30+21*
Morigaon	2	2	49	1	1	21	1	1	20	2	2	40
Kamrup	1	1	29	2	2	66	1	1	29	1	1	50
Cachar	1	1	30	2	2	55				1	1	32
RARS Jorhat	1	1	25	1	1	25				1	0	0
RARS Nagaon	1	1	23	1	1	20				1	1	20
RARS Lakhimpur	1	1	26	1	1	25				1	1	24
RARS K-Anglong	1	1	28	1	1	30				1	1	27
RARS Kokrajhar	1	1	29	1	1	26				1	0	0
Goalpara (HRS)	1	1	41	1	1	41	1	0	0	1	1	25
Total	30+1*	28+1*	774	30	29	785	10	6	159	30+1*	18+1*	499

* Left over activity of *Boro* 2019-20.

T - target, A - achievement, Benf. - beneficiaries

2.3.2.5 A brief description of technology promoted under APART

As a remunerative alternative of traditional manual harvesting and threshing of paddy, which involves several issues regarding labour, cost, time-consumption, and human drudgeries, we demonstrated reaper, portable crop-harvester and axial flow thresher in most of the KVKs during the training and demonstration program at the time of harvesting and threshing of paddy at farmer's field. The farmers have realized the benefits of these machines that helped in reducing labour-use to merely 1-2, to harvest 1.5 ha of land in a day with an average charge of INR 2500/ha. Similarly, early harvesting is possible with reaper at optimum moisture content with 60% less labour requirement, as only 1 operator and 1 labour are required for the operation. Thus, mechanised reaping saves 85.7% time and reduces 85.4% loss of paddy in manual harvesting. Axial flow thresher is being introduced in Assam to allow threshing of paddy, immediately after cutting in order to avoid losses, save residual soil moisture, and create an opportunity to advance sowing of succeeding crop by 8-10 days. Axial flow thresher gives farmers a higher yield by lowering the total grain loss to less than 5% and resulting in better-quality paddy.

<table>
<tr>
<td> 
</td>
<td>

Alternative machine for paddy harvesting
Prime mover: Self-propelled
Reduces drudgery
Saves time of operation
Reduces harvesting losses
Reduces cost of harvesting
Helps to harvest the crop at the proper stage of maturity

Cost: INR 1,50,000
</td>
</tr>
<tr><td colspan="2">Reaper</td></tr>
<tr>
<td>  </td>
<td>

Cuts the crop at the desired height
Easily transported to the fields
Prime mover: Self-propelled petrol engine
Reduces drudgery
Saves time of operation
Reduces labour cost
Capacity: 1 bigha/hour
Shattering losses are minimized

Cost: INR 45,000
</td>
</tr>
<tr><td colspan="2">Crop harvester</td></tr>
</table>

- Cleanly separates the grain from the stalk
- Reduces cost of threshing
- Prime mover: Tractor (35hp or more)
- Reduces drudgery
- Saves time of operation
- Gives farmers higher yield and better-quality paddy
- Capacity: 16 q/hour

Cost: INR 1,80,000

Axial flow thresher

2.3.2.6 Introduction of mini track-type combine harvester for Assam farmer

About 89% of rice in Assam is grown as rainfed in the basins of Brahmaputra and Barak rivers receiving heavy rainfall. In *Boro* season, harvesting period coincides with pre-monsoon season. Similarly, uncertain rainfall occurs during harvesting period of *Sali* paddy, i.e. in the month of November or December, and it is difficult to dry the field before harvesting. Therefore, the farmers are forced to delay harvesting, which results in over-ripening of crop, leading to shattering losses. Farmers lose the crop, both qualitatively and quantitatively. Shortage of labour during this period adds an extra burden to harvesting operation of paddy.

To address the above problem, a mini track-type combine harvester was introduced in Assam under APART project in Kamrup and Jorhat district with technical support from IRRI. The major advantages of the machine are:

i. The provision of a track-type wheel system in this machine makes it easy to operate in a wet field where a full-feed combine harvester is unable to operate.

ii. By using this type of combine harvester, farmers will get a full-length straw, as in manual harvesting, which gives additional monetary support to the farmer.

iii. The half-feed threshing system in this combine also has two additional benefits, such as:

   a. Less impact force on the grain results in <1% broken grains in threshed paddy. (The full-feed combine harvesters generally have 10-12% broken grains.)

   b. Straw is smooth and easy for chewing of cattle.

   c. Besides paddy, it can be used for harvesting, threshing, and cleaning of wheat and barley also.

The paddy fields in Assam are small in size, so this mini combine can easily move in small size fields compared to other bigger versions of the combine. During the harvesting time, the fields have up to 2 feet of standing water, where the farmers usually use the boat to harvest the matured paddy crop. This combine harvester worked effectively when demonstrated with standing water in the field. It brought a smile on farmers' face as they are facing many problems to harvest paddy in the current season.

The combine harvester operated in the standing water in the presence of IRRI/KVK team took 45 to 60 mins to harvest 1 acre of land (15-20 mins per bigha). (Cost of machine is 18200 USD @ 1 USD=76 INR)

(1 bigha=1333.3m^2 =1/3 Acre)

Fig 24: Combine harvester in Assam field

2.3.2.7 Demonstration and dissemination of portable rice mill in Assam

Milling is a first operation for the value-added product in post-production of rice. The fundamental objective of a rice milling machine is to remove the husk and the bran layers and to produce an edible white rice kernel that is properly milled and free of extraneous matter/impurities. Depending on the requirement of the farmer, the rice should have a minimum of broken kernels for better market value. Most rice varieties are composed of roughly 20% husk, 10% bran layer, and 70% starchy endosperm, also termed as total milled rice. Total milled rice contains whole grains or head rice, small and medium broken grains.

Operation of portable rice mill was demonstrated at different locations through CHCs. This rice mill is efficient because of the double rubber-roller present in it. In this upscale machine, while husking, the hulling efficiency was seen to be 80-85% with minimum broken and cracked grains. In a properly adjusted rubber-roll husker, husking efficiency can be as high as 95%; however, the efficiencies are often lower. Besides machine adjustments, uniformity of grain thickness will affect the husking efficiency.

Fig. 25: Portable rice mill: at CHC, Jorhat

Fig. 26: Milling quality in Portable rice mill

Paddy grains weighing 100 kg with the moisture content of 15.6% (dry basis) were fed into the hopper. The paddy was then conveyed with the help of a bucket elevator and was pre-cleaned for extraneous matter in a sieve wire mesh. The clean paddy was then put into the rubber roller

where the first husking was done. It was seen that a certain amount of paddy was left with the unmilled rice, which was later husked in the second roller. It was evident that with both the rollers, the husk was completely removed from rice. The unpolished rice was then further conveyed with the help of a bucket elevator and fed to a polisher, wherein white rice was produced from brown rice by removing the bran layer and the germ. The bran layer was removed from the kernel by applying friction to the grain surface by rubbing the grains against an abrasive surface or against each other. The amount of bran removed was 8 kg, husk removed was 22 kg, and polished rice was 67 kg. The milling characteristics inferred after the milling 100 kg of paddy were:

1) Dead rice- 1%
2) Broken percentage-
    a) Small broken (<20% size of whole rice) - 9%
    b) Medium broken (20% to 80% size of whole rice) - 27%
    c) Head rice (80% to 100% size of whole rice) - 64%
3) Foreign matter - 0
4) Presence of paddy after milling - Nil
5) Whiteness - 72%
6) Yellowness - 28%
7) Chalkiness - 19%

The farmers were delighted to see the operation of the portable rice mill and were surprised to see that the broken percentage was minimal. This technology was appreciated by the farmers because it had rubber-roller and had undergone polishing also. The farmers were initially dithered using the portable rice mill, but after seeing the performance and benefits, they are now willing to use it in the long run.

2.3.2.8 Capacity building of the farmers, SPs, dealers, and other extension functionaries for large-scale adoption of postharvest management practices

Mechanization in post-harvest and rice value chain is very much essential, and under APART many technologies are promoted across 16 districts of Assam. For extensive scale adoption of these technologies, the project has planned to create master trainers (MTs) by conducting ToTs (2-day or 3-day training program) on these technologies for broader dissemination across the state, in collaboration with AAU and DoA.

The field functionaries of the DoA, KVKs, NGOs, members of CHCs/SHGs/FPOs, who are working with farmers at the grass-root level, and progressive farmers, are being trained as MTs. During these two-day and three-day trainings, participants were trained mainly on harvesting, threshing, improved hermetic storage, rice milling, and drying systems for paddy. The training programs were conducted with pre- and post-training evaluation test and comparison sheet were prepared (Fig. 27).

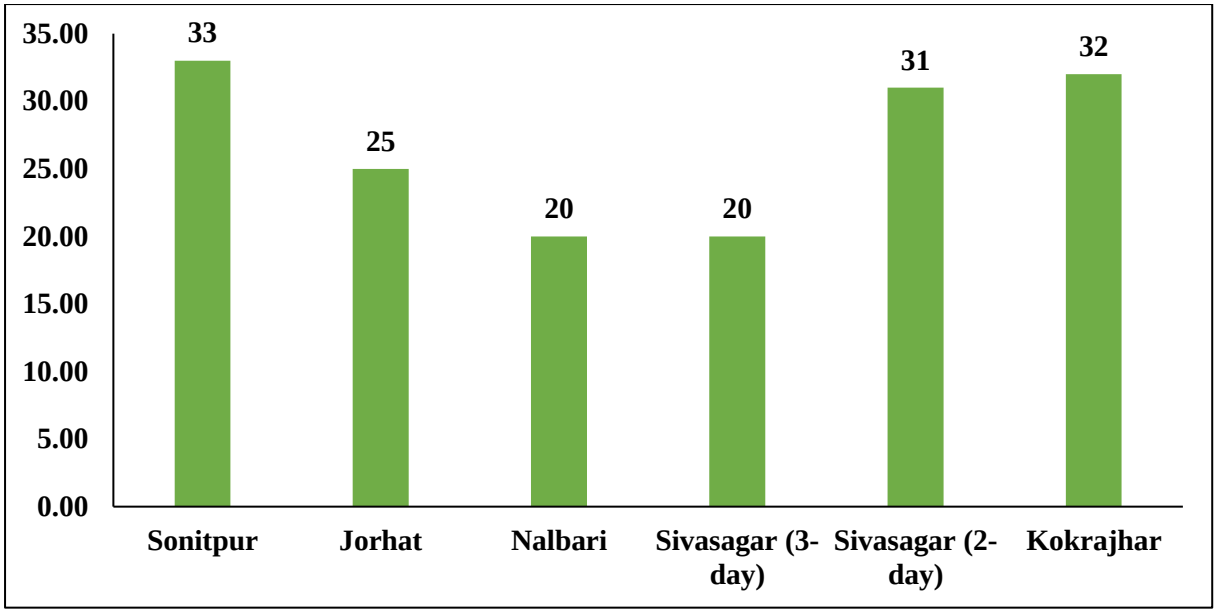


Fig. 27. Percent increase in post-training marks over pre-training marks of participants

The details of different capacity building programs organized with AAU, DoA-ATMA and IRRI collaborative efforts are given in table 27.

Table 27. Summary of different capacity building programs under objective-III

Location	2-Day training			3-Day training		
	Training (No.)			Training (No.)		
	Target	Achieved	Beneficiaries	Target	Achieved	Beneficiaries
Jorhat	1	1	23			
Sivasagar	1*	1*	24*	1	1	35
Golaghat	1	0	0			
Nagaon				1	0	0
Sonitpur	1	1	30			
Lakhimpur				1		
Karbi Anglong				1	0	0
Kokrajhar				1*	1*	25*
Dhubri				1	0	0
Nalbari	1	1	25			
Cachar	1	0	0			
Total	**5+1***	**3+1***	**102**	**5+1***	**1+1***	**60**

* Left over activities of *Boro* 2019-20 were scheduled in March, 2020, but due to COVID-19 these have been postponed.

The details of capacity building and training of extension functionaries, service providers, and progressive farmers are given in table 27.

Table 28. Summary of different capacity building programs based on profession, social-status and gender under objective III

	Farmers				ATM/BTM/AEA/Scientist/ Extension functionaries				Dealers/Others				Gender		Total
	Gen	OBC	SC	ST	Gen	OBC	SC	ST	Gen	OBC	SC	ST	Male	Female	
2-Day training (n=3)	20	43	15	0	0	0	0	0	0	0	0	0	46	32	78
3 Day training (n=1)	9	26	0	0	0	0	0	0	0	0	0	0	30	5	35
Postharvest training (n=26)	222	238	115	107	3	0	0	0	0	0	0	0	504	181	685
Postharvest demo (n=27)	265	246	70	141	3	0	0	0	0	0	0	0	565	160	725
Rice value chain training (n=5)	60	62	10	1	0	0	0	0	0	0	0	0	60	73	133
Demonstration on rice value chain (n=17)	86	177	27	115	0	0	0	0	0	0	0	0	305	147	452
Exposure visit within district (n=0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exposure visit within Assam (n=0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Objective III, Total (n=79)	**662**	**792**	**237**	**364**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1510**	**598**	**2108**

2.3.2.9 Custom Hiring Centre (CHC)

Farm mechanization plays a key role in enhancing agricultural production by facilitating optimal use of farm inputs and natural resources, and timely completion of different operations which gives the crop more time to mature, and allows the farmer to be more flexible in his farming operations, and facilitates crop intensification. Adoption of mechanization ensures timeliness of agricultural operation, which reduces the cost of production and lessens drudgery in carrying out various agricultural operations. It also helps bring about a significant improvement in agricultural productivity.

Custom Hiring Centres (CHCs) are a unit comprising a set of farm machinery, implements, and farmers could gain ease in accessibility to mechanisation and associated services for hire in comparison to purchasing the same. Custom Hiring Centre (CHC) is an important mechanism, particularly for the small and resource-poor farmers who cannot afford to own agricultural machinery. They can avail services at affordable rentals from CHC, for all field operations, starting from land preparation to post-harvest management. This method helps in engaging youth in mechanized farming system to improve the productivity of the crop. Presently, owning a tractor is compulsory to start with the CHCs under APART to utilize the tractor for other support services which will help to increase their net income.

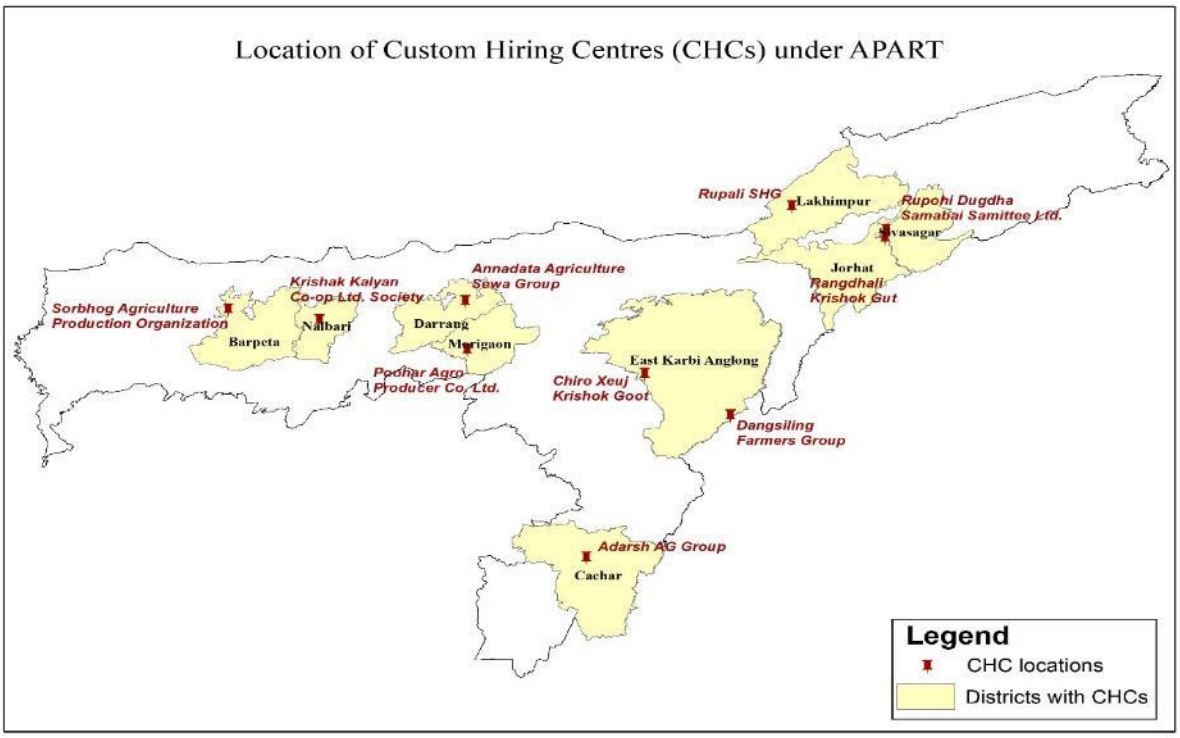


Fig. 28: Location of custom hiring centres in Assam, 2019-20

Under APART, ten CHCs are established in nine districts through KVKs/RARSs with the guidelines from Assam Agricultural University. As per the project requirement, the concerned KVKs have transferred all the machines purchased under APART to CHC initially for one year. The CHCs operates the machine in their respective areas as a business in the given time. Further, in the next year, new CHCs will be created with the same mandate, and the existing CHCs will purchase their own machinery to continue the service in their respective areas and to grow their business further.

Custom Hiring Centres (CHCs) are basically a business unit comprising a set of farm machinery such as:

a. Transplanter b. Weeder c. Thresher
d. Reaper e. Portable rice mill f. Drum Seeder
h. Battery sprayer i. Combine harvester j. Dry grinding machine

The existing CHCs have fixed the rental rates for different services, which are comparatively lesser than existing local farmer-professionals. The details are mentioned in the table.

Table 29. Custom hiring rates charged for farm machineries

Service	Operational cost of machine at CHC (INR)	% Difference over traditional systems
Transplanting	1000 per bigha	- 37.5%
Weeding	200 per bigha	- 60%
Harvesting by reaper	400 per bigha	- 66.7%
Threshing	350 per bigha	- 41.7%
Milling	100 per quintal	- 60%

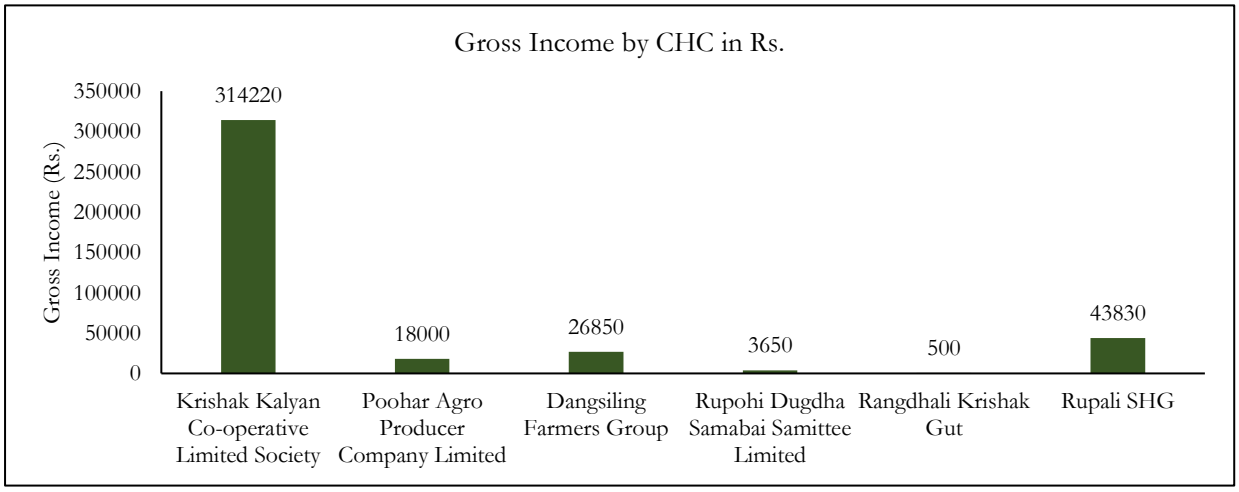


Fig. 29: Gross income (Rs) earned by different custom hiring centres

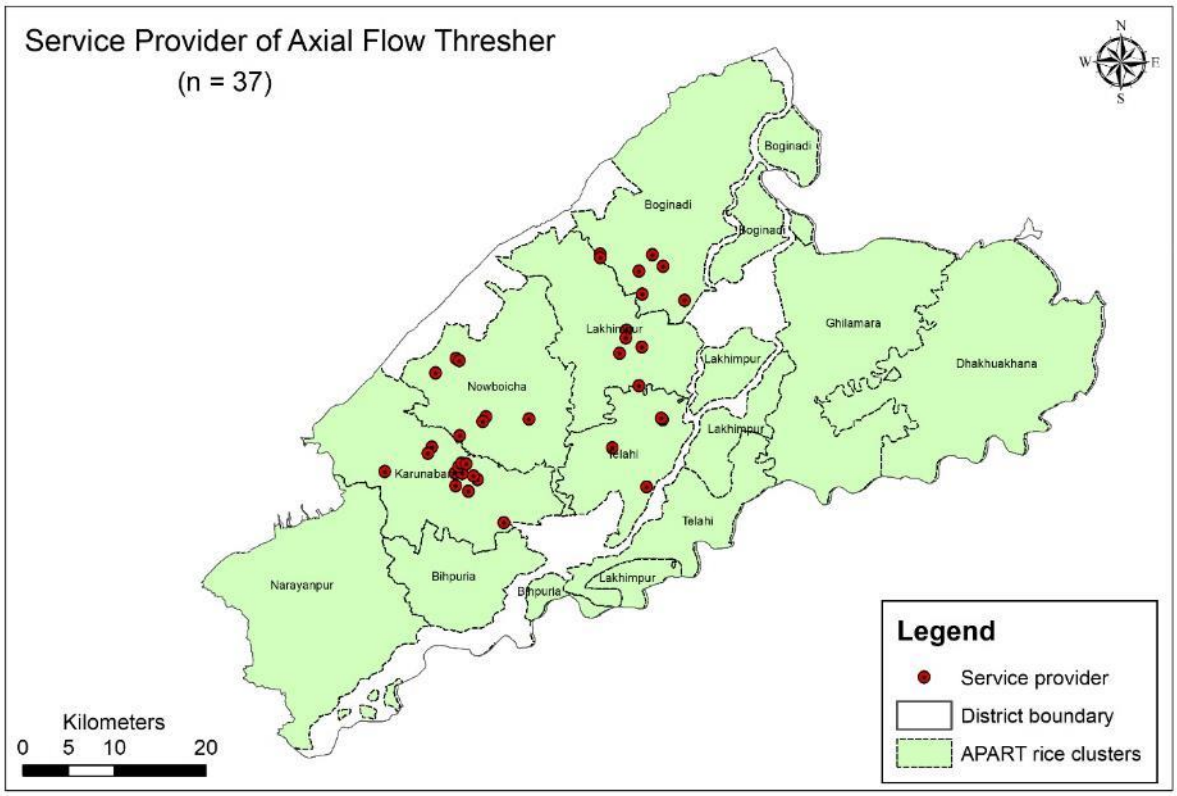
Krishak Kalyan Co-operative Society Ltd was established in 2019 and used the machines in two seasons earning a net income of Rs 3,14,220 since Nov 2019. With this earning, the Society purchased one tractor for the CHC. The above-said machines were handed over for one to two years, and in the last *Sali* season, the customers used reaper and thresher. All other CHCs were established very recently in ongoing season only.

2.3.2.10 Business opportunity by the private service provider (PSP): A case study of axial flow thresher (AFT) in Lakhimpur

The introduction of mechanization and development of service economy/entrepreneurship is vital to improving the productivity and profitability of rice-based cropping systems in Assam.

This intervention efficiently addresses the major concerns of farmers, i.e. the consistently increasing labour-scarcity and production-cost under traditional methods of rice cultivation.

Though CHC is one of the best options to address these problems, PSP is another option providing a solution to these issues. On a trial basis, 8 PSPs for reaper, and 6 PSPs for axial

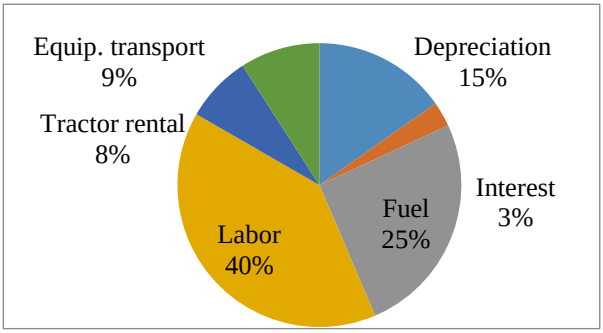


flow thresher were created in Cachar during last *Sali* season 2019. During *Boro* season 2019-20, with IRRI initiative and support 37 new service provider were identified for operating AFT in Lakhimpur district.

The PSPs run their machine in their respective areas and earn money from the services. The development of the business model is needed for the reaper also to ensure sustainable adoption and delivery of technologies. As mentioned above, 37 PSPs developed for AFT in Lakhimpur tried to capture the business done by progressive farmers. The PSPs operated their machines for 10,872 hrs with a profit of 1,20,000. Looking at the poor business model, the IRRI team explained the business model and cost-return calculation to do a better business mentioned as below.

Table 30. The business model of the Axial-Flow Thresher

Total threshing cost	Rs/Acre	% of total
Depreciation	137.7	15.3
Interest	25.2	2.8
Fuel	229.5	25.5
Labour	357.30	39.7
Tractor rental	68.40	7.6
Equip. transport	81.90	9.1



Capital return	
Income (Rs/year)	8,99,990
Total cost (Rs/year)	5,43,830
Net profit (Rs/year)	3,56,160
Internal rate of return (IRR)	125
Time of capital return (year)	0.79

2.3.2.11 Creation of linkages of manufacturers with local dealers of Assam

The farm machinery supply chain is a sequence of processes and flows that aim to meet farmers' machinery requirements, and take place within and between different stages along a continuum [Ref. 4]. The chain then links manufacturers or importers through a dealer network with farmers. Other actors in the chain are machinery service-providers that include machinery hirers and machinery maintenance and repair artisans. The purpose of the input supply chain is to provide efficient mechanization services to farmers for agricultural production and processing.

Under APART, a lot of machineries are being promoted; out of which drum seeder, mechanical transplanter, reaper and thresher have got a good response, and simultaneously are being accepted by the farmers on a wider scale. For the successful adoption of any machine, the availability of local level dealers, and maintenance shop is a must. Through several round-table meeting on mechanization and post-harvest technologies, IRRI endeavoured to create local-level dealers for transplanter, reaper, and thresher. After 2 years of efforts, district-level dealers were established for different machines with repair & maintenance services at the district level, as listed below:

National level manufacturer in Assam

1. VST dealer for reaper and transplanter at 18 different locations
2. Mahindra dealer for transplanter at Guwahati
3. Shrachi dealer for reaper at Guwahati
4. National Agro dealer for seed-cum-fertilizer drill at Jorhat and Guwahati

5. STIHL dealer for power weeder at Jorhat
6. PCI dealer for super bag and solar bubble dryer at Guwahati & Jorhat

Follow up for some more dealership Assam

1. Daedong dealer for mini combine harvester at Guwahati
2. Landforce dealer for seed-cum-fertilizer drill and axial flow thresher at Guwahati
3. Kushawaha Engineering for portable rice mill at Nagaon

Reference:

1- Report on Assessment of Quantitative Harvest and Post-Harvest Losses of Major Crops/Commodities in India, 2015, ICAR

2- Small Holder Farmers in India: Food Security and Agriculture Policy, FAO

3- Hunger in a time of plenty: The curious case of Indian food security, The Wire, July 2016

4- J.G.A.J. Van der Vorst, C.A. da Silva, & J.H. Trienekens, FAO, 2007. Agro-industrial supply chain management: concepts and applications, by, Agricultural Management, Marketing and Finance Occasional Paper No. 17, Rome.

Objective IV: Developing extrapolation domain of cropping systems for efficient targeting of technologies in low-productive rice-fallows and stress-prone areas

2.4 Objective IV: Developing extrapolation domain of cropping systems for efficient targeting of technologies in low-productive rice-fallows and stress-prone areas

The main goal of this objective is to generate extrapolation domains for identifying low-productivity rice-fallows and stress-prone areas to efficiently target improved cropping systems and climate-resilient stress-tolerant cultivars under site-specific conditions. The geospatial technologies play an important role in order to achieve the primary goal of increasing the cropping intensity and improving the yield of prevailing low productivity rice-based cropping systems in Assam. Detailed characterization of present cropping pattern and resource profiles, including identifying hotspots of biotic and abiotic stresses is required to understand the potential opportunities and constraints in the cropping systems. Geospatial technology, including Remote Sensing (RS) has the advantage of synoptic and repetitive spatial coverage through satellites/aerial platforms. Geographical Information System (GIS) can be integrated with this technology to create maps, statistics and spatial database, as an appropriate tool for making decisions regarding target areas to bring a significant increase in agricultural outputs in low productivity areas and enhance system productivity.

To achieve the overall goal of the project, the major activities planned under this objective are:

1. Primary and secondary data collection
2. Characterization of existing cropping systems and stress-prone areas
3. Creation of extrapolation domain maps/database
4. Field-level demonstrations of suitable technologies
5. Training and capacity building, dissemination of maps, and project outputs

2.4.1 Details of activities performed on extrapolation domains for efficient targeting of technologies:

2.4.1.1 Characterization of existing cropping systems:

2.4.1.1.1 Cropping system and intensity mapping for 2019-2020:

Cropping system study, which includes the characterization of the cropping pattern of an area and its management for maximum utilization, is useful to understand the overall sustainability of an agricultural system. It also helps in generating many important parameters which are useful in climate change impact assessment. In objective IV, multi-temporal satellite images were used to capture the cropping systems of Assam. Three cropping seasons: *kharif* (June-November), *rabi* (December-February), and *zaid* (March-June) have been combined to generate the cropping system map of Assam for 2019-2020.

Landsat 8 Optical Land Imager (OLI) satellite images were obtained from National Aeronautics and Space Administration, NASA's geoportal for data procurement (https://search.earthdata.nasa.gov) and used for generating cropping systems and cropping intensity maps of Assam. A total of 58 satellite images were downloaded to prepare the map for the entire state. The details of images used for cropping systems and intensity mapping is given in Table 31. Landsat's OLI sensor provides images at 30 m spatial resolution with a temporal interval

of 16 days. These images are captured with different wavelengths of the electromagnetic spectrum ranging from blue to infrared and available as individual bands for every wavelength captured.

Table 31: Details of satellite images used for cropping systems and intensity mapping:

Sl.	Path/Row	Acquisition Date	Districts covered
1	138_041	13.10.2019 30.11.2019 16.12.2019 17.01.2020 05.03.2020	Kokrajhar, Chirang, Bongaigaon
2	138_042	13.10.2019 29.10.2019 30.11.2019 16.12.2019 17.01.2020 02.02.2020 06.04.2020	Kokrajhar, Chirang, Dhubri, Goalpara, Bongaigaon
3	137_041	23.11.2019 09.12.2019 26.01.2020 11.02.2020 30.03.2020	Udalguri, Baksa, Chirang
4	137_042	30.03.2020 11.02.2020 26.01.2020 09.12.2019 23.11.2019	Chirang, Baksa, Bongaigaon, Barpeta, Udalguri, Nalbari, Kamrup Rural, Dhubri, Kokrajhar, Kamrup Metro
5	136_041	15.10.2019 18.12.2019 04.02.2020 08.04.2020	Udalguri, Sonitpur, Biswanath Chariali, Golaghat, East Karbi Anglong, Nagaon
6	136_042	15.10.2019 04.02.2020 23.03.2020 08.04.2020	Udalguri, Sonitpur, Biswanath Chariali, Golaghat, East Karbi Anglong, Nagaon, Morigaon, Hojai, Darrang, Dima Hasao, Kamrup Metro
7	136_043	08.04.2020 23.03.2020 04.02.2020 19.01.2020 02.12.2019 15.10.2019	Cachar, Karimganj, Hailakandi, Dima Hasao
8	135_041	25.11.2019	

		12.01.2020	Tinsukia, Dibrugarh, Charaideo, Dhemaji, Lakhimpur, Sivasagar, Biswanath Chariali
		28.01.2020	
		13.02.2020	
		29.02.2020	
		01.04.2020	
9	135_042	12.01.2020	Biswanath Chariali, Jorhat, Golaghat, East Karbi Anglong
		13.02.2020	
		29.02.2020	
		01.04.2020	
10	135_043	25.11.2019	Dima Hasao, Cachar
		12.01.2020	
		28.01.2020	
		29.02.2020	
		16.03.2020	
		01.04.2020	
11	134_041	17.10.2019	Tinsukia, Dibrugarh, Charaideo, Dhemaji
		02.11.2019	
		04.12.2019	
		06.02.2020	
		22.02.2020	
		25.03.2020	

Individual band images for each of the 58 images were stacked together to produce a single composite image, and each of these images were pre-processed for further analysis. The methodology adopted for cropping systems and cropping intensity mapping is given in fig. 29. The satellite image pre-processing, processing and analysis for extraction of cropping system and cropping intensity maps of Assam 2019-2020 were carried out in the image processing software Erdas Imagine.

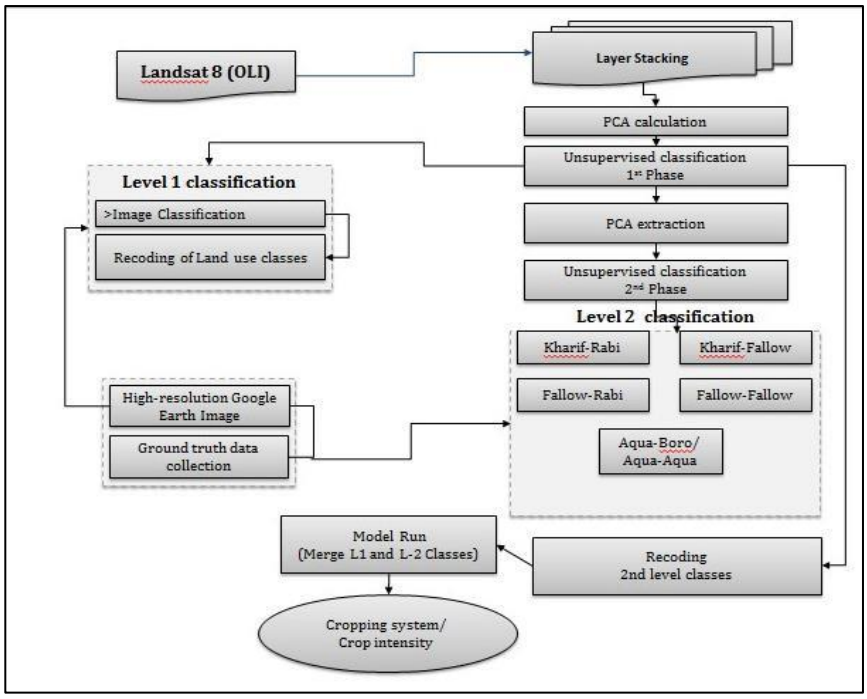


Fig. 29: Methodology adopted for cropping system/intensity mapping

Principal Component Analysis (PCA) was performed on the images to extract unique information and remove redundant data. The first component of PCA (PCA1) was classified using an unsupervised algorithm with 120 classes and 90 iterations to generate clusters. In Level 1 classification approach, these clusters were later merged into 7 classes, viz. agriculture, vegetation, settlement, forest, water body and sand, based on visual interpretation and field knowledge. The agriculture class from Level 1 classification was extracted and further processed for the Level 2 classification. Firstly, PCA was again performed on the agriculture class, and unsupervised classification with 100 classes was run on PCA1. The classes were again merged into 5 sub-classes within agriculture class: double crop (crop in both *kharif* and *rabi* season), *kharif* crop, *rabi* crop, fallow and aquaculture with *Boro*. It is executed by taking signatures at different geographical locations on the satellite image and cross-checking them with Google Earth and field data locations. The final map was prepared by merging the Level 2 classification with the Level 1 classification.

For the generation of cropping intensity map, the classes in cropping systems map were reclassed into single-crop (only one crop during an agricultural year), double-crop (two crops during an agricultural year) and fallow areas. This was done by executing a model in the model builder of Erdas Imagine software.

Fig. 30 shows the final cropping systems map of Assam for 2019-2020 where the different agricultural classes along with other land use/ land cover classes are shown in different colours.

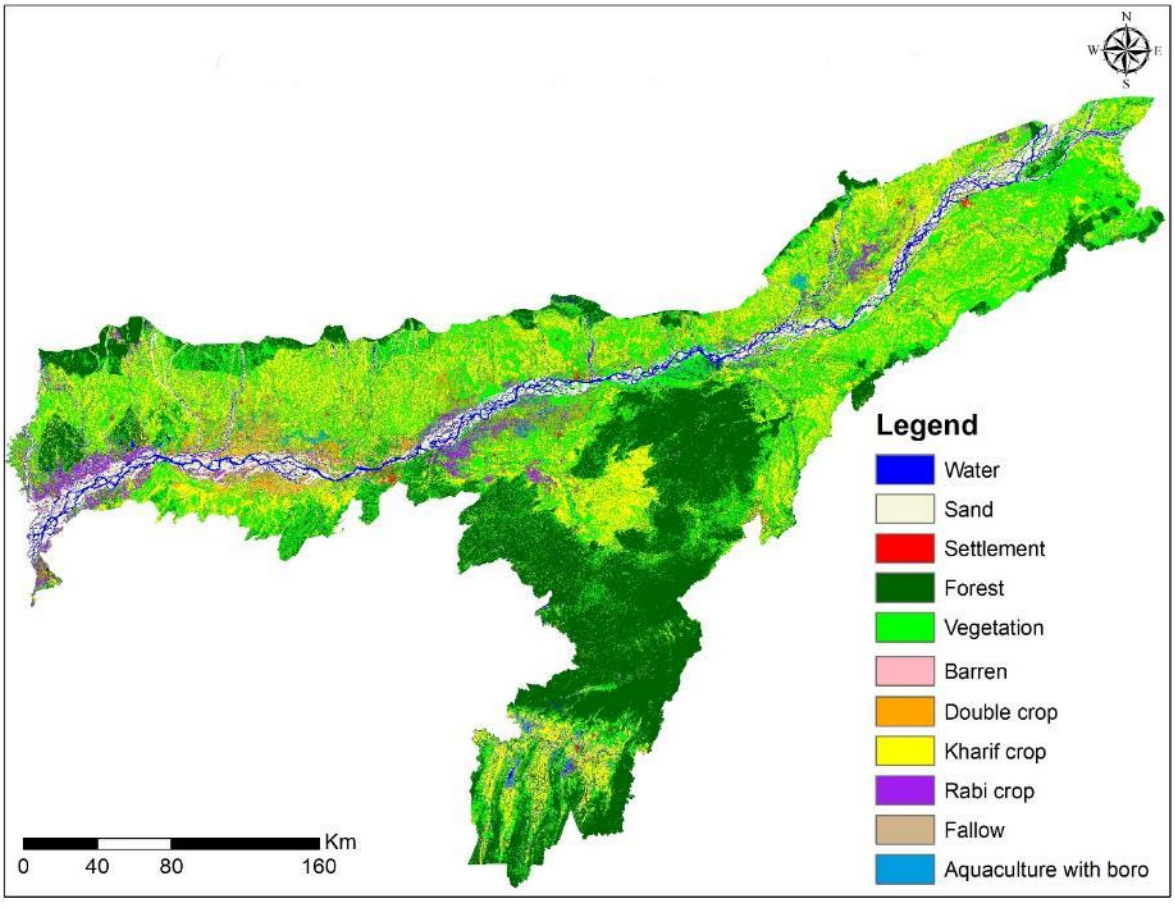


Fig. 30: Cropping systems map of Assam (2019-2020)

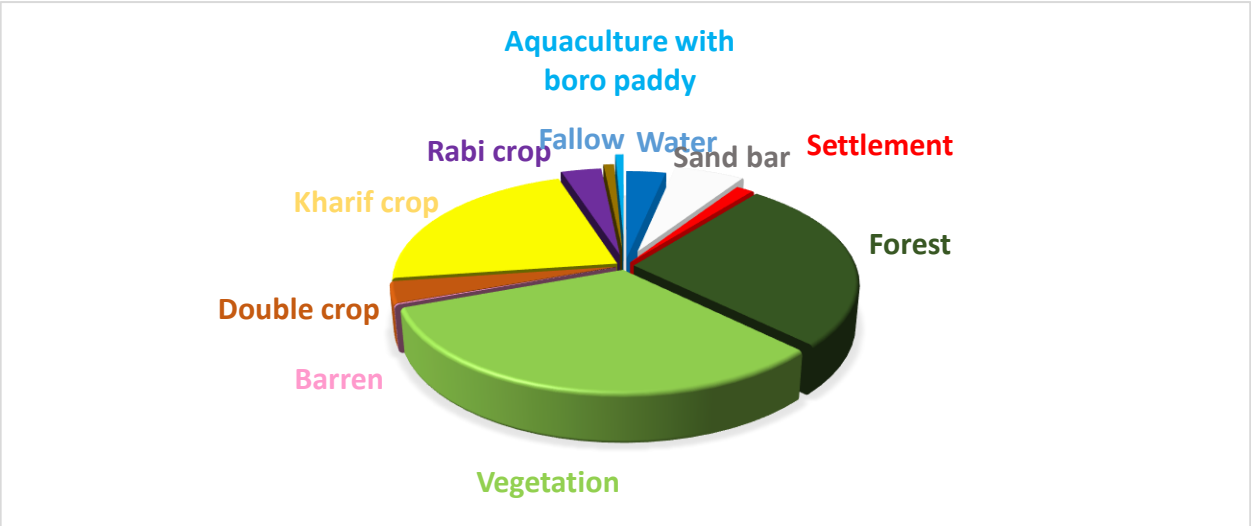


Fig. 31: Land area (%) covered under different categories in Assam during 2019-20

The pie-diagram (Fig.31) indicates the percentage of area covered under each category for the state of Assam in 2019-2020. Double cropping was observed only in 3% of the total area of the state, while a single crop during *kharif* covers a bigger fraction of 22%. These percentages were analysed over their respective spread in each district (Fig. 32). Double cropping is a widespread practice in

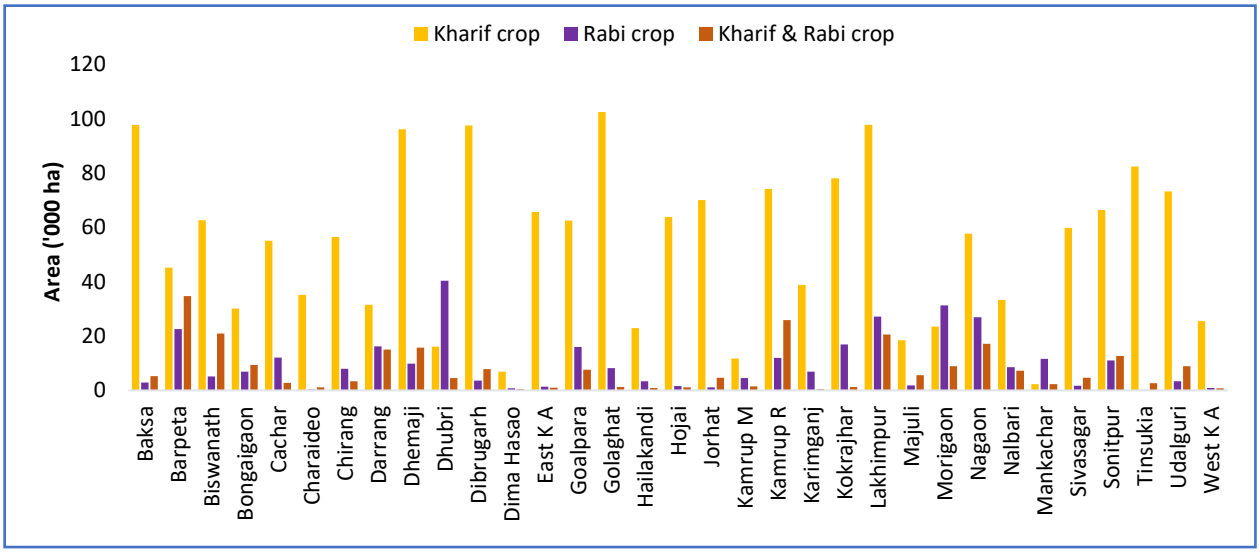


Fig. 32: District-wise area under different cropping systems in Assam

the districts of Barpeta, Kamrup, Biswanath, Lakhimpur, Nagaon, Dhemaji, Darrang and Sonitpur districts covering more than 10,000 ha in each district. Rice is the major *kharif* crop of the state, while jute, vegetables, oilseeds, sugarcane, pulses constitute *rabi* crops. Since the majority of the districts are rainfed, *kharif* cultivation is done extensively throughout the state, however, in the drier *rabi* season, only areas with access to irrigation, practise crop cultivation. Besides lack of irrigation, the cultivation of long-duration rice with traditional methods in a single season has also restricted the farming community from practising double cropping. *Kharif* fallow areas are observed in districts where flood recurs every year. In these areas, crops are cultivated mostly in intermediate *Ahu* season, late after the flood. Districts such as Dhubri and Morigaon have the

highest amount of land under this category. Permanent fallows are most widespread in the districts of Cachar, Karimganj, Dibrugarh and Dhemaji. Aqua-*Boro* cultivation constitutes the areas where pisciculture is practised in *kharif* season, and *Boro* rice cultivated is practised in the *rabi* season. This kind of cropping system is most commonly seen in Cachar, Nagaon, Barpeta, Lakhimpur and Nalbari. These areas are also frequently inundated with flood-water every year; hence farmers in these regions opt for fisheries instead of rice cultivation in the *kharif* season.

Cropping intensity map for 2019-2020 was derived through reclassification of the generated cropping system map. The agricultural classes and their patterns were extracted and combined to generate the cropping intensity map and were divided into three (3) classes: *kharif-rabi* was termed as a double-crop class category; a single crop consisted of *kharif* crop, *rabi* crop and Aqua-*Boro* classes; and fallow class remained as a separate class.

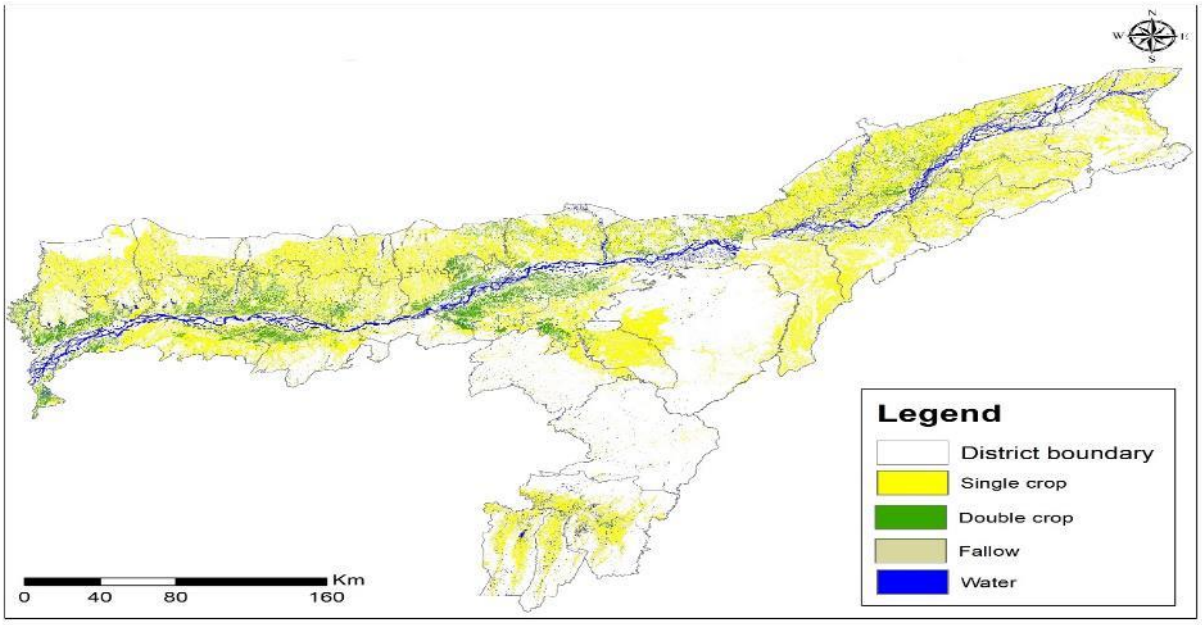


Fig. 33: Cropping intensity map of Assam (2019-2020)

The fig. 33, shows the cropping intensity map of Assam for 2019-2020. The total area under single crop in Assam during 2019-2020 is estimated to be around 20 lakh ha, under double crop is approximately 3.6 lakh ha, and the permanent fallow area is around 70,000 ha. The cropping intensity is calculated to be around 116% for 2019-2020.

The fig. 34, shows the area under different cropping intensity classes for different districts of Assam during 2019-20. Double cropping is practised majorly in districts of Barpeta, Morigaon, Nagaon, Dhubri, Darrang, Kamrup, Biswanath and Lakhimpur covering more than 20,000 ha in each district. Access to irrigation, the good type of land, trained farmers, the reach of government schemes, and capacity building might be some of the reasons for this type of cropping.

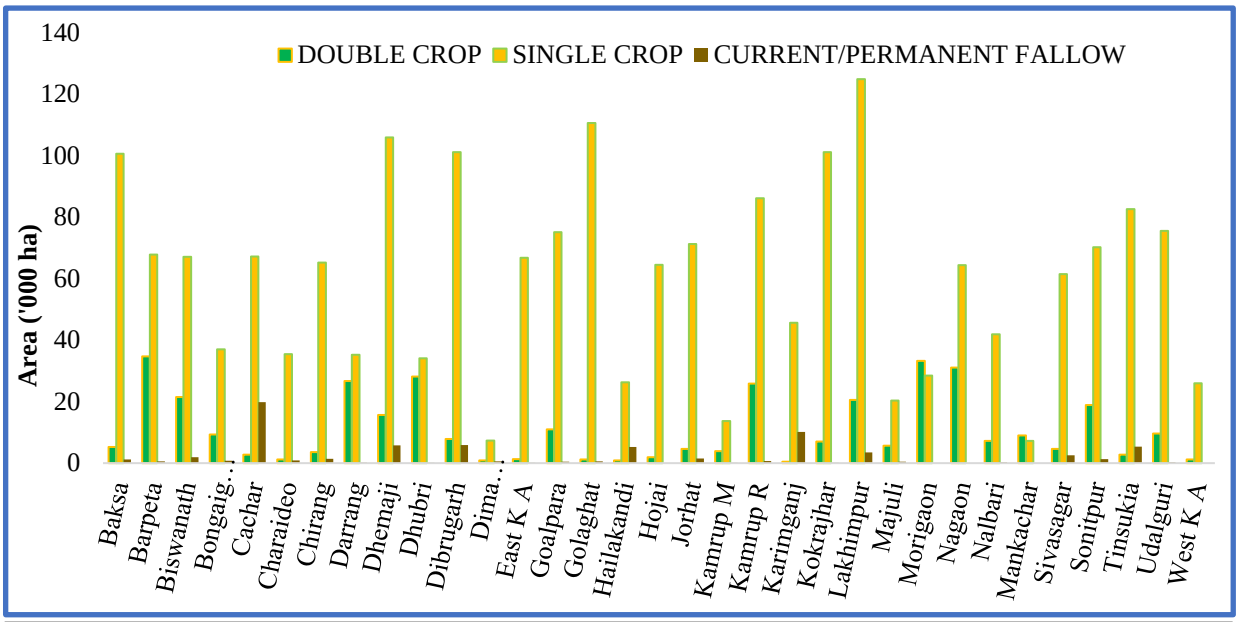


Fig: 34: District-wise area under single, double and current/permanent-fallow in Assam (2019-20)

Single cropping is practised majorly in districts of Lakhimpur, Golaghat, Dhemaji, Dibrugarh, Kokrajhar and Baksa. Sole dependency on monsoons, flood hazard, no reach of government assistance, less or no trainings, lack of irrigation facilities, and type of land, may be some of the reasons of disinterest/neutrality among farmers towards increasing the cropping intensity.

2.4.1.1.2 Rice-fallow mapping for 2019-2020

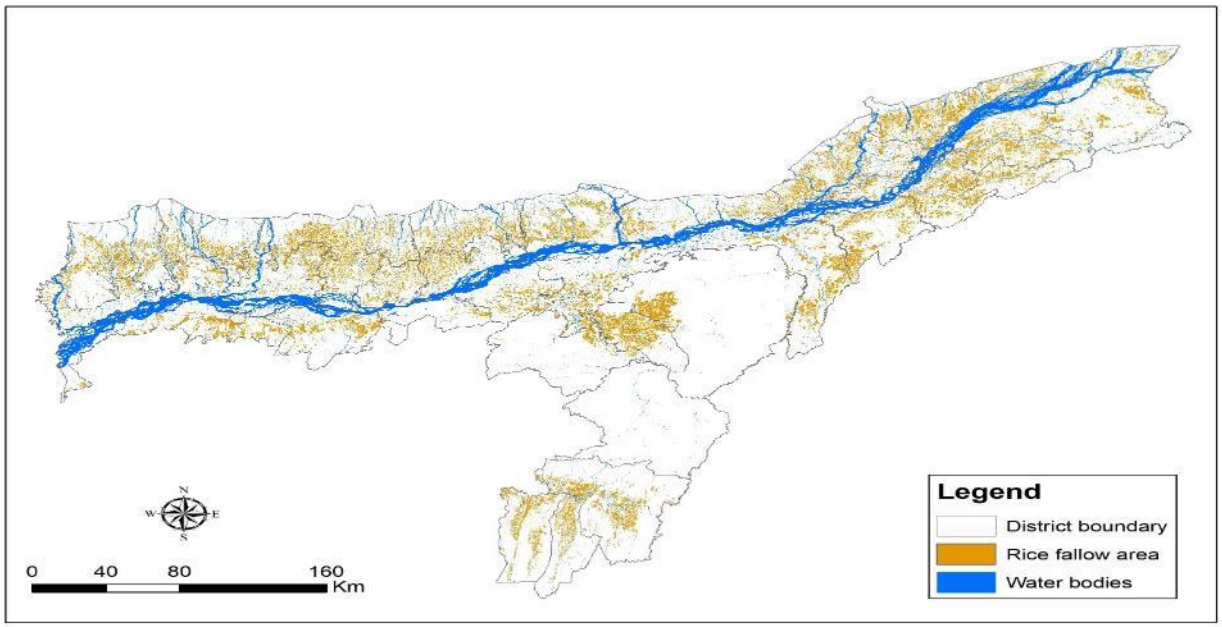


Fig. 35: Rice-fallow map of Assam (2019-2020)

Rice-fallow areas are those where rice crop is grown once during the *kharif* season (*Sali*, June-October), and subsequently left fallow. These cropland areas are mostly not suitable for growing

rabi-season rice due to their high water needs but are suitable for a short-duration (≤ 3 months) low water-consuming pulses such as chickpea, black gram, green gram, lentils, etc., and short-duration maize or baby corn etc. Rice-fallow map was extracted by overlaying the rice areas from the rice map generated for *kharif* 2019, and fallow areas generated from the cropping systems map for 2019-2020, using a model builder in Erdas Imagine software. The final map generated is shown in fig. 35. An area of approximately 9 lakh hectares was estimated to be rice-fallow during *rabi* 2019-2020. District-wise statistics were generated for all the districts of Assam. Fig. 36 shows a graph of the rice area and rice-fallow areas in the districts of Assam during 2019-2020.

In the map and graph of rice-fallows (Fig. 36), it is observed that most rice-growing areas of upper Assam districts remain largely fallow during *rabi* season. Districts like Lakhimpur, Dhemaji, Dibrugarh and Baksa have a rice-fallow area of more than 50,000 ha each, while districts of Golaghat, Kokrajhar and Kamrup have a rice-fallow area of more than 40,000 ha each. Sivasagar, Jorhat, Hojai, Cachar, Sonitpur and Udalguri districts have an area of more than 35,000 ha under rice fallow. Most part of upper Assam remains fallow in the *rabi* season and based on primary knowledge/field knowledge; it can be attributed to i) traditional cultivation of *Sali* rice using long-duration varieties, ii) lack of irrigation facilities, and iii) lack of adoption of crops other than rice. Late receding of flood-water from the agricultural land in lower Assam, and lack of irrigation and hilly topography in Barak Valley, are the major reasons for fallows.

2.4.1.2 Characterization of stress-prone areas

2.4.1.2.1 Soil moisture mapping (2019-2020)

Multi-temporal satellite data is a feasible source to obtain timely, cost-effective information in a spatial format for constantly varying soil-moisture patterns at the landscape level. The daily Soil Moisture Active Passive (SMAP) product from Nov 2019 to Apr 2020 was obtained from NASA. Two-day products of consecutive dates were mosaicked to obtain the full coverage of Assam. The mosaicked images were stacked and further processed using open-source statistical and image analysis software 'R'. The monthly averages of the mosaicked two-day soil-moisture products were analysed for assessing the seasonal variation in the soil moisture (Fig. 37) of the state from Nov 2019 to Apr 2020, which explains highly variable soil-moisture depletion rate across the time.

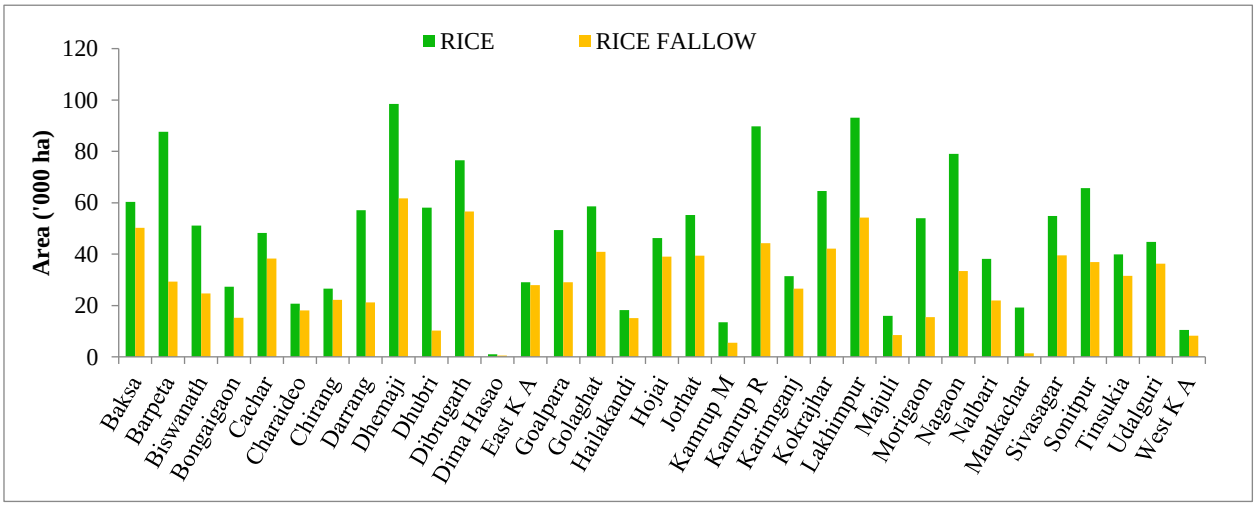


Fig. 36: District-wise area under rice fallow in Assam (2019-2020)

The soil moisture maps for the *rabi* season were analysed, and soil moisture suitability maps for fallow areas are under preparation to effectively target agricultural interventions in the *rabi* season.

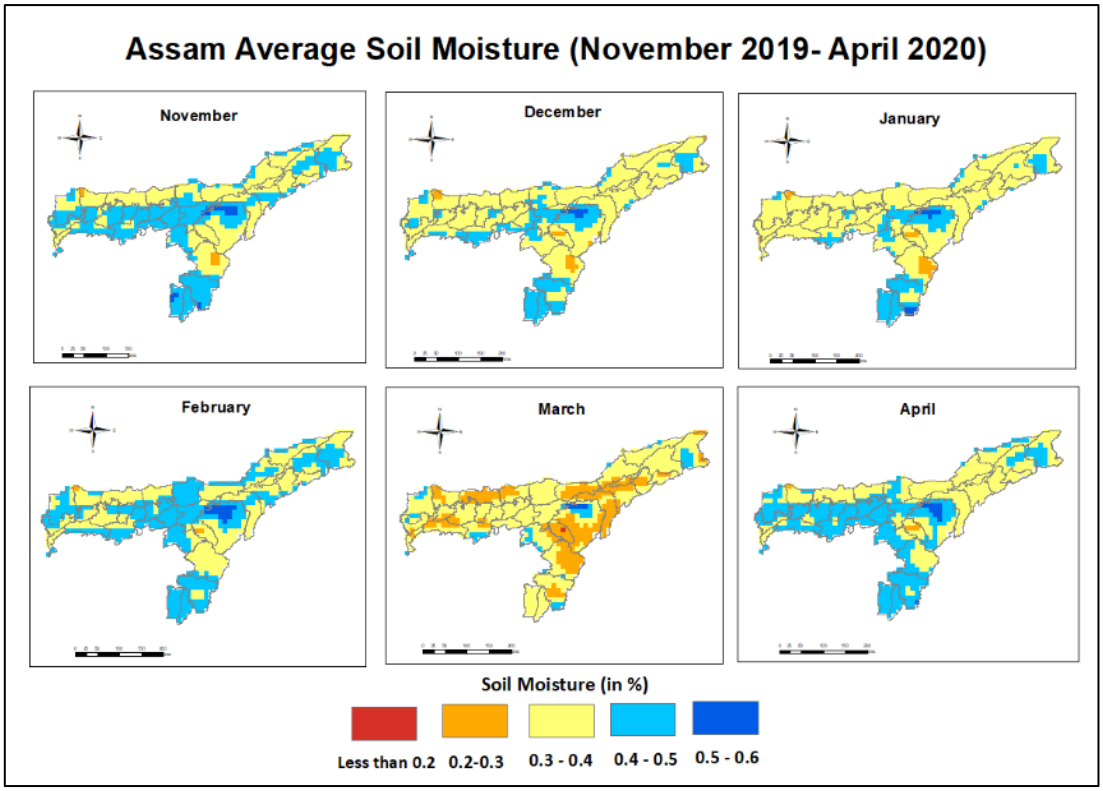


Fig. 37: Monthly average soil moisture (%) of Assam in selected months of 2019-2020

2.4.1.2.2 Flood inundation mapping (2020)

Assam is one of the most flood-prone states of the country, and it is common to have at least two or more flood waves in the state during the monsoon which results in loss of lives and property including heavy crop loss, affecting livelihoods every year. Extraction of flood inundated areas, in near real-time, is, therefore, a very important requirement for the state.

Sentinel-1 SAR (Synthetic Aperture Radar) images were used to delineate inundated areas due to floods from May to Jul 2020. SAR data has the advantage of cloud penetration as the entire monsoon season is heavily cloud-covered over Assam, and it is challenging to acquire an optical satellite image. Images were processed for inundation area using a flood-detection algorithm in Google Earth Engine, which is a cloud-based platform for heavy data processing. The inundated areas were extracted and analysed for district-wise statistics, and maps were generated.

Three flood waves of monsoon from May to Jul in 2020 were captured using time-series SAR data. Satellite images of 26 May, 27 May, 28 May, 2 June, 7 June, 9 June and 14 June 2020 were used to represent the first flood wave of the season. Satellite images of 26 June, 28 Jun, 1 July and 3 July 2020 represented the second flood wave of the season. The third wave was mapped using satellite images of 10 July, 13 July, 15 July, 19 July and 20 July 2020. The final map showing flood inundated areas in 2020 is shown in fig. 38.

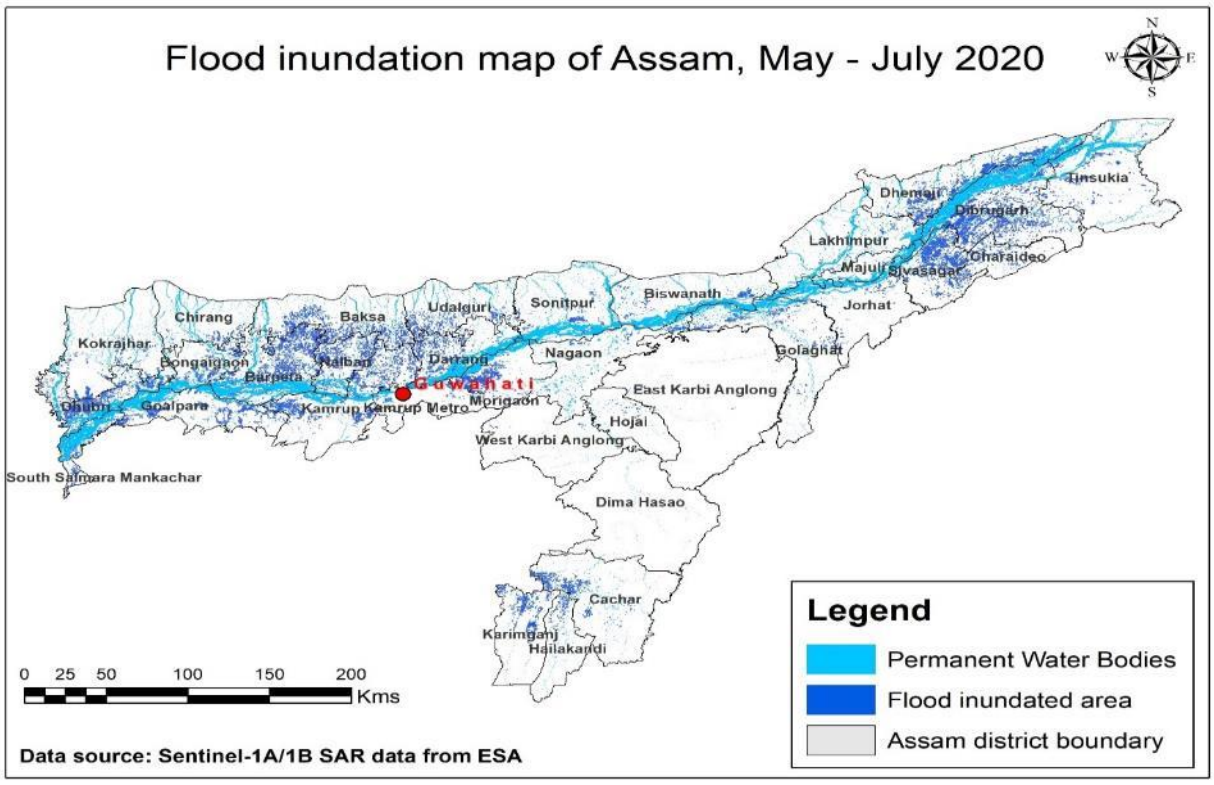


Fig. 38: Flood inundated areas of Assam during May-Jul 2020

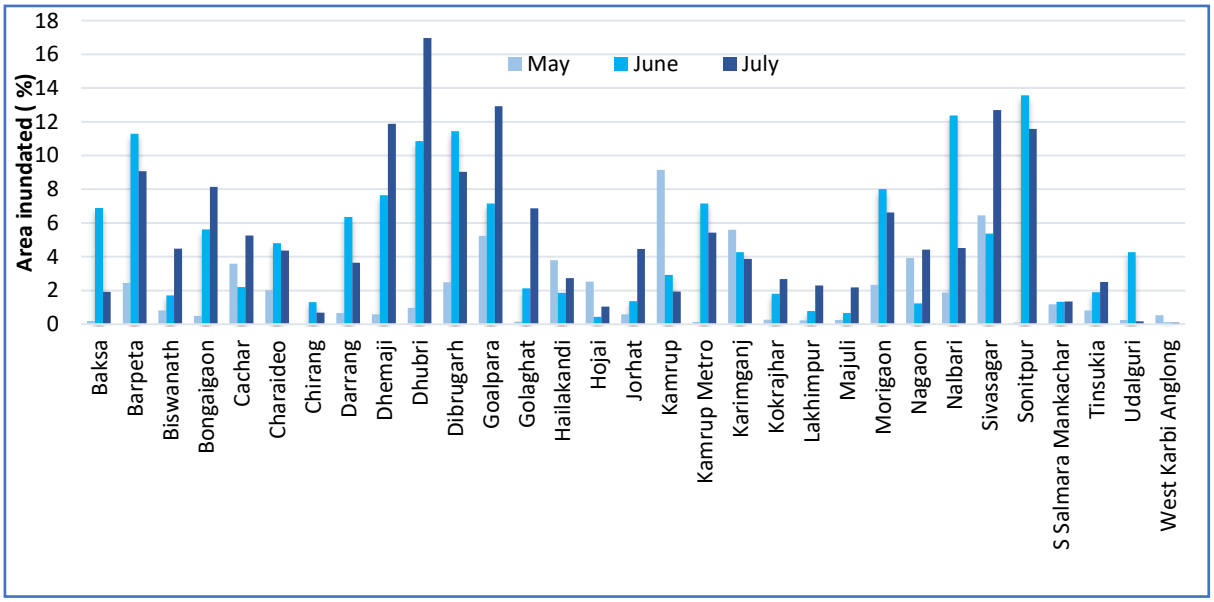


Fig. 39: Temporal coverage of inundated area (%) from May-Jul 2020 for different districts of Assam

The district-wise flood inundated area in percentage is shown in fig. 39. The flood was observed in 31 out of 33 districts of Assam, excluding the hill districts of Dima Hasao and Karbi-Anglong. During the first flood wave, the districts of Kamrup, Goalpara and Sivasagar were severely affected. During the second flood wave, almost all districts of Assam were affected; among the worst affected were Nalbari, Barpeta and Dhubri in lower Assam, and Sivasagar, Dibrugarh and Dhemaji in upper Assam. Morigaon and Kamrup in central Assam also faced flooding in many areas. In the third wave, districts of Dhubri, Goalpara and Barpeta in lower Assam, and Sivasagar, Dhemaji and Dibrugarh in upper Assam, were severely affected.

2.4.1.2.3 Spatial distribution of pest infestations

Diseases naturally occur as a part of any plant ecosystem. In human-managed cropping systems, the environment that is created by the farmer influences disease development as well as the natural environment. Some diseases are favoured by cool and wet weather, whereas others are more favoured by warm and wet weather. It is, therefore, very important to generate a detailed spatial

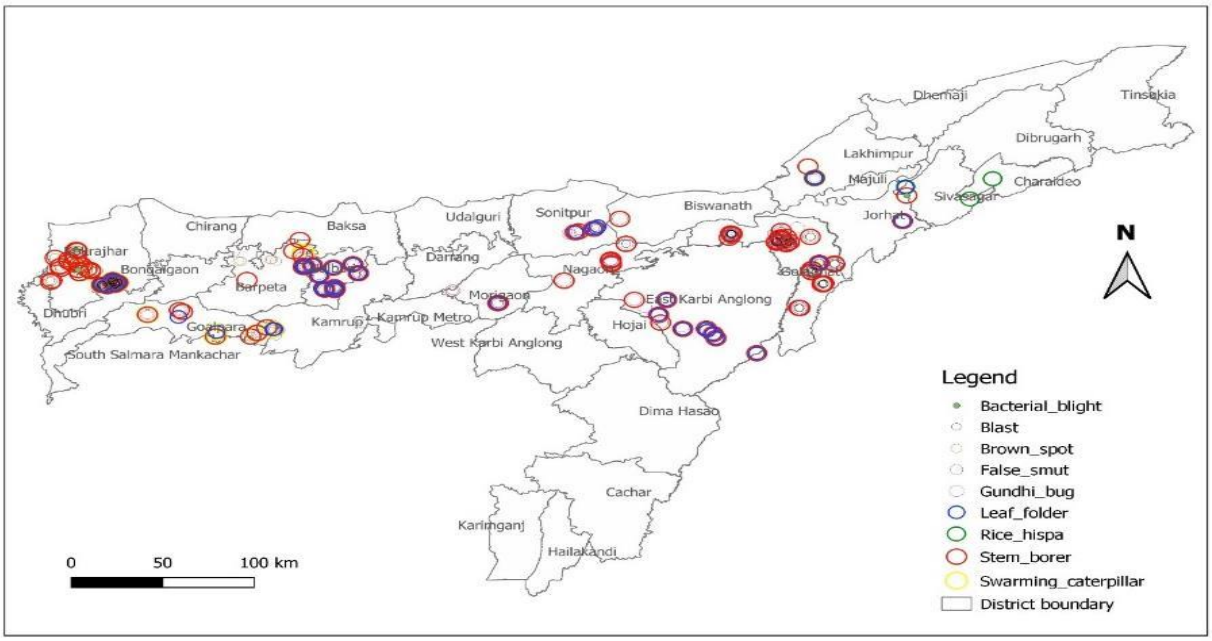


Fig. 40: Spatial distribution of pest infestations in paddy, *kharif* 2019

profile of the relative risks of major rice diseases (e.g., bacterial blight, brown spot, and leaf blast) for efficient targeting of improved cropping systems and stress-tolerant cultivars. Maps showing the estimated relative risk of bacterial blight, brown spot, and leaf blast are proposed to be developed as a part of the project. To understand the nature of these diseases and pest infestation, information was collected from the field, and this data was spatially plotted to analysis patterns and trends which can be used to generate hotspots for pest infestations. The spatial distribution of different pest attacks during *kharif* 2019 is shown in fig. 40. Due to limited field data, further analysis will be continued in next season to get samples with wider coverage.

2.4.1.3 Extrapolation domain maps/database

Mapping of potential areas for paddy-fish farming

Mapping of potential areas for paddy-fish farming was carried out with the recommendations from WorldFish. In Assam, 31 blocks in 11 districts were selected for paddy-fish farming and maps for each of these blocks were derived using data obtained from North Eastern Space Applications Centre (NESAC) as well as data prepared for the project. Data on water bodies, roads and existing pisciculture locations were procured from NESAC. Paddy areas from Sentinel-1 SAR data, and the perennial water bodies associated with paddy areas, were extracted. Water bodies falling within 2 km buffer of roads, signifying accessibility, were considered to be suitable for pisciculture. The map showing potential pisciculture locations for the entire state is shown in fig. 41.

Fig. 42 and 43 show two of the maps prepared at the block level. Block maps for all the 31 selected blocks were prepared and shared with WorldFish and Dept. of Fisheries, Govt. of Assam. Around 7,600 ha of potential pisciculture locations were mapped in these 31 blocks of 11 districts. Field validation of the prepared maps is now going on in the selected districts.

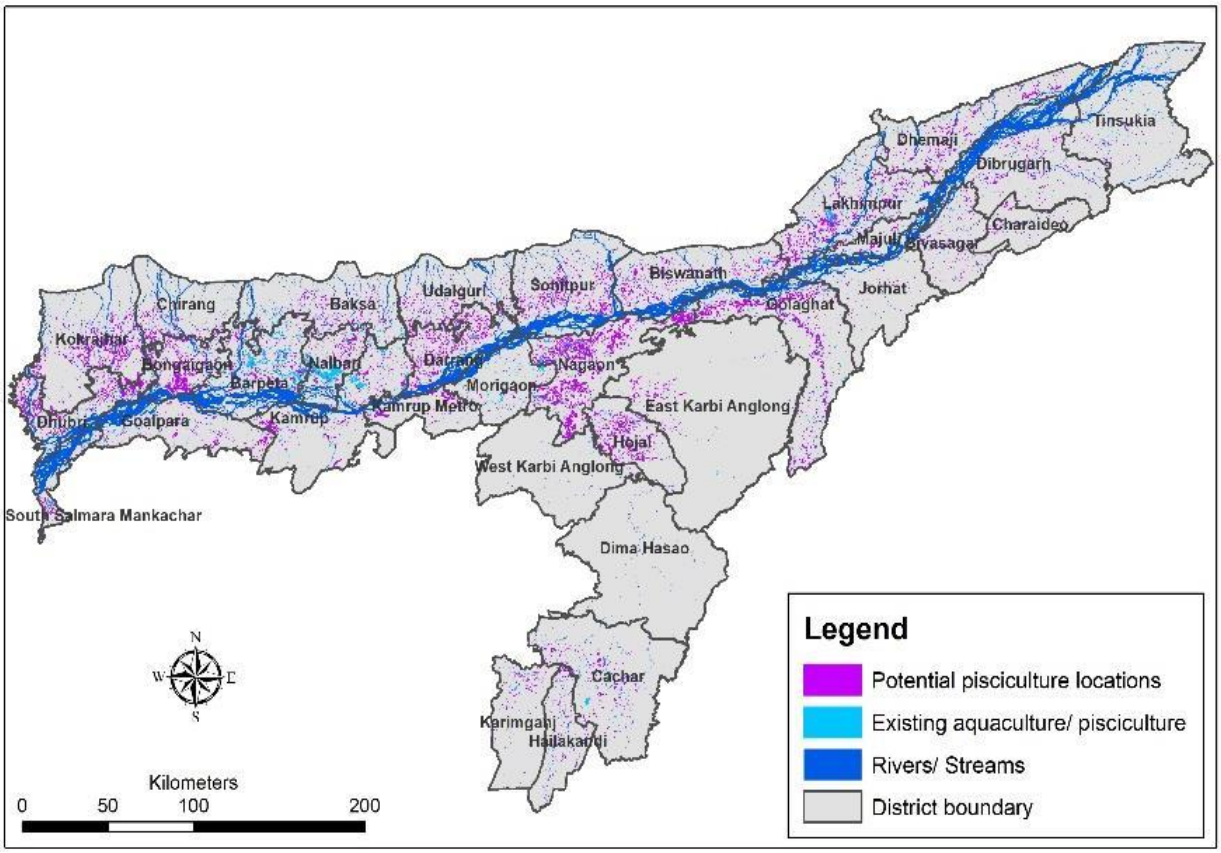


Fig. 41: Potential locations for paddy-fish farming in Assam

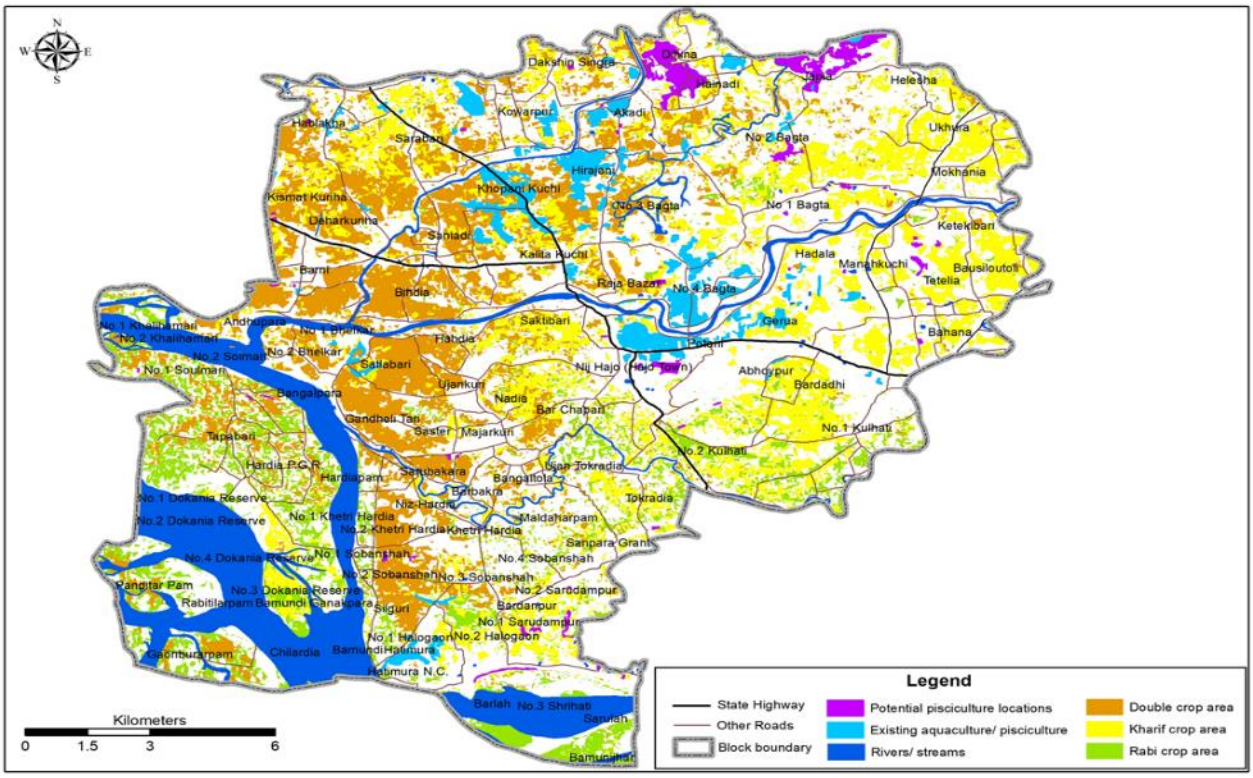


Fig. 42: Potential locations for paddy-fish farming in Hajo block, Kamrup

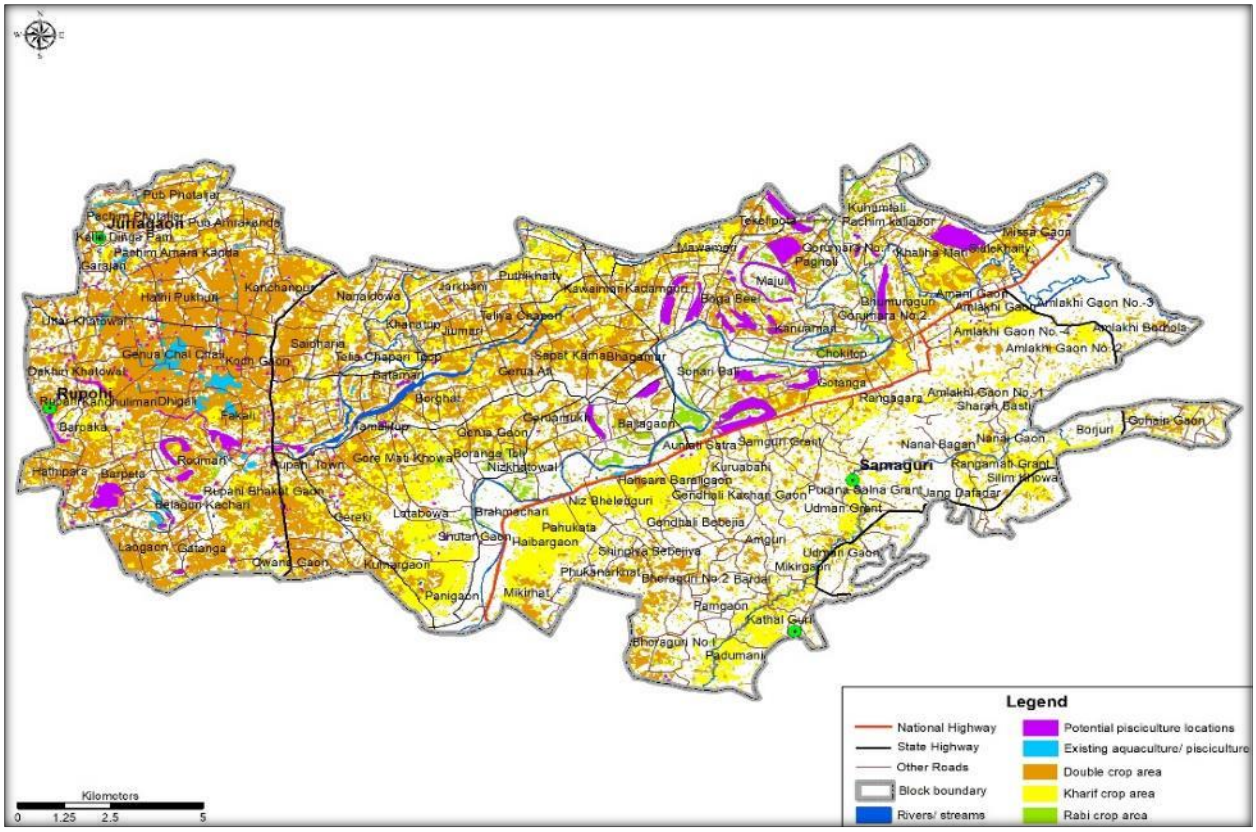


Fig. 43: Potential locations for paddy-fish farming in Batadrava block, Nagaon

2.4.1.4 Field-level demonstrations of different technologies

Black gram demonstration in rice-fallow areas

Considering the scope for enhancing the productivity of rice-based systems by introducing short-duration crops, such as pulses, in the existing cropping systems, a total area of 100 ha was chosen in some districts for pulse demonstrations during *rabi* 2019-2020, based on the availability of soil moisture in rice-fallow areas. The primary objective was to increase the cropping intensity in areas where farmers are cultivating only a single crop during the *kharif* season. Since black gram is a popular crop in Assam, it was suggested to cultivate high-yielding short-duration black gram varieties, which can be easily grown in areas with sufficient soil moisture. It was suggested that IPU-2-43 variety of black gram, which is suitable for north-eastern plains and resistant to the yellow mosaic virus (YMV) and Cercospora leaf spot disease, will be suitable. This short-duration (75 days) variety, suitable for summer sowing, can be cultivated in a wide range of soils from mid-Feb to March. IRRI has shared the best management practices with its implementing partner organization, AAU, for conducting these demonstrations through the KVKs in selected districts.

Table 32: Districts selected for black gram demonstrations along with area and quantity of seeds sown

Sr. No.	Districts	Area sown (ha)	Seed quantity (kg)
1	Kamrup	10	250
2	Barpeta	15	375
3	Nagaon	20	500
4	Golaghat	15	375
5	Sonitpur	15	375
6	Biswanath	5	125
7	Jorhat	5	125
8	Majuli	15	375
	Total	**100**	**2500**

Table 32 below shows the districts where summer black gram demonstrations were carried out during *rabi* 2019-20. More than 100 beneficiaries from 38 villages participated in black gram demonstrations in the selected 8 districts. Before the sowing, the land was ploughed 2-3 times followed by levelling to obtain a fine tilth. The demonstrations were conducted using two different treatments, (i) Improved practice (Line sowing + Seed priming/ treatment with fungicide + RDF) and (ii) Farmer's practice (Seed broadcast without fertilizer application). Under the improved practice, the seeds were sown in lines 30 cm apart by seed-drill using a seed rate of 25 kg/ha or 3.3 kg/bigha. The plant-to-plant distance was maintained at 10 cm. In broadcast sown crop (FP), slightly higher seed rate (27 kg/ha or 3.6 kg/bigha) was used. Timely weeding after 20 - 25 days of sowing was also performed to keep the crop free from weeds.

The season was unfavourable due to prolonged rains, other weather calamities and COVID-19 lockdown, however, satisfactory results were seen at few locations. Maximum crop areas were damaged due to the moisture stress after sowing, the hailstorms and heavy rains damaged the standing crop later on. In most of the areas, the crop was damaged due to stagnated water. In some areas, heavy rainfall during pod maturation stage caused viviparous germination of grains in the pods. Moreover, the inability to go to fields due to COVID-19 lockdown resulted in poor management of crops resulting in weed and pest infestations and invited grazing by stray animals.

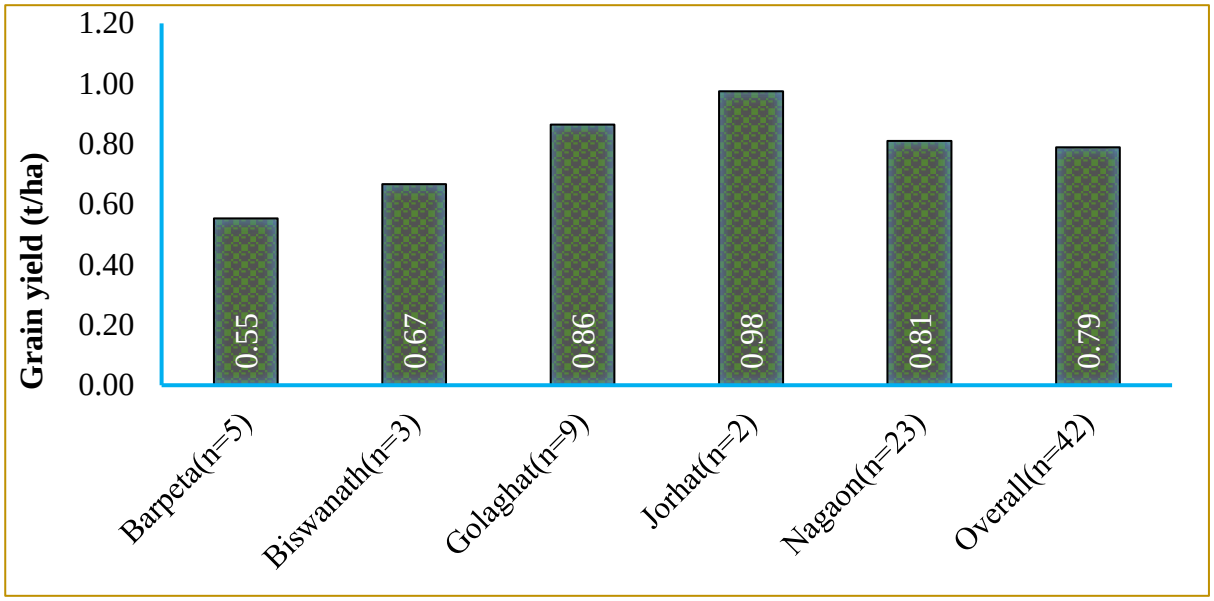


Fig. 44: District-wise black gram grain yield for demonstrations in *rabi* 2019-20

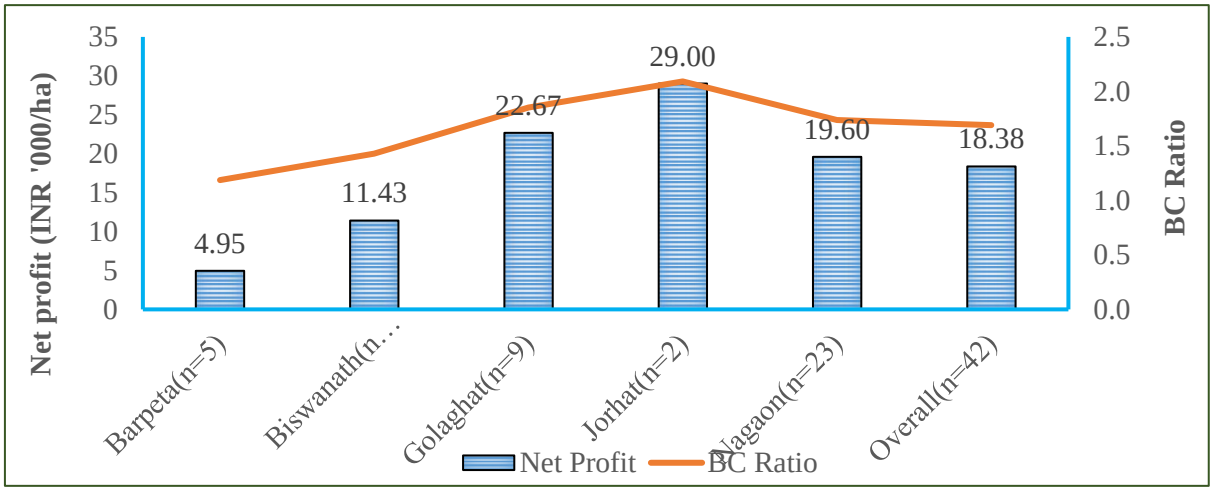


Fig. 45: District-wise black gram net return with BC ratio for demonstrations in *rabi* 2019-20

Crop-cut data in few districts could not be collected due to lockdown. The data from limited districts were analysed. Fig. 44 shows the district-wise black gram grain yield and fig. 45 shows the district-wise net return with BC ratio. The highest yield of 0.98 t/ha was observed in Jorhat district, followed by Golaghat (0.86 t/ha) and Nagaon (0.81 t/ha). The overall average grain yield of black gram was 0.79 t/ha. The net return to the farmers by growing pulse crop in the rice-fallow

areas ranged between Rs 5000 and Rs 29000 per ha. The benefit-cost ratio also varied between the districts from 1.2 to 2.1, depending on the productivity. In this year 2020, early rains caused the flood in the month of May, which damaged the pulse crop in some of the districts. The crop cutting data from many fields could not be collected due to COVID-19 related sudden shutdown.

Black gram demonstration at Porongonia, Golaghat

Black gram demonstration at Bhalukekhuwa, Sonitpur

Line sowing with seed-cum-fertiliser drill in Nagaon

Black gram sowing with broadcasting method at Kaharpara, Barpeta

Fig 46: Black gram demonstration locations in *rabi* 2019-20

2.4.1.5 Primary and secondary data collection

A geospatial database is in preparation which consists of satellite images from different sources of different resolutions, spatial and meteorological data collected from different organizations. Table 33 shows the list of geospatial data collected from various sources required for the development of extrapolation domain maps.

The satellite images procured have been pre-processed to use as inputs for analysis and layers prepared by merging individual datasets for the entire state. Soil moisture data which was available in daily format was processed to create weekly and monthly images for the entire state. Meteorological data available in GRID format was converted to images to be used as input in spatial analysis.

Table 33: Secondary geospatial data collected for the project

Sr. No.	Data type	Quantity	Resolution/ scale	Source	Timeline
1	Multispectral satellite images (AWiFS)	45	56 m	NRSC	2019 - 2020
2	Multispectral satellite images (LISS IV)	48	5.6 m	NRSC	2019 - 2020

3	Multispectral satellite images (Landsat OLI)	128	30 m	NASA	2018 – 2020
4	Microwave satellite images (Sentinel-1)	89	20 m	ESA	2018 – 2020
5	Daily Soil moisture (SMAP)	424	9 km	NASA	2018 – 2020
6	Digital Elevation Model (SRTM)	28	30 m	NASA	2012
7	Rainfall data	-	0.25 degree	IMD	1989 – 2019
8	Temperature data	-	0.25 degree	IMD	1989 – 2019
9	Administrative boundaries and transport (District, Block, Village, Roads & Railways)	-	-	NESAC	-
10	Land use and land cover data	-	1:50k	NESAC	2015-16
11	Soil data	-	1:250k	NESAC	-
12	Digital Elevation Model (Cartosat)	1	10 m	NESAC	-

Presently, the high-resolution satellite data obtained from NRSC, are being pre-processed to prepare for digital analysis. Data obtained from NESAC have been curated to use in various GIS applications. Cartosat DEM has been checked for errors and data voids and corrected by filling with averaged neighbouring values. Other data, such as detailed soil physical and chemical profile, if available from concerned official sources, will be procured in the next few months.

The details of geospatial layers prepared under this project for the entire state, and primary data collected from field surveys, is presented in table 34. Layers are generated for the whole state to generate maps at state- and districts-scale. Statistics can be generated at district-, block- or village-level, as required.

Table 34: Details of geospatial layers generated from remote-sensing data

Sr. No.	**Data type**	**Data used**	**Time**
1	Cropping system	Landsat OLI satellite images	2017-18, 2018-19, 2019-20
2	Cropping intensity	Landsat OLI satellite images	2017-18, 2018-19, 2019-20
3	Rice area	Sentinel-1 SAR images	2017, 2018, 2019
4	Rice fallow area	Rice area & Cropping intensity	2017-18, 2018-19, 2019-20
5	Flood inundation area	Sentinel-1 SAR images	2017, 2018, 2019, 2020
6	Flood-prone areas	Flood inundation areas	2016-2018, 2018-2020
7	Drought stress	MODIS satellite data products	2017-18
8	Pest infestation	Field data	*Kharif* 2019

9	Cropping systems (16 districts)	Field data	*Rabi* 2018-19, *kharif* 2019, *rabi* 2019-20

2.4.1.6 Capacity building

A one-day training on GIS, GPS and field data collection was conducted for the field technicians and extension officers of Dept. of Fisheries, Govt. of Assam and WorldFish on Sep 1, 2020 at Guwahati. Around 15 participants from 8 districts participated in the training which mainly focussed on field data collection for verification of maps prepared for potential areas under paddy-fish farming.

A well-furnished GIS facility with necessary hardware and software was inaugurated at AAU, Jorhat in August 2020. The facility is functional, and a three-day training on the use of ArcGIS software was organized with the help of ESRI, Kolkata through online sessions on Sep 2-4, 2020.

2.4.1.7 Data dissemination

All output maps/databases prepared under this objective are proposed to be shared with partners and stakeholders through an open web-GIS-based system, atlas and research reports. An atlas for geospatial outputs prepared for 2018-19 is under process, and the first draft is ready for feedback and recommendations. Plan for web-GIS based system is under discussion, and the process of website designing will begin soon.

2.5 Monitoring and Impact Assessment (IA) of APART programme: Progress so far

With the APART project almost reaching midterm, it is essential to learn whether the beneficiaries are indeed benefitting from the program, and to employ that knowledge to learn what works and does not work, for improvement in developmental processes, and ultimately outcomes. For tracking progress under the rice-specific agricultural interventions promoted under the project, a Monitoring and Impact Assessment (IA) framework was developed early in this year around pre-defined indicators. **Annual quantitative door-to-door household surveys** were proposed as the major instrument for acquiring social, economic and agricultural data from farmers to learn these developmental outcomes.

Each of the 4 objectives under APART programme was planned to be covered with a set of elaborative questionnaires comprising of a "Basic Impact Assessment Module" and "Objective Specific Modules" to track outcome and impact indicators. These Modules were developed and incorporated in the CAPI software **Kobotoolbox**. A group of 32 enumerators comprising of Project Scientists, Assistant Project Scientists and IRRI staff participated in a 4-day training program to clear all doubts and discuss all linguistic nuances of the questionnaire and understand the operational procedure of the software. The enumerators were also engaged in mock testing of the questionnaire, and doing a pilot survey in the field to get familiar with the survey instruments and improvise the questionnaire. The first phase of the survey slated to commence from April had to be delayed due to unforeseen COVID-19 eventuality. Consequently, realizing the unlikelihood of effecting door-to-door surveys in the imminent future, it was decided to carry on **telephonic interviews**.

However, telephonic interviews have their own limitations and smooth communication with such an elaborate set of questionnaires is a big challenge. Consequently "Basic Impact Assessment Module" [1] was drastically pruned and "Seed System and IPM Module" was altogether dropped for the current lap of the survey. With telephonic surveys as the new mode of data collection, enumerators were trained virtually through video-conferencing. The enumerators were advised to complete and submit the pilot survey with the farmers, and their submitted data was analysed, errors were identified, and communicated on a later date through virtual discussion to minimise the chances of errors in the final survey with the beneficiaries and non-beneficiaries under APART. The survey has adopted cross-sequential stratified random sampling as the sampling procedure, and the current lap has chosen a sample list of total 1606 respondents which includes 320 non-beneficiaries as

[1]Basic Impact Assessment Module (telephonic survey version) comprises of 11 sections which captures information on various social, economic and agricultural indicators. You can see the questionnaire by clicking on the Kobotoolbox link provided here: https://ee.humanitarianresponse.info/x/TRWeF28P

well. Our beneficiary respondents of the current survey were the APART farmers partaking in *Sali* 2019 program. As per our original plan, seed system beneficiaries dominate the current sample farmers spread across 16 APART (undivided) districts. A telephonic call tracking protocol and social communication group for monitoring telephonic survey has also been put in place, which helps in tracking the progress of the survey on a day-to-day basis. A mid-term review of the survey involving enumerators and IRRI experts was virtually conducted in the 3rd week of September to acquire feedback and to learn implementation hurdles. Replacement in the sample list was done, where the respondent was untraceable owing to the incorrect contact number. Tiding over challenges concerning connectivity/ audibility, farmer's availability and mutual time suitability, the enumerators were able to complete 783 surveys in a span of two months. We have also been experiencing delays with respect to the completion of interviews, as the enumerators are simultaneously engaged in other project-related activities as well. Through the social networking platform, the progress is being tracked, enumerators constantly encouraged and problem-solving done on a daily basis. With an expected increase in the pace of progress in the upcoming days, we hope to complete the survey latest by mid-November.

We wanted to learn the preliminary results from the ongoing survey and hence conducted some early basic analysis on 605 files compiled till 25th September, 2020. These farmers being randomly chosen within different districts are representative of the population comprising of beneficiaries and non-beneficiaries. Amongst the STRVs promoted under the programme, Ranjit-Sub1 followed by Bahadur-Sub1 were found most popular. We understood that awareness about these varieties was comparatively higher among the beneficiaries with APART related sources contributing much in awareness creation. Interestingly, we found that non-beneficiaries also acquired primary information about these varieties from APART related sources. Since adoption follows experimentation on a smaller field, we defined adopters as those who had cultivated any promoted STRV in 2020 and have been cultivating it for at least two seasons. With much high awareness, Ranjit-Sub1 was learned to be the most preferred STRV with more than 50 per cent users among beneficiaries as well as non-beneficiaries opting for the same. While looking at varietal access amongst those who have used it for more than one season, we found the majority of them opted for their own farm-saved seed and did not access the market. In this context, we understood the pertinent need to promote quality seed production practices in order to maintain the quality and purity of these varieties through years of cultivation. The yield of paddy during *Sali* 2018 and *Sali* 2019 was put under rigorous scrutiny under 3 treatment combinations of variety-flood-IPM. Under normal conditions, both traditional varieties and STRVs had comparable performances at an average yield above 4 tonnes/ha during both years. However, with the flood, the yield of traditional variety took a nosedive to 2.2 tonnes per hectare in 2019. With STRV-IPM a significantly higher average yield of 4.32 tonnes/ha could be obtained under flooded conditions, whereas, in the absence of flood the yield reaches almost 5 tonnes. With such reasonable performance, the majority of our respondents gave a rating of *satisfactory* or above for these varieties.

The use of machines among the sample respondents was looked at to study the extent of mechanisation in Paddy cultivation. We understood that more than 85 per cent of respondents across both categories employ machines during at least one crop operation in Paddy. However, on further analysis, it became clear that machine use is limited mostly to land preparation and threshing. Although most of our sample farmers follow transplanting, hardly 1 per cent of

beneficiaries and none of the non-beneficiary were found to follow mechanical transplanting. With most of these machines employed being hired, and not owned, we learnt that the machine unavailability at nearest source was the major hurdle for not hiring a mechanical transplanter (MTR). A significant proportion of them also cited unawareness about MTR as a reason. This emphasises the need to popularise CHCs and service providers in the state.

Along with being a producer, a farmer has to be a seller as well if he wishes to climb the ladder to economic prosperity. Hence, we looked at the market participation behaviour of the respondents. Amongst the three forms of paddy viz, seeds, paddy(grains) and value-added produce marketed in the market, we found market participation with respect to paddy to be the highest. However, we learnt that the proportion of farmers selling it under assured procurement was a much less 4.5 per cent amongst beneficiaries and zero among the non-beneficiaries. With assured procurement almost non-existent and with 70 per cent respondents having no idea about Minimum Support Price (MSP), for the majority of them, the produce sold in the market fetched very low price. There is a pertinent need to engage farmer in the value-added market as well.

On a final note and most importantly, we found a marginal beneficiary farmer to be the most efficient in terms of net returns obtained per hectare from paddy cultivation. This gives us hope that small landholders are getting benefitted more under the programme. Paddy is contributing as the most important source of farm income with 63 and 59 per cent, for beneficiaries and non-beneficiaries respectively, an increase in the same is desirable and advisable to improve the economic status of farmers. This can only be aimed through the adoption of improved best management practices as well as STRVs and improved market linkage resulting in higher productivity and income.

A further detailed early assessment report elaborating more upon results explained above is presented in the mid-term report. In the present context with incomplete data, we are a bit cautious with respect to generalising these results. Hence, extrapolation of the present results to the population was not attempted. With a very small sample representation in the present analysis, we also wish to be prudent with results in relation to non-beneficiaries. We aim to present a complete detailed report with population-level indicators and impact of adoption decisions on outcome and impact indicators upon receipt of the complete set of interview files.

3. Workforce involved in the assignment:

In APART, IRRI has appointed the key and non-key experts to take care of the project activities. The list of international staff engaged in the project and locally appointed staff are given in tables 35 and 36.

Table 35. Client's international staff engaged

Sr.	Name of expert	Key or Non-key	Designation in IRRI	Designation in APART	Place of deployment	Date of availability for work in the assignment
1	Dr. Nafees Meah	Key	IRRI representative, South Asia	Strategic Advisor	Delhi	In place
2	Dr. Arvind Kumar	Key	IRRI representative, India & Director, IRRI-SARC	Leader, Objective-1	Varanasi	In place
3	Dr. Sudhanshu Singh	Key	Rainfed Lowland Agronomist & IRRI-CSISA Coordinator, South Asia	Team Leader, and Leader Objective-II	Delhi/ Varanasi	In place
4	Mr. Martin Gummert	Key	Senior Scientist, Leader Mechanization and Postharvest Cluster	Postharvest, rice value chain, and industry promotion expert, and Leader Objective-III	Philippines	In place
5	Dr. Virender Kumar	Key	Senior Scientist-Weed Science	Weed science, and precision agronomy expert	Philippines	In place
6	Ms. Swati Nayak	Key	Scientist & South-Asia Lead - Seed Systems & Product Management	Agricultural Extension and Rural Disseminatio n Expert	Delhi	In place
7	Amit Srivastava	Key	Scientist - GIS & RS	Leader Objective -IV	Varanasi	In place

Sr.	Name of expert	Key or Non-key	Designation in IRRI	Designation in APART	Place of deployment	Date of availability for work in the assignment
8	Dr. Prakashan Chellattan Veettil	Key	Agricultural Economist – Socio-economic	Service Economy & Value Chain Expert	New Delhi	In place

Table 36. Client's local staff engaged

Sr	Name of expert	Key or Non-key	Designation in IRRI	Designation in APART	Place of deployment	Date of availability for work in the assignment
1	Dr. Najam W. Zaidi	Key	Sr. Associate Scientist II- Plant diseases	IPM Expert	New Delhi	In Place
2	Mr. Nikhil Kumar	Key	Consultant- Rice Knowledge Bank	Consultant- Rice Knowledge Bank	Bihar	In Place
3	Dr. Ashish Kumar Srivastava	Key	Associate Scientist- Plant Physiology	Plant Nutrition and Crop Management Expert	Varanasi	In Place
4	Mr. T.C. Dhoundiyal	Key	Project Manager – South Asia (Stress Tolerant Rice Program)	Project Manager	Varanasi	In Place
5	Mr. Rohit Katara	Key	Officer - Technical & Administrative Support	Officer – Seed Multiplication & Dissemination	Varanasi	In Place
6	Dr. Kanwar Singh (L8)	Key	Senior Associate Scientist II - Precision Agronomist & Resident Program Coordinator	Senior Associate Scientist II - Precision Agronomist & Resident Consultant and Program Coordinator	Guwahati	In Place
7	Dr. Suryakanta Khandai (L6)	Key	Senior Specialist - Agriculture Research & Development	Senior Specialist - Agriculture Research & Development	Guwahati	In Place

Sr	Name of expert	Key or Non-key	Designation in IRRI	Designation in APART	Place of deployment	Date of availability for work in the assignment
			(Postharvest & Rice Value Chain)	(Postharvest & Rice Value Chain)		
8	Miss Suranjana Bhaswati Borah (L6)	Non-Key	Senior Specialist - Geographical Information System & Remote Sensing	Senior Specialist - Geographical Information System & Remote Sensing	Guwahati	In Place
9	Vipin Kumar (L5)	Non-Key	Specialist - Agriculture Research & Development (Crop & Natural Resource Management)	Specialist - Agriculture Research & Development (Crop & Natural Resource Management)	Guwahati	In Place
10	Dr. Rahul Priyadarshi (L5)	Non-Key	Specialist – Agriculture Research & Development (Seed Expert)	Specialist – Agriculture Research & Development (Seed Expert)	Guwahati	In place
11	Vivek Kumar (L5)	Non-Key	Specialist - Agriculture Research & Development (Agriculture Extension)	Specialist - Agriculture Research & Development (Agriculture Extension)	Jorhat	In place
12	Mr. Jyoti Bikash Nath (L5)	Non-Key	Specialist - Agriculture Research & Development (Agriculture Extension)	Specialist - Agriculture Research & Development (Agriculture Extension)	Guwahati	In place
13	Saurajyoti Baishya (L5)	Non-Key	Specialist- Post Harvest and Rice value Chain	Specialist- Post Harvest and Rice value Chain	Jorhat	In place
14	Lisa Mariam Varkey (L5)	Non-key	Specialist: Socio-Economics	Specialist: Socio-Economics	Guwahati	In place

Sr	Name of expert	Key or Non-key	Designation in IRRI	Designation in APART	Place of deployment	Date of availability for work in the assignment
15	Mr. Hirak Jyoti Goswami (L4)	Non-Key	Officer – Finance & Administration	Officer – Finance & Administration	Guwahati	In place
16	Miss Kasturi Goswami (L3)	Non-Key	Junior Researcher - Agriculture Extension	Junior Researcher - Agriculture Extension	Guwahati	In place
17	Mr. M. Mudoi (L3)	Non-Key	Junior Researcher - Agriculture Extension	Junior Researcher - Agriculture Extension	Barpeta	In place
18	Dibyarishi Bhattacharya (L3)	Non-key	Junior Researcher - Agriculture Extension	Junior Researcher - Agriculture Extension	Sonitpur	In place
19	Miss Ankita Sahu (L3)	Non-Key	Junior Researcher - Agriculture Extension	Junior Researcher - Agriculture Extension	Jorhat	In place
20	Mr. Pradyumna Mohapatra (L2)	Non-Key	Research Technician II - Agronomy Extension	Research Technician II - Agronomy Extension	Karbi Anglong	In place
21	Mr. Pradyumna Srichandan (L2)	Non-Key	Research Technician II - Agronomy Extension	Research Technician II - Agronomy Extension	Jorhat	In place
22	Govind Singh (L2)	Non-Key	Research Technician II - Agronomy Extension	Research Technician II - Agronomy Extension	Guwahati	In place
23	Sanjay Kumar Yadav (L2)	Non-Key	Research Technician II - Agronomy Extension	Research Technician II - Agronomy Extension	Lakhimpur	In place
24	Dr. Pardeep Sagwal (L5)	Non-Key	Specialist - Capacity Building (ISARC) (Partial (50%) time	Specialist - Capacity Building (ISARC) (Partial (50%) time	Varanasi	In place
25	Dr Virendar Kumar (AST)	Non-Key	Expert – Program Coordination	Expert – Program Coordination	Jorhat	In place

Sr	Name of expert	Key or Non-key	Designation in IRRI	Designation in APART	Place of deployment	Date of availability for work in the assignment
26	Puja Rajkhowa	Non-Key	National Consultant	National Consultant	Guwahati	In place
27	Ajit Kumar (L2)	Non-Key	Research Technician II - Agronomy Extension	Research Technician II - Agronomy Extension	Cachar	In place
28	Janmejay Biswal (L2)	Non-Key	Research Technician II - Agronomy Extension	Research Technician II - Agronomy Extension	Nagaon	In place
29	Karamjeet Singh (L1)	Non-Key	Driver	Driver	Guwahati	In Place

4. Consultants Invoice:

Table 37. Invoice details

Sr. No.	Invoice No. and Date	Date of submission of invoice to PCU ARIAS Society	Date of clarification sought by PCU, If any	Date of replies given by the consultant, if any	Date of payment by PCU
1	Invoice No.1002444 Invoice date: April 26, 2018 Amount: US$457,741.20	April 30, 2018	NA	NA	Aug 21, 2018
2	Invoice No:1002764 Invoice date: October 12, 2018 Amount: US$ 492,717.80	October 16, 2018	NA	NA	January 9, 2019
3	Invoice No: 1003061 Invoice date: April 2, 2019 Amount: US$341,969	April 4, 2019	NA	NA	May 27, 2019
4	Invoice No: 1003350 Invoice date: 09 October 2019 Amount: US$525,425	October 16, 2019	NA	NA	January 21, 2020
5	Invoice No: 1003749 Invoice date: March 30, 2020 Amount: US$ 395,750	April 16, 2020	NA	NA	August 24, 2020
6	Invoice No: 1004011 Invoice date: Oct 07, 2020 Amount: US$ 538, 262	Oct 16, 2020			

5. Contractual issues (if any) and changes desired

Table 38. Contractual issues and changes desired

Sr. No.	Issues	Changes desired
1.	Procurement of machines	Presently, most of the machines are procured through the normal tendering process, following the RFQ process. But, the machines costing more than 20 lakh rupees, need e-tendering as per World Bank norms. Since AAU is not having the e-tendering process, the procurement of machines such as paddy transplanter is getting delayed. Therefore, an alternate way of tendering needs to be suggested for timely procurement of machines.
2.	Targeting short duration varieties for flood-affected areas, and for increasing cropping intensity	In Assam, the flood is a common challenge during June and July months, and many farmers face difficulty in saving their nurseries. To overcome this problem, we have proposed a short/ medium-duration submergence-tolerant rice variety BINA Dhan 11, whose nursery can be raised in July and transplanting can be done in August. This will save time as well as losses due to flood to the farmers. Such short/ medium duration varieties can also be targeted at normal sowing time to increase the cropping intensity of the state.
3.	Procurement of value-adding machines under rice-value chain	Some companies who are manufacturing puff-making machines are not coming forward to put their quotations; as a consequence, these machines are not procured till date. An alternate way needs to be suggested by ARIAS Society to get this procurement effected for the Assam Agricultural University.
4	Procurement of recirculating batch dryer (RBD)	At the time of project proposal, the recirculating batch dryer with 4-ton capacity was suggested, but somehow the procurement got delayed. Now the company has stopped manufacturing this small size RBD. The company is making only 5-10-ton capacity RBD, which costs more than 15 lakhs. So, there is a need to change the budget for the procurement of this machine.
5	Effective use of RTs shifted at ATMA offices from the KVKs	One RT from each KVK has been shifted to the ATMA offices in all districts to help in APART activities. They need proper monitoring support and role assignment so that their services can be fully utilized for the work they have been hired.

6. Work plan for the next six months

Table 39. Month-wise work-plan for Objective I

Sr. No.	Month-wise activities	No.
October 2020		
1	Awareness meeting	4
2	Dealer meeting	3

November 2020		
1	Crop cuttings *Sali* season 2020	
2	District-wise demonstration plans' seed placement (AAU/DoA-ATMA) *Boro*/early *Ahu* season 2020-21	
3	Participatory varietal evaluation of crop cafeteria, *Sali season 2020*	4
December 2020		
1	Data analysis of the *Sali* season 2020	
2	Beneficiary selection for *Boro*/early *Ahu* season 2020-21	
3	Monitoring of seed supply, district-wise (AAU/DoA-ATMA)	
January 2021		
1	Minikit demonstrations for *Boro/early Ahu* season	3000
2	Head-to-head demonstrations for *Boro*/early *Ahu* season	750
3	Quality seed production training	20
February 2021		
1	Field monitoring	
2	Seed stakeholder meeting	1
March 2021		
1	Data analysis and report writing *Sali* 2020	

Table 40. Month-wise work-plan for Objective II

Sr. No.	Month-wise activities	No
October 2020		
1	One-day training (AAU/DoA-ATMA)	3
2	Two-day training	2
3	Exposure visit within the district (AAU/DoA-ATMA)	6
4	Exposure visit within Assam (AAU/DoA-ATMA)	3
5	Field days in LCDs	10
November and December 2020		
1	Field days in LCDs-STRVs	110
2	Field days in LCDs-PQR	40
3	Field days in Wet-DSR learning centre	60
4	Field days in Dry-DSR learning centre	39
5	Field days in MTPR learning centre	40
6	Crop cutting and data collection	
7	Beneficiary selection for *Boro*/early *Ahu* season 2020-21	
8	Monitoring of seed supply district wise (AAU/DoA-ATMA)	
January 2021		
1	ICMDs during summer/*Boro* season	600
2	Learning centres demonstration-STRVs	100
3	Wet-DSR	60

4	Mat-type nursery and mechanical transplanter	40
5	Field days in mat-type nursery	40
6	One-day training (AAU/DoA-ATMA)	18
7	Two-day training (AAU/DoA-ATMA)	4
February 2021		
1	One-day training (AAU/DoA-ATMA)	8
2	Two-day training (AAU/DoA-ATMA)	4
3	Three-day training (AAU/DoA-ATMA)	2
4	Exposure visits at institutes of national and international importance, including ISRAC (AAU/DoA-ATMA)	2
5	Exposure visit outside Assam (AAU/DoA-ATMA)	2
March 2021		
1	Review and planning meeting including annual project workshop	1
2	Round table conference	1
3	Data analysis and report writing *Sali* 2020	
Activity 3: Rice Knowledge Bank (RKB)		
October 2020		
1	RKB usage training	7
2	RKB stakeholders' workshop	6
November 2020		
1	RKB usage training	6
2	Management and maintenance of RKB	1
December 2020		
1	RKB usage training	6
2	Management and maintenance of RKB	1
January 2021		
1	Management and maintenance training	8
2	Management and maintenance of RKB	1
February 2021		
1	Management and maintenance of RKB	1
2	Management and maintenance training	8
March 2021		
1	Field testing of the RKB	2

Table 41. Month-wise work-plan for Objective III

Sr. No.	Month-wise activity	No.
October 2020		
1	Rice-value chain training	3
2	Rice-value chain demonstration	7
3	Two-day training for extension functionaries	2
4	Three-day training for extension functionaries	3

November 2020		
1	Post-harvest machinery training for progressive farmer	24
2	Post-harvest machinery demonstration for progressive farmer	24
3	Two-day training for extension functionaries	3
4	Exposure visit within the district (AAU/DoA-ATMA)	4
5	Exposure visit within Assam (AAU/DoA-ATMA)	2
December 2020		
1	Post-harvest machinery training for progressive farmers	20
2	Post-harvest machinery demonstration for progressive farmers	20
3	Two-day training for extension functionaries	2
January 2021		
1	Three-day training for extension functionaries	2
2	Rice-value chain training	5
3	Rice-value chain demonstration	14
February 2021		
1	Rice-value chain training	5
2	Rice-value chain demonstration	14
3	Three-day training for extension functionaries	3
4	Exposure visits at institutes of national and international importance, including ISRAC (AAU/DoA-ATMA)	2
5	Exposure visit outside Assam (AAU/DoA-ATMA)	2
March 2021		
1	Exposure visit within the district (AAU/DoA-ATMA)	4
2	Exposure visit within Assam (AAU/DoA-ATMA)	2
3	Round-table meeting	1
4	Review and planning meetings, including annual project workshop for discussion on last season activity and upcoming season planning	1

Table 42. Month-wise work plan for objective IV

Extrapolation domains for efficient targeting of improved technologies	**Monthly activity plan**						**Physical target**
	Oct 2020	**Nov 2020**	**Dec 2020**	**Jan 2021**	**Feb 2021**	**Mar 2021**	
1. Ground data collection							33 Districts
2. Rice mapping							33 Districts
3. Soil moisture suitability maps							
3. Mapping biotic stresses							33 districts
4. Extrapolation domain maps							33 districts

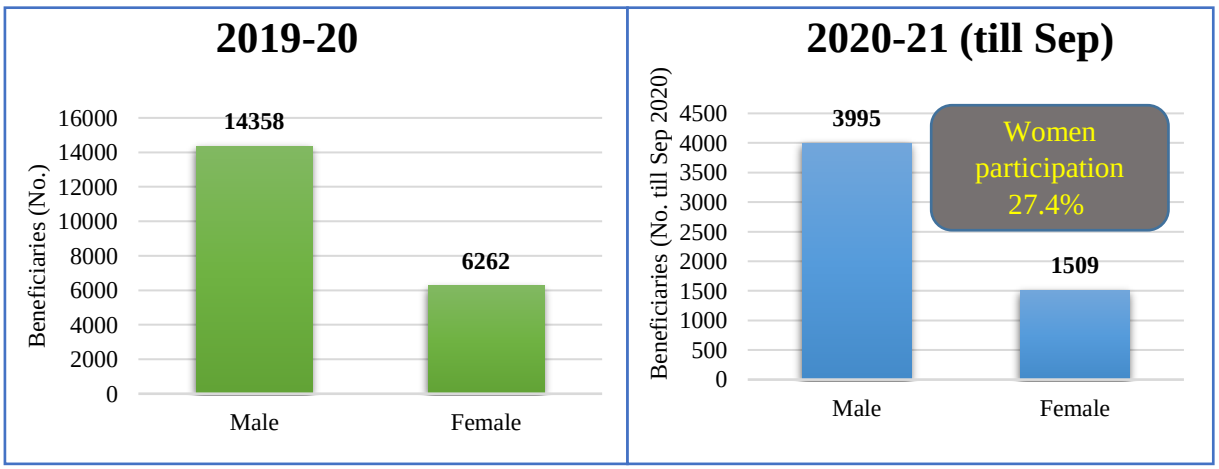
5. Atlas for sharing of maps							33 Districts
6. Creation of WebGIS framework							33 Districts
6. Field demonstrations							100 ha
7. Training and capacity building							10/20/30 persons
8. Stakeholders' meeting							30 persons

7. Social and environmental safeguard aspects

APART has now entered the third year, and the impact assessment survey of the beneficiary and non-beneficiary farmers for the rice-value chain is underway, in the districts where the project is implemented. The project has been maintaining equity and equality among all social categories while identifying and selecting the beneficiaries for the different training activities.

In the 3rd year of the project implementation, till Sep 30, 2020, the overall participation of women in different capacity building activities, including trainings, meetings and field days stands at 27.4%, and the SC and ST participation is 22.6%. Under the current COVID-19 situation, the participation of women has slightly decreased due to their more engagement in dispensing their household responsibilities. Women in Assam play a significant role in agricultural and allied activities, including crop production, livestock management, horticulture, post-harvest operations, agro-forestry, and fisheries. Women participate in different operations of rice cultivation at various stages, right from nursery raising to transplanting in the main field, hand weeding, harvesting, and post-harvest activities, and are potentially contributing to agricultural productivity equivalent to men. Assam has a strong tradition of women's involvement in agriculture since ancient times. Gender equity is an important social indicator of economic growth and human development. Female agricultural workers contribute significantly to household income, and their earnings are crucial, especially for landless and marginal farmer families.

In order to achieve effective integration under APART, and to assure gender equity, both men and women are offered equal benefits and opportunities to partake in different project activities. Under capacity building and training activities organized at the district level by AAU through



KVKs/RARSs/HRS and DoA-ATMA centres, the participation of women was 30.4% and 27.4% during the AWP 2019-20, and 2020-21 (till Sept 30, 2020), respectively.

Fig. 47: Gender-wise beneficiary participation in trainings and capacity building programs during 2019-20 and 2020-21 (till Sep 2020)

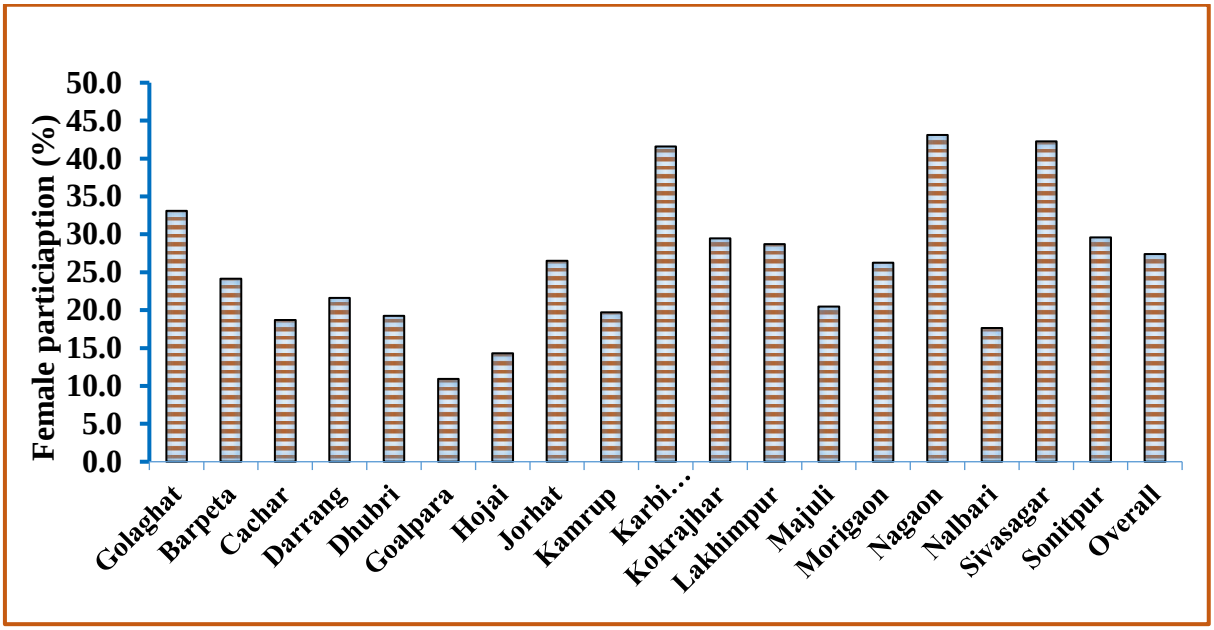


Fig. 48: District-wise gender-wise stakeholders' participation in different capacity building activities 2019-20 and 2020-21(till Sep '20)

The participation of women in different capacity building and trainings programs was mapped in different districts which range between 11 and 43%. Goalpara, Hojai, Cachar, Dhubri, Kamrup and Nalbari are the six districts where participation of women was below 20%, may be because of the imposition of the COVID-19 lockdown at the national level, which continued till July, 2020 in some of the Assam districts. Although the agricultural activities were permitted during the lockdown but the women's participation in all capacity building activities was less during that period, probably due to their enhanced engagement in domestic responsibilities with the family. But there is a large scope of improvement in women participation by involving more women groups, utilizing the linkage of extension functionaries, identifying the women interest areas in present trainings, and development of the gender tool kits. The participation of women in districts like Barpeta, Darrang, Jorhat, Kokrajhar, Lakhimpur, Morigaon and Sonitpur is between >20 to <30, and it could be easily increased to the essential target of 30% by little efforts on the above-listed points. The remaining 4 districts Karbi Anglong, Golaghat, Sivasagar and Nagaon achieved > 30% by involving their network and with little extra efforts on motivating the women participants.

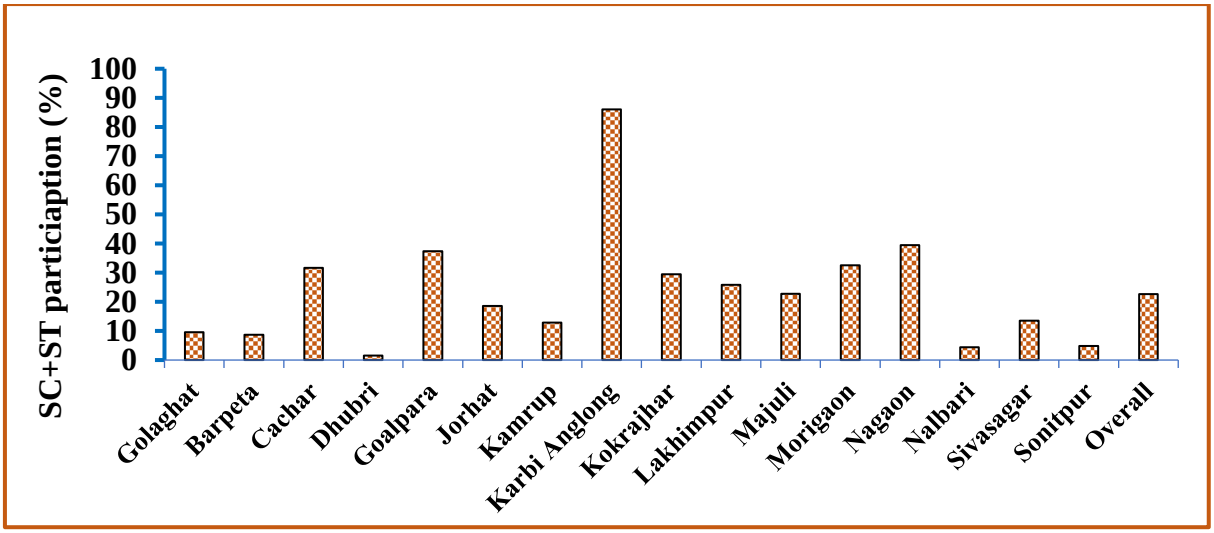


Fig. 49. District-wise SC+ST participation in trainings and capacity building programs during 2019-20

Under APART, the collective participation of SC+ST was also mapped in different training and capacity building activities under different objectives, and it averaged to 22.6% across districts. In some of the districts such as Golaghat, Barpeta, Dhubri, Jorhat Kamrup, Darrang, Nalbari, Sivasagar, and Sonitpur very low participation of SC and ST was noticed, which requires more efforts in utilizing the linkage of extension functionaries and motivating these castes to increase participation. The participation of SC and ST was highest in Karbi Anglong followed by Nalbari, which may be due to more land ownership and inviting them to participate in training for improving the capacity building.

7.1 Participation of male and female in objective-specific activities

Under objective 1, as per plan, three types of capacity building activities such as QSP training, awareness meeting, and dealer meetings were organised during this *Sali* season 2020 in the shadow of COVID-19 pandemic, yet the participation of women when mapped for all three activities, was quite encouraging (33%). Under objective I, the women participation was maximum in dealer meetings (37%) followed by QSP (34%), though the criteria of dealer meeting and QSP training were totally different. The dealer meetings were aimed to motivate the private network, for the horizontal spread of STRVs through their group of farmers, for increasing productivity and profitability. The QSP trainings were planned to make the farmers aware of the methods of seed treatment, their importance and the techniques of quality seed production. Probably, land ownership is one of the important criteria while identifying the beneficiaries of demonstrations for the climate-resilient STRVs. The participation trend of women in awareness meetings was less than the targeted number, which can be increased further in the coming years (fig. 50).

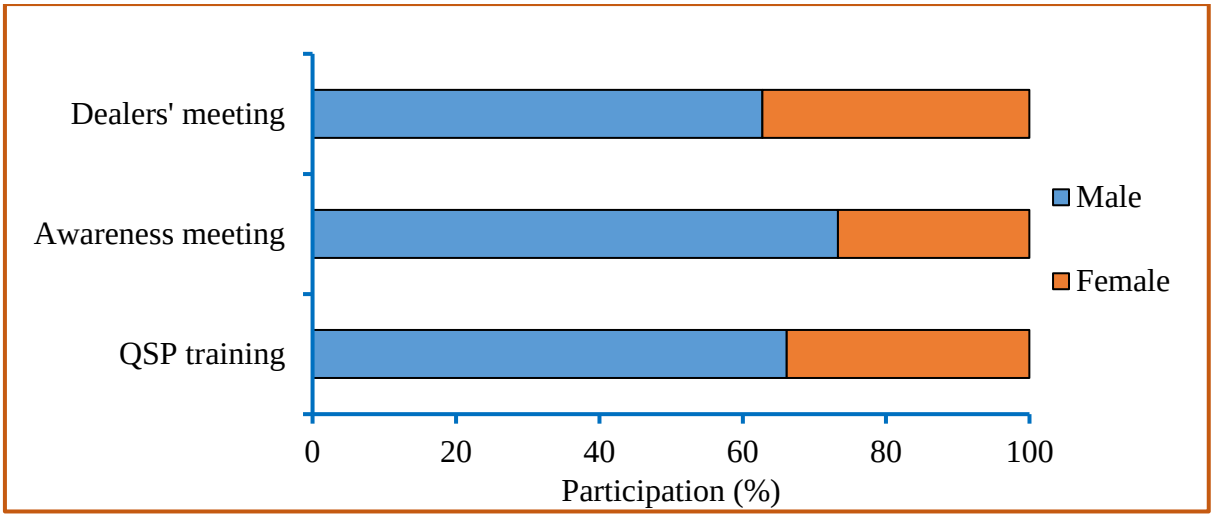


Fig. 50. Gender-wise stakeholders' participation in different capacity building activities under objective I

Similarly, the women's participation was also tracked in objective II (fig. 51) capacity-building activities where the overall average participation of women was 23% during the *Sali* season, till Sep 2020. Due to COVID-19 pandemic guidelines regarding assembling of the peoples, the exposure visits could not be executed till Sep 2020, but in rest of the training programs, beyond Sep 2020, the participation of women was resumed. In some of the activities such as 2-day training of trainers (ToTs) to create the master trainers, field days of *Boro* season 2020, and training on raising mat-type nurseries, the women participation was 36, 29, and 28 %, respectively, but in other activities such as one-day training, season-long training, and three-day training for ToTs, the participation was 8-18%, which may be due to delay in the invitation to women participants, COVID-19 pandemic, and the timings of trainings when women might be more involved in other activities. In RKB usage training, the women engagement was only 12%, which may be due to literacy level and more involvement of women in other pressing agricultural activities.

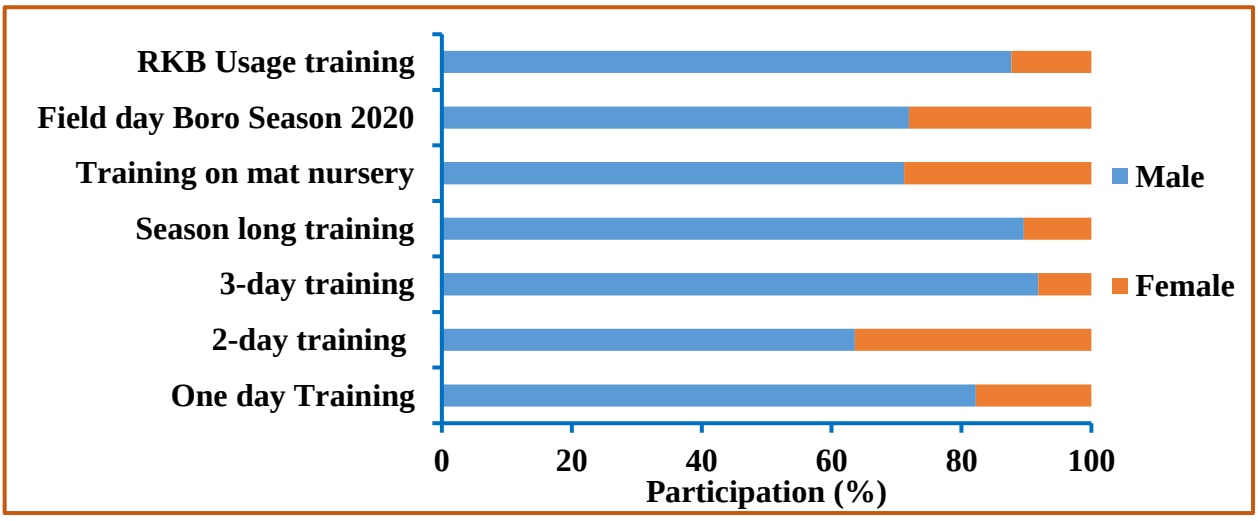


Fig. 51. Gender-wise stakeholders' participation in different capacity building activities under objective-II

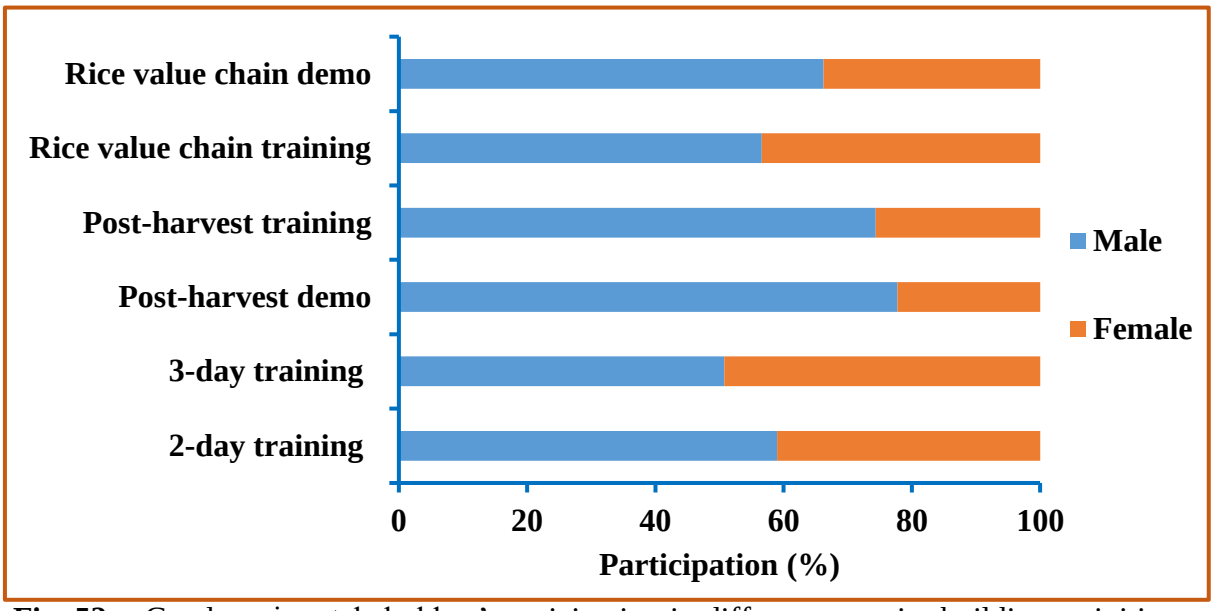


Fig. 52. : Gender-wise stakeholders' participation in different capacity building activities under objective III

Under objective III, the overall women participation in different post-harvest demonstrations and trainings activities averaged 29% (slightly less than the targeted figure of 30%) during the first six months of AWP 2020-21 (fig. 52) prevailing COVID-19 pandemic lockdown. Post-lockdown, the participation was quite satisfactory in the 2-day and 3-day ToTs (41, 49%, respectively). The involvement of women in other rice value chain demonstrations and trainings, was quite satisfactory (>30%), a positive gesture in the direction of promoting mechanization and agricultural equipment in Assam.

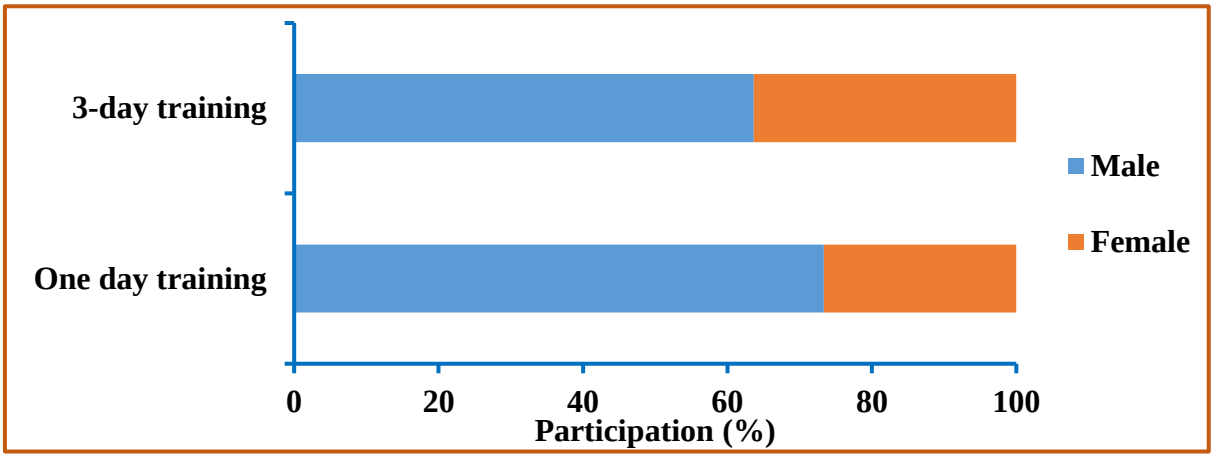


Fig. 53: Gender-wise stakeholders' participation in different capacity building activities under objective IV

The fig. 53 revealed that under objective IV, two trainings on GIS and remote sensing were organised with the staff from the Department of Fisheries, and the AAU, respectively. In one-day training the participation of women was 27%, whereas in 3-day training the participation was 36%. The overall participation in objective IV was >30%, indicating that gender criteria was taken care of, and implemented as per World Bank norms.

7.2 Economic security: The small and marginal farmers, owning 50% of the total agricultural land and 86% of the total population of Assam, are among the potential beneficiaries of APART, and their economic upliftment is the prime goal of the project. Through the introduction, evaluation, and dissemination of climate-resilient stress-tolerant rice varieties, including Ranjit-Sub1, Bahadur-Sub1, Swarna-Sub1, and BINA Dhan11 for strengthening seed system, the project has succeeded in increasing the overall productivity by more than 1.2 ton/ha over existing HYVs of the farmers. Targeting the risk-prone flooded areas, identifying the available soil moisture status after *Sali* season crop harvest for taking the additional crop in the rice-fallow areas to increase the cropping intensity and improving the economic status, are vital to project. In rice-fallow areas, an additional income of ~ Rs 5000/- was earned by the farmers by growing the pulse crop of black gram for the first time. The productivity enhancement through best-bet management including resource-efficient cost-effective mechanized options, value addition of produce through post-harvest mechanization, and entrepreneur development as the service provider for the farm- as well as post-harvest machinery, are some of the important agendas of APART. The project also aims to enhance the productivity of the traditionally grown PQR through improved management for economic viability, and also to safeguard farmers' preference. The project facilitated the sale of 2188 MT of *Boro* paddy 2020, from APART farmers @ Rs 1815/q, when the market price was ~ Rs 1400/q. Also, during the last *Sali* season 2019-20, a total of 1485.5 MT paddy was procured from the APART farmers at MSP of Rs. 1815/q till completion of the procurement of the *Sali* season, 2020. The direct procurement at a premium price and yield advantage due to climate-risk-averting resilient varieties with conforming management helped enhance the monetary gain to the Assam farmers.

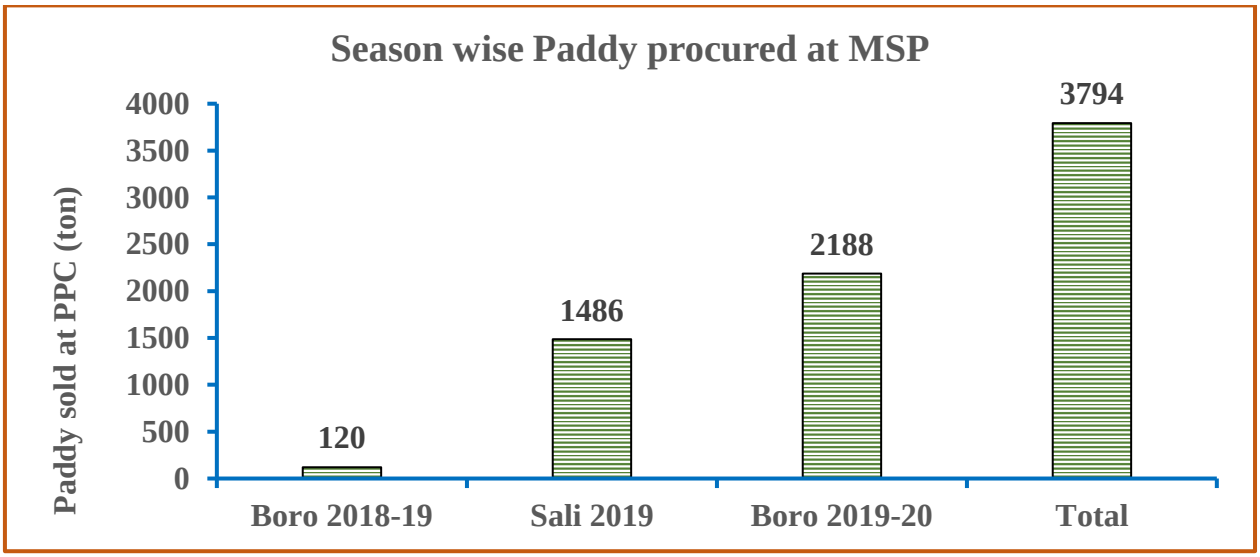


Fig. 54: Season-wise paddy procurement by the paddy procurement centres from APART farmers

The process of paddy sale to the PPCs by APART farmers was started from the *Boro* season 2019, and 120 tons of paddy could be sold to the PPCs during the opening season. In the next season of the year 2019-20, the sale of paddy by APART paddy farmers increased to 1486 tons, and finally, in the *Boro* season 2020, it reached up to 2188 tons (fig.54). The total paddy procurement by PPCs on MSP from APART paddy farmers reached to 3794 tons till the last season. This direct sale on MSP to the PPCs provided a monetary gain of 1.57 crore to the APART paddy farmers.

The fig. 55 shows the spectrum of total paddy sold at the PPCs by farmers during the last 3 seasons in various districts. The district-wise sale of paddy varied from 2 MT to 1974 MT, depending on the linkage of the farmers to PPCs. The linkage of farmers to the PPC centres can be improved to a great extent so that more quantity of paddy is sold, and the farmers get extra-economic gain with direct procurement.

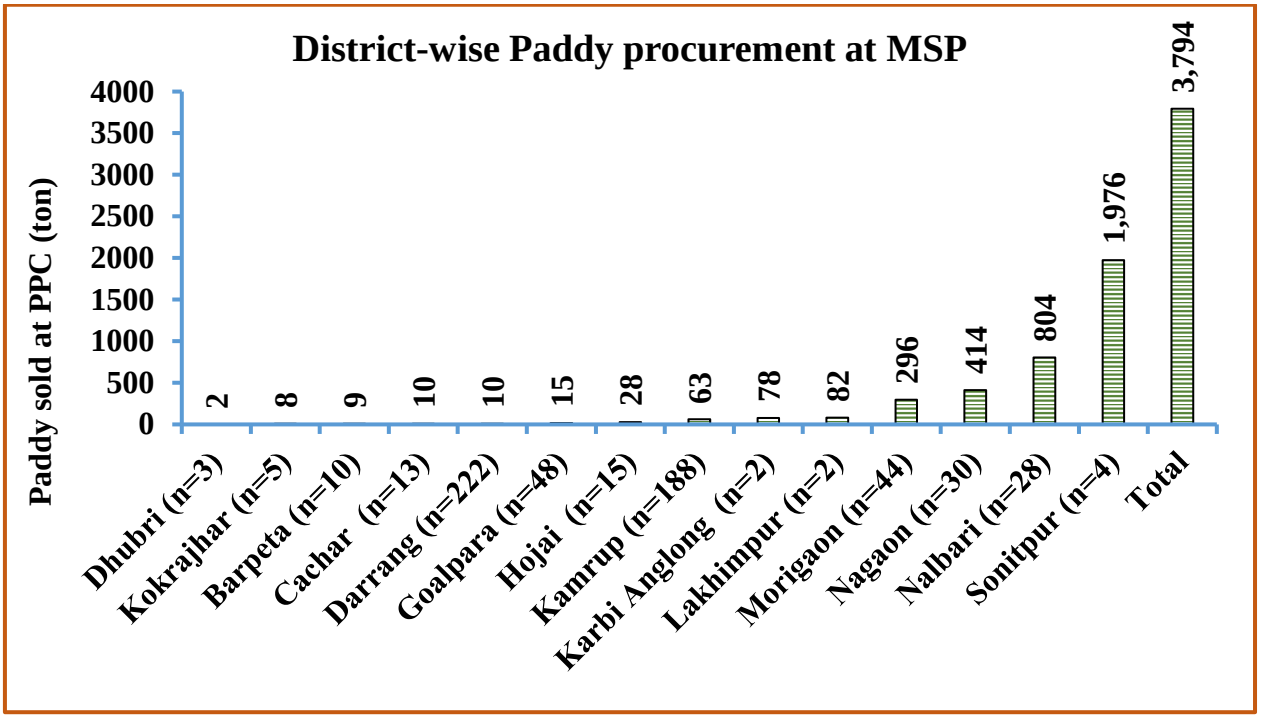


Fig. 55: District-wise paddy procurement at minimum support price from *Boro*/early *Ahu* season 2018-19 to 2019-20

7.3 Environmental safety: The alternate rice crop establishment methods such as Dry-DSR, Wet-DSR, and MTPR have contributed to reducing the global warming potential by mitigating GHG emission. The increased usage of mechanization in harvesting and post-harvest operations has helped in early harvesting and threshing of the matured crops that saved the crops from early monsoon rains. Water is an important component for rice farming, and in *Boro* season, farmers have limited resources to irrigate the rice crop, so the introduction of alternate wetting and drying by using the field water tube ('*Pani* pipe') helped in saving of 4 irrigations. In all ICMDs, the use of this *'Pani* pipe' has been advised during the *Boro* season 2020. All the methods, procedures and resources employed while implementing the project activities, followed the environment-friendly practices including Integrated Pest Management (IPM), Integrated Disease Management (IDM), Integrated Weed Management (IWM), and Integrated Nutrient Management (INM) for the management of insect-pests, diseases, weeds, and nutrients.

Regarding environmental safeguards, the project is trying to minimize the environmental hazards by judicious use of chemicals in the following ways

1. **Use of IPM:** During all the training programs, IRRI has been stressing on IPM. During the last *Sali* season 2020, the IPM interventions were very meticulously proposed to the farmers.
2. **Usage of Tricho cards:** Chemical-free management practices of pests and diseases were encouraged among the farmers. *Tricho* cards were used in some of the demonstrations to avoid

the attack of pests like stem borer. A total of 1,885 *Tricho* cards were procured by different stations such as KVK Barpeta, RARS Kokrajhar, and RARS Nagaon for the management of rice stem borer.

3. **Installation of pheromone traps:** 14,271 pheromone traps were procured by different KVKs, and have been installed in the fields.
4. **Emphasis on cultural control:** In order to minimize the risk of pest and disease attack in demonstration plots, best management practices focusing cultural methods such as crop isolation, proper planting density and spacing, the timing of seeding and planting, destruction of volunteer plants, replacement of alternate hosts and management with trap-crops, etc. are being followed to take care of surrounding environments.
5. **Usage of ITKs:** Clipping of leaf-tips to escape the attack of stem borer, and hanging of dead poultry/frog to evade the attack of *Gundhi* bug during the milk stage, have been advocated to the farmers.
6. **Use of T-perches:** 'T' shaped sticks are placed in the rice field to provide a sitting place for the birds, which would help in insect-pest management as a biological agent. It is a very environment-friendly method and was demonstrated in different cluster demonstrations in various districts. The farmers were also advised to remove these bird perches at the time of grain filling till harvesting.
7. **Efficient spray techniques for safe use of chemicals:** Capacitated the farmers and extension functionaries on requisite precautions while spraying. The information shared in the above context are as follows -
    - Spray-workers should wear full sleeve shirts and trousers, a broad-brimmed hat, a turban or other headgear and safety shoes or boots.
    - The mouth and nose should be covered with a mask, a surgical-type disposable/washable mask, or any clean piece of cloth may be used.
    - Use suitable equipment for measuring, mixing, and transferring chemicals.
    - Do not stir liquids or scoop pesticides with bare hands.
    - Do not temper with the blocked nozzle with a needle or blow with the mouth.
    - All efforts should be made to avoid spillage.
    - Purchase registered pesticides only.
    - Do not eat, drink, or smoke while using pesticides.
    - Left-over pesticide should be disposed of safely.
    - Take a shower after spraying.
    - Avoid spraying during windy/ill weather.

8. Summary of the overall progress

The achievements and results of the period under report are summarised in the table 49, below.

Table 43. Summary of the progress

Sr. No.	Deliverables/ Activity	Unit	Target vis-a-vis Achievement (physical & financial) (Target as given in the Payment Schedule provided in the contract agreement)								Total	
			Physical (Numbers)				Financial (US$)				Physical	Financial
			Target		Achievement		Target		Achievement			
			Year 2019-20		Year 2019-20		Year 2019 -20		Year 2019-20			
			1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half		
	Objective -I: Strengthening Seed Systems & Adoption of High Yielding Stress-Tolerant Rice Varieties											
1	Mini-kit – Total	No.										
1.1	AAU		3000	Nil	3000		3342	522	3342		3000	3342
1.2	ATMA		5000	3000	5000		5882	915	5882		5000	5882
1.2.1	Procurement of seed for mini-kit	No.	8000	3000	8000	0	6477	568	6477		8000	6477
2	On-farm adaptive demonstration	No.	300	Nil	300	0	4806	504	4806		300	4806
2.1	Procurement of seed	No.	300	Nil	300	0	3433	504	3433		300	3433
3	Cluster demonstration	No.	350	Nil	350	0	14437	5035	14437		350	14437
3.1	Procurement of seed	No.	350	Nil	350	0	13018	4596	13018		350	13018
4	Demonstration through Dealer Network	No.	400	Nil	400	0	11736	4120	11736		400	11736
5a	Head to Head (*Sali*)	No.	600	0	600	0	18676	6958	18676		600	18676
5b	Head to Head (*Boro*)	No.	0	650	0	0	6866	23821	6866		0	6866
6	Client-oriented crop cafeteria	No.	2	Nil	2	0	2289	8944	2289		2	2289
7	Trainings on quality seed production	No.	30	20	30	0	8256	5951	8256		30	8256
8	Awareness creation meetings at district level engaging multiple stakeholders*	No.	6	2	4	0	4825	1620	4825		4	4825
9	Dealer meetings*	No.	4	2	3	0	4028	2289	4028		3	4028
10	Stakeholder meet	No.	1	0	0	0	10482	0	10482		0	10482
11	Linkages for production & supply of BS and FS with public and private seed corporations	No.	2	1	2	0	8697	4532	8697		2	8697
12	Data collection and analysis/ Report writing/ Hiring of Short-Term Consultant	No.	1	1	1	0	8532	8532	8532		1	8532
13	Extension materials/brochures/seed training material	000'INR	350	350	350	0	5786	5786	5786		350	5786
14	Impact assessment of STRVs in Assam (Baseline)	No.	0	0	0	0	0	0	0	0	0	0

Sr. No.	Deliverables/ Activity	Unit	Target vis-a-vis Achievement (physical & financial) (Target as given in the Payment Schedule provided in the contract agreement)								Total	
			Physical (Numbers)				Financial (US$)				Physical	Financial
			Target		Achievement		Target		Achievement			
			Year 2019-20		Year 2019-20		Year 2019-20		Year 2019-20			
			1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half		
	Objective: II Raising productivity, profitability, and resource-use efficiencies of rice-based cropping systems in Assam through improved crop and natural resource management.											
	Activity 1 A. Out-scaling of integrated crop management practice and scale appropriate mechanization through demonstrations, learning centre and capacity building to Support knowledge dissemination & service economy											
1a	ICMDs for transplanted rice (*Sali*)	No.	800	0	800	0	18859	12817	18859		800	18859
1b	ICMDs for transplanted rice (*Boro*)	No.	0	600	0	0	0	23528	0		0	0
1c	ICMDs for transplanted PQR	No.	150	0	150	0	14648	4440	14648		150	14648
2a	Learning centre demonstrations for transplanted rice (*Sali*)	No.	120		120	0	7553	2930	7553		120	7553
2b	Learning centre demonstrations for transplanted rice *(Boro*)	No.		100	0	0	0	8926	0		0	0
2c	Learning centre demonstrations for transplanted PQR	No.	40		40	0	5356	915	5356		40	5356
3	Dry DSR	No.	40		39	0	7187	21056	7187		39	7187
4	Wet DSR	No.	60	60	60	0	25176	0	25176		60	25176
5	MTPR	No.	40	40	40	0	4120	4120	4120		40	4120
	Roundtable meetings for the promotion of service-economy/ handholding support to SPs and impact pathway assessment	No.	1		0	0	1144	0	0		0	0

Sr. No.	Deliverables/ Activity	Unit	Target vis-a-vis Achievement (physical & financial) (Target as given in the Payment Schedule provided in the contract agreement)								Total	
			Physical (Numbers)				Financial (US$)				Physical	Financial
			Target		Achievement		Target		Achievement			
			Year 2019-20		Year 2019-20		Year 2019-20		Year 2019-20			
			1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half		
	Activity 1 C. Capacity building and trainings of extension functionaries, service providers, and progressive farmers											
	Task -1 Capacity building and training of extension functionaries, service providers and progressive farmers											
	a) Training events											
1	One-day training	No.										
1.1	AAU*	No.	10	10	11	0	4539	4540	4993		11	4993
1.2	ATMA*	No.	20	20	21	0	9063	9063	9516		21	9516
2	Two-day training (AAU)*	No.	10	10	10	0	9150	9155	9150		10	9150
3	Three-day training (AAU)*	No.	2	2	2	0	2746	2746	2746		2	2746
4	Season-long training (AAU)	No.	1	1	2	0	3662	3662	7324		2	7324
	b. Exposure visits/learning tours											
1	Within district*	No.	6	6	0	0	915	915	0		0	0
2	Within Assam AAU*	No.	2	2	0	0	549	549	0		0	0
3	Outside Assam AAU*	No.	1	1	0	0	1144	1144	0		0	0
	Task-2: Training events of the institute of national and international importance, including ISARC											
1	Within Country*	No.	15	15	0	0	664	664	0		0	0
2	Outside Country*	No.		5	0	0	1121	0	0		0	0
1	Design, preparation, printing, and dissemination of outreach materials	000' INR	210	140	210	0	8972	5951	8972		210	8972
	Review and planning meeting, and monitoring & evaluation (M&E) activities											
1	Review and planning meeting including annual project workshop*	No.	0	1	0	0	0	2746	0		0	0
	Activity-2 : Demonstration of effective IPM technologies to improve rice productivity in Assam											
1	Demonstrations of improved IPM modules imposed on OFADs in farmers' fields	No.	160	0	160	0	5127	1838	5127		160	5127
2	Supporting IPM with cluster demos	No.	350	0	350	0	5676	1373	5676		350	5676

Sr. No.	Deliverables/ Activity	Unit	Target vis-a-vis Achievement (physical & financial) (Target as given in the Payment Schedule provided in the contract agreement)								Total	
			Physical (Numbers)				Financial (US$)				Physical	Financial
			Target		Achievement		Target		Achievement			
			Year 2019-20		Year 2019-20		Year 2019-20		Year 2019-20			
			1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half		
	Activity-3: Developing a rice knowledge bank for the state of Assam											
1	Stakeholder workshops*	No.	3	3	0	0	1602	1602	1602		0	1602
2	Video production*	No.	12	0	0	0	4120	0	4120		0	4120
3	Website development	No.	1	0	1	0	4120	0	4120		1	4120
4	RKB Usage training*	No.	8	16	5	0	1602	2975	1602		5	1602
5	Field testing of RKB*	No.	1	0	0	0	3433		3433		0	3433
6	Management and maintenance of RKB*	No.	1	1	0	0	915	915	915		0	915
7	Management and maintenance trg	No.	0	8	0		0	1602			0	
Objective III Strengthen postharvest management by introducing improved practices, including postharvest mechanization and supporting a service economy to reduce losses, increase efficiency and profitability, and improve the rice value chain												
1	Demonstration and dissemination of improved post-harvest technologies for large scale adoption at farm level	No.										
2	Demos of post-harvest machineries for support and development of entrepreneurs at commercial level	No.	37	37	30	0	3204	3204	2598		35	3845
3	Training of post-harvest machineries for support and development of entrepreneurs at commercial level	No.	37	37	30	0	15105	15105	12247	2858	35	19912
2	Activity 2: Rice value-chain for support and development of entrepreneurs at commercial level											
2.1	Rice value chain related machinery training through entrepreneur with KVKs*	No.	10	9	7	0	12310	11993	8617		9	14190
2.2	Rice value chain related machinery demonstration through entrepreneur with KVKs*	No.	30	29	25	0	16524	16387	13770		33	21514

Sr. No.	Deliverables/ Activity	Unit	Target vis-a-vis Achievement (physical & financial) (Target as given in the Payment Schedule provided in the contract agreement)								Total	
			Physical (Numbers)				Financial (US$)				Physical	Financial
			Target		Achievement		Target		Achievement			
			Year 2019-20		Year 2019-20		Year 2019-20		Year 2019-20			
			1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half		
3	Activity 3: Capacity building of farmers, SPs, dealers, and other extension functionaries											
3.1	Round table meeting to enhance linkage of manufacturers and service providers with policy-makers and other stakeholders	No.	0	1	0	0	0	8239	0		0	0
3.2	Exposure visit of farmers (Outside Assam) *	No.	7	7	0	0	14190	14190	14190		0	14190
3.3	Capacity building and training for extension functionaries; Sub- activity: 2-days trainings*	No.	10	10	5	0	13503	13503	13503		5	13503
3.4	Preparation and dissemination of communication material	No.	5	0	5	0	21056	0	21056		5	21056
3.5	Annual review and planning meeting	No.	0	1	0	0	0	7095	0		0	0
3.6	Training expenses/fees of extension functionaries at the institute of national and international importance											
3.6.1	Within country*	Persons	5	5	0	0	10299	10271	10299		0	10299
3.6.2	Outside country	Persons	0	5	0	0	8010	0	8010		0	8010
Objective IV: Developing extrapolation domain of cropping system for efficient targeting of technologies in low-productive rice-fallows and Stress-Prone Areas												
1	Development spatial database for developing extrapolation domains	%	7	0	7	0	1465	0	1465		7	1465
2	Acquisition planning for satellite data and procurement	%	20	0	20	0	5539	0	5539		20	5539
3	Pre-processing of satellite data and image classification, purchase of secondary data sets, High Resolution Multispectral sensor satellite and SAR data;	%	9	8	9	0	4944	4486	4944		9	4944

Sr. No.	Deliverables/ Activity	Unit	Target vis-a-vis Achievement (physical & financial) (Target as given in the Payment Schedule provided in the contract agreement)								Total	
			Physical (Numbers)				Financial (US$)				Physical	Financial
			Target		Achievement		Target		Achievement			
			Year 2019-20		Year 2019-20		Year 2019-20		Year 2019-20			
			1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half		
3.1	Creation of geo-spatial thematic layers, setting up needed thresholds for each parameter	%	25	25	25	0	6546	6546	6546		25	6546
3.2	Site-wise collection of geo-referenced data to qualitatively validate classified outputs from 16 districts (including travel and associated costs)	%	16	16	16	0	12885	12885	12885		16	12885
3.3	Preparation of decision rules and decision tree for mapping suitability domains of tested technologies	%	8	8	8	0	7782	7782	7782		8	7782
3.4	Geo-spatial modelling for developing extrapolation domain maps for 4 innovative cropping system are prepared (including travel and associated costs)	%	25	25	25		5822	5822	5822		25	5822
	Generation of extrapolation domain maps and qualitative validation (including travel and associated costs)	%	20	20	20	12	8972	8972	8972		20	8972
3.5	Reports & maps prepared and shared with state partners for validation and use	%	15	16	15	0	4403	4623	4403		15	4403
3.6	Development, framework and design of WebGIS	%	20	19	20	0	18996	18035	18996		20	18996
3.7	Development of atlases, brochures, promotional and awareness creation material, and detailed reports and publications	%	40	0	40	0	26686	0	26686		40	26686
	Multi-location farmer participatory demonstrations using extrapolation domain cropping system maps including seed cost of pulses to target in rice fallows	%	13	12	13	0	21972	19912	21972		13	21972

* The activities are under process and will complete just after COVID-19 lockdown is over

** The activities are shifted to *Boro* season 2019-20 because final version of the RKB-Assam could not be launched due to non-delivery of activity by the vendor and later on denial to complete the activity

The target could not be achieved due to short supply of seed by the vendor.

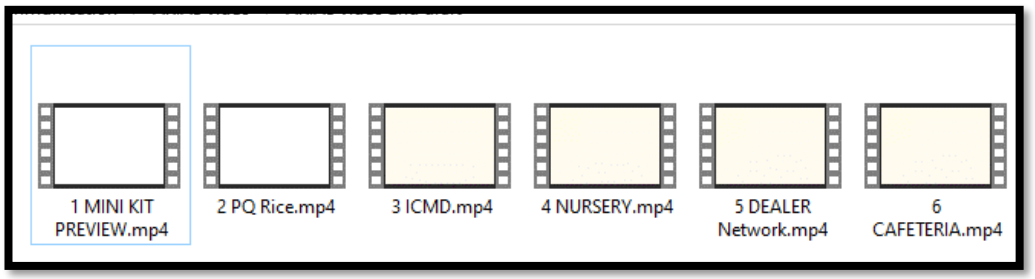
Annexures

Annexure I : Video Documentation

Six videos were prepared on Climate Resilient Technology - Demonstrations on Stress Tolerant Rice Varieties (STRVs) under APART on the following topics. The video documentation can be viewed at

https://drive.google.com/drive/u/0/folders/1WophlG70f6BCz1jgY7_ZCQVQPScDvvzA

1. Minikit demonstrations of STRVs
2. Premium Quality Rice (PQR) with better bet agronomy demonstrations
3. Integrated Crop Management Demonstrations (ICMDs)
4. Mechanical transplanting including raising mat type nursery
5. Dealer network demonstrations
6. Crop Cafeteria (CC)



Annexure II: Details of news published in different print media

Table 1: Details of News published in different media				
S.No.	**Date**	**Name of newspaper**	**Title**	**District**
1	May 29, 2020	Pratidin	Kothia Bitoron	Morigaon
2	May 29, 2020	Niomia Batra	Kothia Bitoron	Morigaon
3	June 11, 2020	Niomia Batra	Mat nursery	Lakhimpur
4	June 12, 2020	Daiknik Gano Adhikar	Mat nursery	Nalbari
5	June 12, 2020	Niomia Batra	Mat nursery	Nalbari
6	June 20, 2020	Dainik Janambhumi	CHC inauguration	Sivasagar
7	June 21, 2020	The Assam Tribune	STRV seed distribution	Morigaon
8	June 24, 2020	Dainik Asom	Mat nursery	Nalbari
9	July 2, 2020	Amar Khabor	CHC inauguration	Jorhat
10	July 5, 2020	The Sentinel	Training	Sonitpur
11	July 6, 2020	News paper	50 bighas cultivation of Joha rice	Barpeta
12	July 15, 2020	Niomia Batra	Darangirir Potharot Rice planter	Goalpara
13	July 16, 2020	Dainik Agradoot	MTR	Goalpara
14	July 18, 2020	Niomia Batra	MTR	Kamrup
15	July 24, 2020	Niomia Batra	CHC inauguration	Lakhimpur
16	August 3, 2020	Dainondin batra	MTR	Barpeta
17	August 3, 2020	Gono Batra	MTR	Barpeta
18	August 3, 2020	News 24 hours	BINA Dhan 11- A shining beacon for flood affected Assam Farmers	Assam
19	August 9, 2020	Asomia Khabar	Training on postharvest machinery	Goalpara
20	September 2, 2020	Asomia Khabar	CHC inauguration	Barpeta
21	September 2, 2020	Asomia Pratidin	CHC inauguration	Barpeta
23	September 4, 2020	The sentinel	CHC inauguration	Barpeta
24	Sept 10, 2020	The sentinel	CHC inauguration	Darrang
25	September 11, 2020	The Assam Tribune	CHC inauguration	Darrang
26	September 12, 2020	IRRI news	Assam women showcase climate resilient technology to tackle Dishang river flood	Sivasagar

JANAMBHUMI

NATION | WORLD | NORTH-EAST | BUSINESS | SPORTS | ENTERTAINMENT | LIFESTYLE | SCIENCE & TECH | OPINION | E-PAPE

Home > North-East > Assam

মৰিগাঁও জিলা কৃষি বিজ্ঞান কেন্দ্ৰৰ উদ্যোগত ৫ শতাধিক কৃষকৰ মাজত ধানৰ কঠিয়া বীজ বিতৰণ

কৃষি বিজ্ঞান কেন্দ্ৰই এক বিশেষ পদক্ষেপ গ্ৰহণ কৰিছে।ধান ৰোপণৰ সময়ত কৃষক সকলে যাতে ধানৰ কঠিয়া বিচাৰি হাহাকাৰ কৰিব লগীয়াত নপৰে সেই উদ্দেশ্যেৰে জিলাখনত বানপানী নোহোৱা ওখ কৃষি ভূমি নিৰ্বাচন কৰি উন্নত জাতৰ ধানৰ কঠিয়া পেলাবলৈ প্ৰস্তুতি সম্পূৰ্ণ কৰি তুলিছে।

এই উপলক্ষে মৰিগাঁও জিলা কৃষি বিজ্ঞান কেন্দ্ৰৰ উদ্যোগত, এপাৰ্টৰ সহযোগত আৰু সাৰথিৰ তত্বাৱধানত আজি মায়ং চক্ৰৰ অন্তৰ্গত ছটাবড়ীত জিলা উপায়ুক্ত ঋতুৰাজ বৰাই ধানৰ কঠিয়াৰ বীজ বিতৰণৰ কাৰ্যসূচী শুভাৰম্ভ কৰে। ধানৰ কঠিয়া বীজ বিতৰণৰ কাৰ্যসূচী শুভাৰম্ভ কৰি দিয়া ভাষণত উপায়ুক্ত ঋতুৰাজ বৰাই কয় দেশৰ অৰ্থনীতিৰ মূল ভেটি হৈছে কৃষি।

সেয়ে কৃষি উৎপাদনত আমি সকলোৱে সৰ্বাধিক গুৰুত্ব প্ৰদান কৰিব লাগিব।ধান উৎপাদনত যিহেতু মৰিগাঁও জিলাৰ এক সুকীয়া স্থান আছে সেয়ে পূৰ্বৰ গৰিমা অটুট ৰাখি আৰু অধিক যাতে ধান উৎপাদন হয় তাৰ ওপৰত খেতিয়ক সকলক গুৰুত্ব দিবলৈ আহ্বান জনাই।ইফালে কৰণা সজ্যগতা ওপৰত বজ্ৰব্য ৰাখি উপায়ুক্ত গৰাকীয়ে চৰকাৰে আপলোড কৰা আৱোগ্য সেতু এপৰ সফলতা বিষয়ে অৱগত কৰি সকলোকে এপটো ব্যৱহাৰ কৰাত মনোনিবেশ কৰিবলৈ পৰামৰ্শ দিয়ে।

জিলা কৃষি বিজ্ঞান কেন্দ্ৰৰ জ্যেষ্ঠ বিজ্ঞানী ড০ ৰিজুস্মিতা শৰ্মা ডেকা, মীন বিশেষজ্ঞ পৰাগ মনি ডেকা, ভূমি বিশেষজ্ঞ সৌৰভ বৰুৱা, এপাৰ্টৰ ড০ জ্যোতি বিকাশ, ৰবিন হাজৰিকা, সাৰথিৰ বিপুল গগৈকে আদি কৰি কেইবাজনো বিষয়া আৰু কেনেদৰে যত্ন কৰিব লাগিব এই সকলোবোৰ ওপৰত এক বিস্তৃত ব্যাখ্যা দাঙি ধৰে।উল্লেখ্য যে জিলা খনৰ মায়ং চক্ৰৰ ঔগুৰি, হাতীউঠা, খোলাগাঁও, জোৰগাঁও, ধৰমতুল, তেতেলিয়া আদি,ভূৰবন্ধা চক্ৰৰ দন্দুৱা, দূৱনী আদি, মিকিৰভেটা চক্ৰৰ চৰাইবাহী, মিকিৰভেটা আদি, লাহৰিঘাট চক্ৰৰ ৰবছলা, নগাৰবন্ধা আদি কৰি সমগ্ৰ মৰিগাঁও জিলাত ৫ শতাধিক কৃষকৰ দ্বাৰা ৫,৫২১ বিঘা মাটিত উন্নত জাতৰ ধানৰ কঠিয়া বীজ পেলোৱা পৰিকল্পনা গ্ৰহণ কৰা বুলি অৱগত কৰিছে জিলা কৃষি বিজ্ঞান কেন্দ্ৰৰ জ্যেষ্ঠ বিজ্ঞানী ড০ ৰিজুস্মিতা শৰ্মা ডেকাই।

The inside story of hunger heroes...

Abhishek Singha

This writer is a Research Technician. He can be reached at: aviboney@gmail.com

"...I am happy that I get the needful support timely from District Agriculture Office – Golaghat and APART project. I would also like to thank the Block Technology Manager of Dergaon Development Block and Research Technician of APART- Golaghat for their valued guidance, motivation and timely monitoring"— Nitu Bora.

Nitu Bora (43 years old) of Balidua village, Dergaon Development Block, Golaghat district is one of the progressive farmers associated with District Agriculture Office, Golaghat for past few years.

Last year, District Agriculture Office, Golaghat had organized a conversation on Good Agriculture Practice (GAP) to promote submergence-tolerant rice varieties: Ranjit Sub 1, Bahadur Sub

Officer: Golaghat, Assistant Director cum Nodal Officer of APART: Golaghat and Deputy PD of ATMA were the key speakers of that meaningful happening.

After couple of days, Nitu Bora along with other fellow

farmers from West Brahmaputra area (One of the Flood affected areas) visited the District Agriculture Office and met Respected: District Agriculture Officer and Assistant Director Cum Nodal Officer of APART: Golaghat

At Balidua, transplanting had been completed and the crop was at tillering stage when floods come. The crop was submerged for 15 days at a stretch when Abhishek Singha, Research Technician of APART – Golaghat visited the plots in the 2nd week of August/2019. The three farmers: Nitu Bora, Lahit Bora & Babul Bora, who had so much faith in the new technology, were disheartened but Abhishek assured them that the crops would come up again as they had the submergence gene within them.

"Patience is not the ability to wait, but the ability to keep a good & positive attitude while waiting" – The plots of Ranjit – Sub 1 revived even after submergence. Flood could not affect the plots of Ranjit - Sub 1 alike the plots of traditional varieties. The yield achieved in

achieved as the plots were totally damaged due to submergence by flood water.

The beneficiaries were happy because for them it was just like a 'Miracle' during that hour-of-crisis. Nitu Bora stated, "Ranjit Sub 1 can endure underwater conditions for 14 to 15 days without losing potential yield where as the traditional varieties (Viz. Prasad Bhog, Mono Ari, Ranjit, Bor Dhan etc.) can barely last only five days of submergence..".

This year, almost 55 to 60 per cent heartily accepts the Ranjit – Sub 1 variety instead of traditional varieties which they practiced in their fields for long years and this change happens within 12 months.

Literally, 'Real Transformation' in the agriculture sector is not possible within a month. It will take time. A year or may be couple of years to create a positive impact in the society. It's not about perfect. It's about our team effort and when we implement that effort and loyalty into our life with a positive mind; every

মৰিগাঁও কৃষি বিজ্ঞান কেন্দ্ৰৰ উদ্যোগ

কৃষকৰ মাজত কঠীয়া-বীজ বিতৰণ

প্ৰতিদিন সংবাদ, মৰিগাঁও, ২৯ মে' ঃ মৰিগাঁও জিলাৰ কৃষকসকলক সকাহ দিয়াৰ লক্ষ্যেৰে মৰিগাঁও জিলা কৃষি বিজ্ঞান কেন্দ্ৰই গ্ৰহণ কৰা বিশেষ পদক্ষেপৰ অংশ হিচাপে আজি কৃষকৰ মাজত উন্নত জাতৰ শালি ধানৰ বীজ বিতৰণ আৰু ধানৰ বীজ সিঁচা কাৰ্যসূচী ৰূপায়ণ কৰা হয়। শালিধান ৰোপণৰ বতৰত বা বানপানীৰ পিচত কৃষকসকলে যাতে কঠীয়া বিচাৰি হাহাকাৰ কৰিবলগীয়াত নপৰে, সেই উদ্দেশ্যেৰে জিলাখনত বানপানী নোহোৱা ওখ কৃষিভূমি নিৰ্বাচন কৰি উন্নত জাতৰ ধানৰ কঠীয়া পেলাবলৈ প্ৰস্তুতি সম্পূৰ্ণ কৰি তোলা মৰিগাঁও জিলা কৃষি বিজ্ঞান কেন্দ্ৰই এপাৰ্ট আৰু সাৰথিৰ সহযোগত মৰিগাঁও জিলাৰ মায়ং ৰাজহ চক্ৰৰ অন্তৰ্গত ছটাবড়ি গাঁৱত ধানৰ বীজ বিতৰণৰ কাৰ্যসূচীৰ আনুষ্ঠানিকভাৱে শুভাৰম্ভ কৰে উপায়ুক্ত ঋতুৰাজ বৰাই। ধানৰ বীজ বিতৰণ কাৰ্যসূচী শুভাৰম্ভ কৰি দিয়া চমু ভাষণত উপায়ুক্ত বৰাই কৃষিক দেশৰ অৰ্থনীতিৰ মূল ভেটি বুলি অভিহিত কৰি কৃষি উৎপাদনত সৰ্বাধিক গুৰুত্ব প্ৰদান কৰিবলৈ ৰাইজলৈ আহ্বান জনায়। মৰিগাঁও কৃষি বিজ্ঞান কেন্দ্ৰৰ জ্যেষ্ঠ বিজ্ঞানী ড' ৰিজুস্মিতা শৰ্মা ডেকা, মীন বিশেষজ্ঞ পৰাগমণি ডেকা, ভূমি বিশেষজ্ঞ সৌৰভ বৰুৱা, এপাৰ্টৰ ড' জ্যোতি বিকাশ, ৰবীন হাজৰিকা, সাৰথিৰ বিপুল গগৈকে আদি কৰি কেইবাজনো বিষয়া আৰু খেতিয়কে অংশগ্ৰহণ কৰা অনুষ্ঠানটোত শতাধিক কৃষকৰ মাজত কঠীয়া, বীজ বিতৰণ কৰাৰ লগতে কৃষি বিশেষজ্ঞসকলে বীজ পেলোৱা আৰু কঠীয়া তোলাৰ সময়ত লৈবলগীয়া ব্যৱস্থাসমূহৰ ওপৰত বিস্তৃত ব্যাখ্যা দাঙি ধৰে। উল্লেখযোগ্য যে মৰিগাঁও জিলাৰ মায়ং ৰাজহ চক্ৰৰ অধীনৰ ঔগুৰি, হাতীউঠা, খোলাগাঁও, জোৰগাঁও, ধৰমতুল, তেতেলীয়া, ভূৰবন্ধা কৃষি চক্ৰৰ অধীনৰ দন্দুৱা, দূৱনি, মিকিৰভেটা কৃষি চক্ৰৰ অধীনৰ চৰাইবাহী, মিকিৰভেটা, লাহৰীঘাট কৃষি চক্ৰৰ অধীনৰ ৰবচলা, নগাৰবন্ধা আদি কৰি জিলাখনৰ পাঁচ শতাধিক কৃষকৰ জৰিয়তে প্ৰায় ৫,৫২০ বিঘা মাটিৰ বাবে উন্নত জাতৰ শালিধানৰ কঠীয়া, বীজ সিঁচা পৰিকল্পনা গ্ৰহণ কৰা বুলি সংবাদ মাধ্যমক জনায় জ্যেষ্ঠ বিজ্ঞানী ড' ৰিজুস্মিতা শৰ্মা ডেকাই।

অসম বার্তা

শুক্রবার, ১২ জুন ২০২০

বিহপুৰীয়াৰ গোসাঁইচুক গাঁৱত দলিচা কঠীয়াতলীৰ প্ৰশিক্ষণ

লখিমপুৰ কৃষি বিজ্ঞান কেন্দ্ৰৰ বিজ্ঞানীৰ প্ৰচেষ্টা

Dainik Gana Adhikar : An Assa...

6 Ads

নলবাৰীত গ্ৰাম্য সৰ্বাঙ্গীণ উন্নয়ন কাৰ্যসূচীৰ শুভাৰম্ভ

চিডলিং ফেক্টৰীৰে কঠীয়া ৰোপণৰ ব্যৱস্থা

ষ্টাফ ৰিপৰ্টাৰ, নলবাৰী, ১২ জুন ঃ কৃষক সকলে অতি কম খৰচত অধিক উৎপাদন পাবলৈ নলবাৰী জিলাত প্ৰথমবাৰৰ বাবে আৰম্ভ কৰা হৈছে বীজ ৰোপণ কেন্দ্ৰ। উল্লেখ্য যে কৃষি অৰ্থনীতিত প্ৰচুৰ সম্ভাবনা থকা জিলাখনৰ ৰবাজোল গাৱত আৰম্ভ কৰা হৈছে এই চিডলিং ফেক্টৰী।এইডচ ডি এফ চি বেংকৰ অৰ্থ সাহায্যৰ গ্ৰাম্য বিকাশ মঞ্চই ৰূপায়ন কৰা " গ্ৰাম্য সৰ্বাঙ্গীণ উন্নয়ন কাৰ্যসূচীৰ অধীনত ইতিমধ্যে শুক্ৰবাৰে গাওঁখনত হনুমান বীজ ৰোপণ কেন্দ্ৰ নামৰ এটি কৃষক গোট গঠন কৰা হয়। উল্লেখ্য এই গোটৰ অধীনত থকা কৃষক সকলক লৈ জিলা কৃষি বিজ্ঞান কেন্দ্ৰৰ এপাৰ্ট প্ৰকল্পৰ সহকাৰী প্ৰকল্প বৈজ্ঞানিক বঞ্জিৎ ভৰালী আৰু গবেষণা সহায়ক ৰূপম ডেকাৰ দ্বাৰা মেট নৰ্চাৰীৰ জৰিয়তে কঠিয়া পৰা পদ্ধতি জিলাখনত প্ৰথমবাৰৰ বাবে আৰু নতুনকৈ আৰম্ভ কৰা হয়। উল্লেখনীয় যে গ্ৰাম্য বিকাশ মঞ্চই জিলাখনত প্ৰথমবাৰৰ বাবে আৰম্ভ কৰা এই পদ্ধতিৰ দ্বাৰা দুখীয়া কৃষক সকল যথেষ্ট পৰিমানে উপকৃত হ'ব পাৰিব। ইয়াৰ উপৰি অঞ্চলটোৰ কৃষক সকলৰ যিহেতু শস্য উৎপাদন কৰিব পৰা ভূমিৰ পৰিমান একেবাৰে কম হোৱাৰ উপৰি কঠিয়া ৰোপণৰ খৰচো যথেষ্ট পৰিমাণে হয় সেইবাবেই জিলাখনৰ ৰবাজোলত প্ৰথমবাৰৰ বাবে অনুষ্ঠানটোৰে এই পদক্ষেপ গ্ৰহণ কৰিছে।এই পদ্ধতিৰ দ্বাৰা দুখীয়া কৃষক সকলে কম খৰচত অধিক উৎপাদন পাবলৈ সক্ষম হব যাব ফলত অঞ্চলটোৰ লগতে সমগ্ৰ জিলাখনৰ কৃষক সকলে নতুনকৈ উদ্ভাৱন কৰা কৃষি পদ্ধতিৰ প্ৰতি আগ্ৰাহান্বিত হ'ব আৰু জিলাখনত কৃষি অৰ্থনীতিয়ে এক প্ৰভূত বৰঙনি আগবঢ়াব। গ্ৰাম্য বিকাশ মঞ্চৰ স্বেচ্ছাসেবক অঞ্জনজ্যোতি গোস্বামী, তেহজীৰ চৌধুৰী আৰু জ্যোতিষ দাসৰ সুপৰিকল্পনাত ৰবাজোলৰ উপৰি জিলাখনত বিভিন্ন প্ৰান্তৰ দুখীয়া কৃষক সকলক কম খৰচত অধিক উৎপাদন নতুন কৃষি পদ্ধতিৰ বিষয়ে কৃষক সকলৰ মাজত সজাগতা আৰম্ভ কৰিছে।

কৃষি খণ্ডক নতুন গতি দিবলৈ নলবাৰীত কৃষি বিভাগৰ মেট নাৰ্চাৰী

বজালী আছুৰ নীৰৱ কৃষি বিপ্লৱ

বিজ্ঞানসন্মত পদ্ধতিৰে ৫০ বিঘা মাটিত জহাধানৰ খেতি

বাপ্পিং দাস
পাঠশালা, ৬ জুলাই

বিজ্ঞানসন্মত পদ্ধতিৰে ৫০ বিঘা মাটিত জহাধানৰ খেতি

এনে কৃষিকৰ্ম। এইবাৰ ৫০ বিঘা মাটিত জহাধানৰ খেতি কৰিছে আৰু বিজ্ঞানসন্মতভাৱে কাৰ্পেটিং কৰি নতুন পদ্ধতিৰে আছুৱে এনে প্ৰশংসনীয় কাম হাতত লৈছে। এইক্ষেত্ৰত কৃষি বিভাগৰ সৈতে জড়িত তথা ফিলিপাইনছত অভিজ্ঞতা আহৰণ কৰি অহা দক্ষ এগৰাকী কৃষি বিষয়া মৃদুপৱন মুদৈ, হাউলী কৃষি বিজ্ঞান কেন্দ্ৰৰ মুখ্য বিজ্ঞানী ড° অৰূপ ডেকা, বজালী মহকুমা কৃষি বিষয়া দীপক দাস, কৃষি বিজ্ঞান কেন্দ্ৰৰ হাউলীৰ বনজিৎ ডেকা, হাউলী কৃষি বিজ্ঞান কেন্দ্ৰৰ আন এগৰাকী বিষয়া প্ৰাণজিৎ বৰুৱাৰ লগতে কুলদ্বীপ তালুকদাৰ, বজালীৰ এগৰাকী অধিবক্তা ধনজিৎ দাসসহ পাঠশালা কৃষি বিভাগৰ ৰমা দাস, ভৱেশ পাটগিৰি আদিয়ে আছুৰ এনে কৰ্মত সহযোগ কৰিছে। আজি পুৱাৰ পৰা বৰপেটা জিলা ছাত্ৰ সন্থাৰ সাধাৰণ সম্পাদক সমুদ্ৰ পাটগিৰিৰ নেতৃত্বত বজালী মহকুমা ছাত্ৰ সন্থাৰ হিমাংশু শৰ্মা, বিশ্বজিৎ গাংগুলী, ধীমান শৰ্মাকে আদি কৰি অধিবক্তা ধনজিৎ দাসসহ ২০গৰাকী আছু কৰ্মীক প্ৰখৰ ৰ'দত আজি কৃষিকৰ্ম সম্পাদন কৰি থকা দেখা গ'ল। আনকি জিলা সাধাৰণ সম্পাদক সমুদ্ৰ পাটগিৰিয়ে নিজে ট্ৰেক্টৰ চলাই আজি পথাৰত দিনটো নামি পৰিল। স্বাভাৱিকতে বজালী আছুৰ এনে যোগাত্মক কাৰ্যক সচেতন মহলে প্ৰশংসা কৰিছে। আনহাতে বজালী মহকুমা ছাত্ৰ সন্থাক এনেদৰে চৰকাৰী কৃষিভূমিত কৃষিকৰ্ম কৰাৰ সুযোগ দি বিভাগে যি ইতিবাচক সঁহাৰি প্ৰদান কৰিছে তাৰ বাবে আছুৱে কৃষি বিভাগক আন্তৰিক ধন্যবাদ জ্ঞাপন কৰিছে।

দৰংগিৰিৰ পথাৰত অত্যাধুনিক 'ৰাইচ ট্ৰান্স প্লেণ্টাৰ'

কৃষি বিজ্ঞানীয়ে পৰিদৰ্শন কৰিলে পোৰাকুছিৰ কৃষিভূমি

ষ্টাফ ৰিপ'ৰ্টাৰ, নলবাৰী, ২৯ জুলাই ঃ অসম কৃষি বাণিজ্য আৰু গ্ৰাম্য ৰূপান্তৰ আঁচনিৰ অধীনত নলবাৰীস্থিত কৃষি বিজ্ঞান কেন্দ্ৰৰ সহঃ প্ৰকল্প বিজ্ঞানী প্ৰাণজিৎ ভৰালী আৰু গৱেষণা প্ৰযুক্তিবিদ বিশ্বজিৎ গগৈয়ে পোৰাকুছিৰ কৃষিভূমি আজি পৰিদৰ্শন কৰাত ৰাইজে সন্তুষ্টি প্ৰকাশ কৰিছে। কৃষি বিজ্ঞান কেন্দ্ৰৰ তৰফৰ পৰা প্ৰদান কৰা বীজেৰে কৰা কৃষিকৰ্মৰ মান আৰু পদ্ধতি নিৰীক্ষণৰ বাবে উপস্থিত হোৱা বুলি বিজ্ঞানীদ্বয়ে সংবাদ মাধ্যমক জানিবলৈ দিয়ে। কৃষিভূমি আৰু ধাননিৰ বৃদ্ধি-বিকাশ সম্বন্ধীয় পৰিদৰ্শন কালত বিশেষভাৱে সহায় কৰে পোৰাকুছিৰ আদৰ্শ যুৱ খেতিয়ক ভূপেন বৰ্মন আৰু হৰিহৰ বৰ্মনে। পৰিদৰ্শন কালত স্থানীয় কৃষকসকলক বিজ্ঞানীদ্বয়ে কয় যে বিজ্ঞানসন্মত পদ্ধতিৰে শাৰী শাৰীকৈ ধান ৰোপণৰ বিভিন্ন ইতিবাচক দিশ আছে। অধিক পৰিমাণৰ ফচল প্ৰাপ্তিকে ধৰি উদ্ভিদৰ ৰোগ নিৰ্মূলতো এই পদ্ধতিয়ে সহায় কৰে। মূলতঃ বাহাদুৰ প্ৰজাতিৰ ধান শাৰীকৈ ৰোৱা বাবে পোৰাকুছি গাঁৱৰ যুৱ খেতিয়ক ভূপেন বৰ্মনক ভূয়সী প্ৰশংসা কৰাৰ লগতে ভৱিষ্যতে বীজ-সাৰ-কীটনাশক ঔষধ আদি যোগান ধৰাৰ প্ৰতিশ্ৰুতি দিয়ে। তদুপৰি উন্নত কৃষি পদ্ধতিৰ বাবে যাৱতীয় দিহা-পৰামৰ্শ দিয়াৰ কথাও সদৰী কৰে।

কাঁহিকুছিত অত্যাধুনিক ভূঁই ৰোৱা যন্ত্ৰৰ প্ৰদৰ্শন

মহানগৰ বাৰ্তা, আজাৰা, ১৮ জুলাই ঃ কাঁহিকুছিস্থিত আজি কৃষি বিজ্ঞান কেন্দ্ৰ, কামৰূপৰ অধীনৰ এপাৰ্ট প্ৰকল্পৰ অন্তৰ্গত অত্যাধুনিক যন্ত্ৰপাতিৰ প্ৰদৰ্শন কাৰ্যসূচীৰ অধীনস্থ ভূঁই ৰোৱা যন্ত্ৰৰ প্ৰদৰ্শনমূলক প্ৰশিক্ষণ কাৰ্যসূচী অনুষ্ঠিত হয়। ৰঙামাটি অঞ্চলৰ কৃষক চিদা মোহন দাসৰ খেতিপথাৰত ভাৰত চৰকাৰ তথা স্বাস্থ্য বিভাগৰ দ্বাৰা অনুমোদিত যথাযথ সামাজিক দূৰত্ব বৰ্তোৱাৰ লগতে মাস্ক পৰিধানৰ ব্যৱস্থাৰে কম সময়ত আৰু কম খৰচত

এপাৰ্টৰ অধীনত বৰপেটাত মেচিনেৰে ধানৰ কঠীয়া ৰোপণ আৰু প্ৰশিক্ষণৰ ব্যৱস্থা গ্ৰহণ

■ সৰুপেটাৰ সমীপৰ নতুন টাঙলাপাৰা গাঁৱত 'পথাৰ দিৱস' পালন ■

বান-সহনশীল ক্ষমতা থকা ধানৰ খেতিত গুৰুত্ব বিশেষজ্ঞৰ

আগিয়াত 'এপাৰ্ট'ৰ মেচিনাৰী সঁজুলিৰ প্ৰদৰ্শন, সজাগতা সভা

আমাৰ খবৰ, আগিয়া, ৯ আগষ্ট ঃ গোৱালপাৰা জিলাৰ আগিয়া থানাৰ অন্তৰ্গত বালিজানা আঞ্চলিক জনসেৱা সমিতিৰ কাৰ্যালয়ত যোৱা ৭ আগষ্টত দিনৰ ১১.০০ বজাৰ পৰা ২ বজালৈ Demonsatration on post Harvest Machinerics Under Assam Agribusiness and Rural Transformation Project (APART) হৰ্টিকালচাৰেল ৰিচাৰ্ছ ষ্টেচন কাঁহিকুছিৰ উদ্যোগত অনুষ্ঠিত হয়। প্ৰাপ্ত বাতৰি মতে জিলাখনৰ আগিয়া অঞ্চলৰ বিভিন্ন উদীয়মান যুৱক আৰু প্ৰকৃত খেতিয়ক ৰাইজক লৈ বিভিন্ন ধৰণৰ খেতিৰ মাধ্যম আৰু বৈজ্ঞানিক পদ্ধতিৰে খেতি কৰাৰ লগতে খাদ্য শস্য বৈজ্ঞানিক পদ্ধতিৰ দ্বাৰা কেনেদৰে সুন্দৰকৈ ৰাখিব পাৰি সেইবিষয়ে জনায়। লগতে খেতিয়ক ৰাইজৰ সুবিধাৰ্থে বিভিন্ন ধৰণৰ মেচিনাৰী সঁজুলিৰ প্ৰদৰ্শনীমূলকভাৱে অহি আৰ আৰ টিৰ ৰিচাৰ্ছ পাৰ্ছন কনিষ্ঠ অৰীপ বিষয়া ডাঃ কস্তুৰী গোস্বামীয়ে পৰ্যালোচনা কৰে। অনুষ্ঠানত ডাঃ কস্তুৰী গোস্বামীক সহযোগিতা আগবঢ়ায় এপাৰ্টৰ সদস্য ক্ৰমে প্ৰিয়ংকা দাস, দিবাকৰ মহোদি আৰু ভাস্কৰ বৰুৱাই। আনহাতে অনুষ্ঠানত অঞ্চলটোৰ পৰা ৪০ জন খেতিয়কে অংশগ্ৰহণ কৰে।

ভেল্লাত মেচিনেৰে কঠীয়া ৰোপণৰ ব্যৱস্থা

প্ৰথমটো কৃষি সা-সঁজুলিৰ ভাৰা কেন্দ্ৰ উদ্বোধন

শিমলুগুৰিঃ নিজা প্ৰতিবেদক, ২০ জুনঃ নাজিৰা মহকুমাৰ বহদৈস্থিত শিৱসাগৰ কৃষি বিজ্ঞান কেন্দ্ৰৰ উদ্যোগত গৌৰীসাগৰ উন্নয়ন খণ্ডৰ অন্তৰ্গত উজনি ভৰলুৱা গাঁৱত অলপতে কৃষি বিজ্ঞান কেন্দ্ৰৰ APART আঁচনিৰ অধীনত তথা অসম কৃষি বিশ্ববিদ্যালয়ৰ IRRI গৱেষণা প্ৰকল্পৰ সহযোগত এটি কৃষি সা-সঁজুলি ভাৰা কেন্দ্ৰ অঞ্চলটোৰ কৃষক ৰাইজৰ সুবিধাৰ্থে মুকলি কৰা হয়। এই কেন্দ্ৰটোৰ জৰিয়তে অঞ্চলটোৰ কৃষকসকলে ন্যূনতম মূল্যৰ বিনিময়ত কৃষিৰ সা-সঁজুলি ভাৰাত লৈ উন্নত পদ্ধতিৰে কৃষি কাৰ্য সম্পন্ন কৰিব পাৰিব। এই উপলক্ষে আয়োজিত এক চমু অনুষ্ঠানত আমগুৰি কৃষি উন্নয়ন খণ্ডৰ ভাৰপ্ৰাপ্ত মহকুমা কৃষি বিষয়া ক্ষীৰেশ্বৰ শইকীয়াই কেন্দ্ৰটোৰ শুভ উদ্বোধন কৰে। অনুষ্ঠানত শিৱসাগৰ কৃষি বিজ্ঞান কেন্দ্ৰ, ৰহদৈৰ মুৰব্বী বিষয়া তথা কৃষি বিজ্ঞানী ডঃ প্ৰদীপ সন্দিকৈয়ে কেন্দ্ৰটোৰ উদ্দেশ্য সম্পৰ্কে কৃষক ৰাইজক অৱগত কৰাৰ লগতে কৃষক ৰাইজক এই আঁচনিৰ সুবিধা গ্ৰহণ কৰিবলৈ আহ্বান জনায়। অনুষ্ঠানত জিলা কৃষি বিভাগৰ জ্যেষ্ঠ কৃষি উন্নয়ন বিষয়া উৎপল দত্ত, কৃষি বিজ্ঞান কেন্দ্ৰৰ বিজ্ঞানী ডঃ অৰুন্ধতী ৰৱদলৈ, প্ৰিয়ংকা দত্ত উপস্থিত থাকে। ইফালে, এই কাৰ্যসূচীৰ লগত সংগতি ৰাখি দুদিনীয়া কাৰ্যসূচীৰে কৃষি সঁজুলিৰ ব্যৱহাৰ আৰু দলিচা কঠীয়াতলী প্ৰস্তুতকৰণ পদ্ধতিৰ সম্পৰ্কে এক প্ৰশিক্ষণ কৰ্মশালা অনুষ্ঠিত হয়। কৃষি বিশ্ববিদ্যালয়ৰ IRRI গৱেষণা প্ৰকল্পৰ সৌৰজ্যোতি বৈশ্য, অংকিতা চাহ আৰু নিতেশ গুপ্তাই কৃষি সঁজুলিৰ ব্যৱহাৰ সম্পৰ্কে প্ৰশিক্ষণ আগবঢ়োৱাৰ লগতে শিৱসাগৰৰ APART আঁচনিৰ পঞ্চমী ৰৱদলৈ, বিজিত কোচ, বুবুল মহন আৰু সঞ্জু ৰৱৰাই দলিচা কঠীয়াতলী প্ৰস্তুতি সম্পৰ্কে প্ৰশিক্ষণ আগবঢ়াই আৰু দলিচা কঠীয়াতলী প্ৰদৰ্শন কৰে।


The Assam Tribune

PUBLISHED SIMULTANEOUSLY FROM GUWAHATI & DIBRUGARH

N-1127/57 TECH/GH – 103/2018-2020, VOL. 82, NO. 168

www.assamtribune.com

Flood-tolerant rice varieties demonstrated

CORRESPONDENT

MORIGAON, June 21: The Krishi Vigyan Kendra, Morigaon demonstrated flood-tolerant rice varieties in 158.26 hectares of land in Morigaon district under the Assam Project of Agribusiness and Rural Transformation (APART). A total of 5,815 kg of seeds of Ranjit Sub-1, Bahadur Sub-1, Swarna Sub-1 and Binadhan 11 varieties were distributed among farmers under the International Rice Research Institute (IRRI)-supported demonstration.

These varieties have the capacity to survive complete submergence for two weeks and are known as STRV (Stress Tolerant Rice Varieties). These varieties perform well under flash floods and KVK and IRRI have been trying to popularise these varieties and conducting demonstration since 2018.

Last year, a Custom Hiring Centre was inaugurated by KVK, Morigaon in Manaha Kachari Gaon under Mayong Block for land preparation, transplanting, weeding, harvesting and threshing by farmers of the district.

ifteen tractors were among farmer groups by unindra Sarma under ive Rural Development ve been distributed Bikash Sarma, the lations Officer was ervice

v's Rule

ople's Democratic has demanded with- and holding of early Ram Mushahary said foundation day tly at Bijni in Charang said that the meeting release of NDFB gan Daimary following respondent

chemes

tion of five rural on Saturday in West Legislative Assembly Ranoj Pegu. The nd urinal of Nemuten- f Anganwadi Kendra at re development of ment of drinking water

Rabha

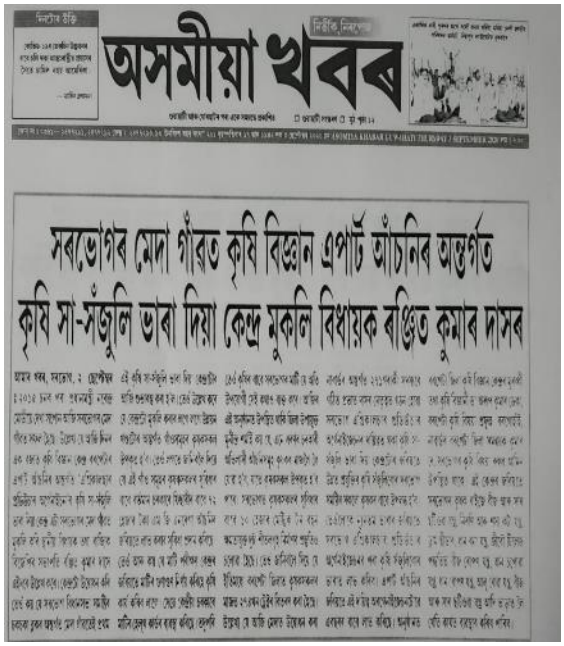
CORRESPONDENT

BARPETA, Jun death anniversary ru Bishnu Prasad observed across Ba trict on Saturday. lanjia Suraksha Bah and Barpeta distric tee of AASU con day-long program

The portrait of garlanded by Kris Das, president of t committee of the it was also the deaf sary of Purushottam of the cultural doy sam, tributes were to him. Wreaths we at the portrait of tam Das by Satye Das, secretary of t ta district committ lanjiya Suraksha Ba

Abinash Kumar, of Barpeta Anchal paid tribute to marty en lamps were lit in Ali Chowk by these tions as a mark of both the great soul

The district admi also observed Rab Songs of Bishnu R aired through louds DIPRO from 8 am Deputy Commissio indra Sarma garla portrait of Rabha an



সৰভোগৰ মেদা গাঁৱত কৃষি বিজ্ঞান এপার্ট আঁচনিৰ অন্তৰ্গত

কৃষি সা-সঁজুলি ভাৰা দিয়া কেন্দ্ৰ মুকলি বিধায়ক ৰঞ্জিত কুমাৰ দাসৰ

অসমীয়া প্রতিদিন

সৰভোগত কৃষি সা-সঁজুলি ভাড়া দিয়া কেন্দ্র উদ্বোধন

NEWS 24HRS

BINA Dhan 11 – A shining beacon of hope for flood-affected Assam farmers

যোৰহাটৰ প্ৰথমটো কাষ্টম হায়াৰিং চেণ্টাৰ উদ্‌ঘাটন

Customer Hiring Centre

MANGALDAI, Sept 11: Creating an opportunity for poor farmers who cannot afford modern technology-based agri-mechanized equipment or are yet to be covered by government schemes, a 'customer hiring centre' under the World Bank-aided programme Assam Agri Business and Rural Transformation (APART) and promoted by Krishi Vigyan Kendra (KVK), Darrang under Assam Agriculture University was launched at Bihudiya village near Kharupetia in Darrang district on Thursday. The centre to be run by local farmers group Annadata for a minimum of two years was launched by Darrang SP Amrit Bhuya. A brief meet was held where Dr Abdul Hafiz, head of KVK, Darrang; district agriculture officer (in-charge) Uddhab Chandra Deka, Dr Kanwar Singh and Bhaskarjyoti Mahanta of APART and BJP Darrang president Amarendra Sarma appealed to the farmers to avail this opportunity. – Correspondent

The Sentinel

of this land, for its people

Custom hiring centre inaugurated

লালুকৰ পুখুৰীপৰীয়াত কাষ্টম হায়াৰিং চেণ্টাৰ উদ্বোধন

Published on July 23, 2020 | News Source: অসমৰ বৰপত্ৰ পোৰ্টাল

লালুক, ২৩ জুলাই: লখিমপুৰ জিলাৰ লালুক পুখুৰীপৰীয়া গাওঁত আজি এটা কাষ্টম হায়াৰিং চেণ্টাৰ মুকলি কৰা হয়। অসম কৃষি বিশ্ববিদ্যালয়ৰ অধীনস্থ কৃষি বিজ্ঞান কেন্দ্ৰ লখিমপুৰৰ অসম কৃষি বাণিজ্যকৰণ আৰু গ্ৰাম্য কাণ্ডাৰৰ প্ৰকল্প(এপাৰ্ট) অধীনস্থ কেন্দ্ৰটো আজি উদ্ঘাটন কৰে লখিমপুৰ জিলাৰ উপাযুক্ত ডাঃ বীভীষণ বিয়ে।

লখিমপুৰ কৃষি বিজ্ঞান কেন্দ্ৰৰ আঁচনি সহযোগী যামিনী কুমাৰ দত্তই আগেকয়া উদ্যোগী অনুষ্ঠানত আগবঢ়ি ভাষণ প্ৰদান কৰে কৃষি বিজ্ঞান কেন্দ্ৰ লখিমপুৰৰ ডেকা বিজ্ঞানী তথা মুকলী ডাঃ ভবেশ চন্দ্ৰ ডেকাই উপস্থিত থাকে জিলা কৃষি বিষয়া প্ৰবীণ শইকীয়া আৰু আঞ্চলিক কৃষি গবেষণা কেন্দ্ৰৰ মুখ্য বিজ্ঞানী ডাঃ প্ৰবাল শইকীয়া।

কাষ্টম হায়াৰিং চেণ্টাৰৰ জৰিয়তে স্থানীয় কৃষকসকলে ধান বোৱা যন্ত্ৰ, ট্ৰাক্টৰ ডিগাৰ, সহজে কাটিহাই লৈ যুৱিব পৰা ধান কটা যন্ত্ৰ, বেটাৰী চালিত স্প্ৰে মেচিন,বন নিকচাঁৱা যন্ত্ৰ, আলু কটীয়া বোপন যন্ত্ৰ আদি উপলব্ধ থাকিব। লালুক পুখুৰীপৰীয়াৰ কাপাসী আন্তঃসহায়ক গোটক কেন্দ্ৰৰ পৰিচালনাৰ দায়িত্ব প্ৰদান কৰে।

আজিৰ উদ্বোধনী কাৰ্যসূচীত কৃষি বিজ্ঞানী লক্ষীকান্ত নাথ, জ্যোতিষ দাস, এপাৰ্টৰ প্ৰকল্প সহযোগী মৌচুমী দত্ত,সহযোগী প্ৰকল্প বিজ্ঞানী কাপশিখা গোস্বামী,গবেষণা কাৰিকৰী দুলভি বৰা আৰু আন্তঃৰাষ্ট্ৰীয় ধান গবেষণা কেন্দ্ৰৰ গবেষণা

Custom Hiring Centre inaugurated at Kharupetia

Superintendent of Police of Darrang Amrit Bhuyan inaugurating the Custom Hiring Centre at Kharupetia on Thursday. (Sentinel)

OUR CORRESPONDENT

MANGALDAI, Sept 10: With a view to provide agricultural equipment to the rural farmers on hire at a very minimum rent, the Krishi Vigyan Kendra (KVK), Darrang inaugurated a "Custom Hiring Centre (CHC)" at Annadata Organic Agriculture Farm at village Bihudia at Kharupetia in Darrang district on Thursday.

The locality of Kharupetia has already earned the reputation of being the vegetable hub of Assam. Superintendent of Police of Darrang, Amrit Bhuyan ceremonially inaugurated the CHC and dedicated it to the rural farmers of the district. "The CHC will be beneficial for the farmers which will enable them to hire agricultural equipment like tractor, thrashers, paddy transplanters, reapers and other hand-operated equipment easily. The farmers of Kharupetia area are known for their dedication in agriculture, adopting the scientific methods and I hope that the progressive farmers will also be able to double their contribution to agriculture in the State," said the Superintendent of Police.

Earlier, Head of KVK, Darrang Dr. A Hafiz accorded a hearty welcome to the guests and the farmers in presence of the president of Darrang district committee of BJP, Amarendra Sarma, Programme Coordinator of APART, BJ Mahanta, and a number of dignitaries.

Annexure - III: News in different Visual Media

Sl. No	Location	Topic	Month	Name of Media	Photo
1	Sivasagar	3 Days Training on Post Harvest Technology	September 11, 2020	Assam Today	
2	Dhubri	QSP training	July 14, 2020	Assam Focus	
3	Dhubri	QSP Training	July 16, 2020	Assam Today	
4	Dhubri	Awareness meet	July 29, 2020	Assam Focus	
5	Dhubri	3 Days Training on Post Harvest Technology	September 24, 2020	Assam First	
6	Dhubri	Three-day training	September 28, 2020	Assam First	

7	Dhubri	Training on Rice Value Chain	September 29, 2020	Assam First	
8	Nagaon	Seed Production by FPC with the support from IRRI	September	Krishi darshan , DDK	
9	Kamrup	STRVs in Assam	June	Krishi darshan , DDK	
10	Kamrup	Seed treatment	June	Krishi darshan , DDK	
11	Darrang	CHC inauguration	September	News Live	
12	Lakhimpur	CHC inauguration	July, 24, 2020	DD News	

Annexure - IV: Success Stories

BINA Dhan 11 – A shining beacon of hope for flood-affected Assam farmers

Dr Sudhanshu Singh & Dr Kanwar Singh

In Assam, rice is cultivated over an area of 18 lakh ha during the *Sali* season. Flood is a regular phenomenon that Assam farmers have to face every year. At least two to three waves of the flood are common during the monsoon months, causing huge loss to the lives of people, property, and crops. Most of the farmers start raising their nurseries of *Sali* paddy in the last week of May and continue till the 1st week of July. The farmers generally use their saved paddy seed of long-duration varieties such as Ranjit, Bahadur, etc., for growing their nurseries.

This year, although 30 districts out of 33 were affected by floods, images developed by GIS and remote sensing team of the International Rice Research Institute (IRRI) show that some of the districts were heavily flooded in June and July with two successive massive flood events. The districts Barpeta, Bongaigaon, Cachar, Charaideo, Darrang, Dhubri, Dhimaji, Dibrugarh, Goalpara, Morigaon, Nalbari, Sivasagar, and Sonitpur, received major floods in the second and third waves in the season.

It is worth mentioning that the GIS and remote sensing team of the IRRI under the Assam Agri-Business and Rural Transformation Project (APART) have extracted the flood inundation maps in real-time, to assess the flood-affected areas, and to help the beleaguered farmers. The Sentinel-1 Synthetic Aperture Radar (SAR) images were used to delineate the areas inundated due to floods from May to July 2020. SAR data have the advantage of cloud penetration, as the entire monsoon season has heavy cloud cover over Assam.

The occurrence of severe floods during June and July have devastated most of the nurseries raised by the farmers in the early vegetative stage, and also damaged the transplanted seedlings in the main field during the current *Sali* season. When the flood receded, the paddy growing season was near to completion. Most of the farmers had already used their saved seed for growing nursery. If somehow they could manage seed, it was of long duration varieties, which may not match the remaining season duration. Under such critical circumstances, a short-

duration rice variety grown by direct seeding method could serve the purpose well for the rice fields devasted by recent floods. In the direct seeding method, seeds are sown directly in the main field without growing a nursery that lessens the duration of the crop by a few days.

IRRI under APART had introduced a flood-tolerant short duration (120-125 days) variety, BINA Dhan 11, which has already proved a big success in Assam during the last year. Moreover, the project is also promoting wet-direct seeding through drum seeder as an alternative resource-efficient crop establishment option to manual transplanting for rice. Both these technologies can be jointly promoted as a contingency strategy to compensate farmers' loss.

In some areas, raising community nursery of BINA Dhan 11and distributing the young seedlings (15-20 days) to farmers may be one of the possible alternatives. The seed from their previously grown *Boro* season BINA Dhan 11 can be used or may be purchased from private suppliers.

Field can't be kept barren! It must be productive! These techniques will help farmers manage the current season production, and secure food for their families. It will also help to alleviate the adverse impact of the flood on rice production of the State in the future.

Success Stories (2)

Assam women showcase climate-resilient technology to tackle Disang river floods

By Dr. Kanwar Singh & Jyoti Bikash Nath

Assam, a northeastern state of India, faces a challenge due to change in climate, leading to huge crop losses in the field. The Disang River overflows every year, affecting more than 50,000 people across seven districts. The Mahomora village, in particular, witnessed the devastating flood almost annually.

As the Disang River floods pose challenges to agriculture and income in Assam, there is a pressing need to disseminate knowledge and technology on appropriate climate-resilient agriculture and to bring institutional innovations to cope with climate variability. The International Rice Research Institute (IRRI), as a technical partner of the World Bank funded Assam Agribusiness and Rural Transformation Project (APART), has introduced Stress Tolerant Rice varieties (STRVs) that can withstand submergence up to two weeks.

An effective and fast approach to reach farmers for technology transfer is through targeting women farmer groups who have a major role in decision-making relative to income-generating activities by their families. Women group members interact regularly and help ensure access to immediate finance facilities that can supplement household income.

Voluntary organizations (VO) formed by Assam State Rural Livelihood Mission, are one of the most significant and vibrant women group types in Assam. Abhijatri VO, formed in April 2018, is an association of 16 Self Help Groups (SHG) consisting of 189 women members of Mahomora Development Block of Sivasagar district of Assam.

Abhijatri VO is managed by an Executive Committee formed by elected members from each SHG. Mrs. Ronju Gogoi and Sagarika Gogoi are President and Secretary, respectively, of the VO. The VO, developed by leadership and managerial capacity by virtue of their experience, has the financial capacity to invest in group enterprise and has good working relationships with local government departments. The members are very keen on experimenting with new technologies and need-based interventions.

How to make a change? How to save their livelihood? These are the points of discussion among the women during their meeting. Agriculture, as a male-dominated sector, experiences low participation levels of women in decision-making, particularly in selecting the paddy variety.

Traditionally, women support their family in the paddy field in transplanting, weeding and harvesting. The responsibility of selling the produce and procuring the inputs always lies with men. However, as women aimed to be involved in the conversation, their out-of-the-box ideas on rice cultivation to increase group income impressed their family members.

First, the group decided to experiment with STRVs in their village. Considering their zeal and experience in paddy cultivation, Krishi Vigyan Kendra, Sivasagar with the technical support of IRRI under APART approved a cluster demonstration of 5 ha area of a STRV Swarna-Sub1 and ensured all the necessary inputs and technical support. The site selected by the women group for paddy cultivation is rainfed lowland where flash flood or submergence is a common phenomenon that affects crop growth leading to severe yield losses.

Some of the interested group members individually tried the Swarna-Sub1 in their fields too, and around 10 bighas of land were cultivated by the VOs in the group. As usual, this year water from the Disang River flooded their field, but fortunately, it was not so devastating and receded after two days. When asked about the present status of the crop, the president smiled and said that crop growth is very good except for some biotic stresses in their field that can be managed. The submergence was only for three days which did not make any difference to the crop. The paddy field is now at the vegetative stage with very effective tillering in each hill, bringing hope for bumper yield.

A single demonstration with 189 women has made a strong bonding between their families. They are now motivated and trained. They have developed overwhelming self-confidence and strong determination that will for sure lead to imitation of climate-resilient technology among farmers in a faster way in the district.

Annexure – V: Success stories published in APART newsletter Krishi Rupantar

http://arias.in/newsletter.html

POLICY BRIEF: CREATING SUSTAINABLE VALUE CHAINS FOR TRANSFORMING FOOD SYSTEMS

The COVID-19 pandemic is disrupting food value chains across South Asia. It is now recognized that food systems are at the nexus of food security, nutritional health, ecosystems, climate change, and rural prosperity. With countries in South Asia closing down their economies almost overnight to fight this pandemic, the strains are showing in agriculture, farming communities, and entire food supply chains.Policy makers need to take urgent measures to avoid hunger and economic ruin. However, the action taken cannot be to reinstate business-as-usual given the unprecedented impact of this global crisis. Transformation of food systems in order to deliver nutritious and sustainable diets for all will be imperative, especially when incomes across the region are likely to fall over the next year. In his timely policy brief, IRRI Regional Representative for South Asia Nafees Meah synthesizes outputs from an expert panel discussion on "Creating Sustainable Value Chains for Transforming Food Systems". This was conducted last February 2020 with specialists in the fields of agriculture, nutrition, environment, research and development, and policy deliberating on how to achieve food systems transformation in India and South Asia sooner rather than later.

KRISHI RUPANTAR

ASSAM AGRIBUSINESS AND RURAL TRANSFORMATION PROJECT (APART) E-NEWSLETTER

CAPACITY BUILDING PROGRAM ON IMPROVED POSTHARVEST TECHNOLOGIES

Conventional practices of postharvest activities cause some losses; farmers may not be aware of different improved Post Harvest (PH) technologies. Besides, labour problems are a major issue for which mechanization seems to be the only solution. Moreover, PH storage of seed and grains is another concern all over India. Hence, a series of Training of Trainers (ToTs) in collaboration with AAU and DoA, Govt of Assam were conducted to create master trainers on these technologies for broader dissemination across the state.

A 3-day training program on 'Strengthening of Postharvest Management' was organized by KVK Nagaon on February 21-23, 2020. Dr Niranjan Deka Head, KVK Nagaon while inaugurating the program stated that improved postharvest technologies are very much important nowadays for a better quality of paddy. A total of 26 participants (14 females and 12 males) were present during the program which included progressive farmers and extension functionaries. Present scenario of agricultural practices in Assam, and how it could be improved was explained.

Participants of the ToT programme

ASSAM AGRIBUSINESS AND RURAL TRANSFORMATION PROJECT (APART)

KRISHI RUPANTAR

- APART monthly e-newsletter

ISSUE 13 May 2020

SUCCESS THROUGH HARD WORK AND DETERMINATION

Dr.Gerd Müller, Federal Minister for Economic Development, Germany visiting the paddy field of Ramu Medhi

In 2018, KVK had organized an awareness meeting among the farmers on the submergence-tolerant rice varieties that had been introduced in the state, especially for the flood-affected areas like theirs. Ramu met the scientists from Krishi Vigyan Kendra (KVK), Morigaon and expressed his interest to be a part of the awareness training programme that was organized under APART. Team from the International Rice Research Institute (IRRI) undertook the training as resource persons and explained about the three newly introduced flood-tolerant varieties viz., Ranjit-Sub1, Bahadur-Sub1 and Swarna-Sub1 that possessed the special quality of survival under complete submergence up to 14 days. The KVK also selected the farmers to take part in demonstrations attracted him towards these varieties. With his renewed interest, the KVK on his request provided 30 kg of the seed of Bahadur-Sub1 variety to two of his uncles to grow in their fields. He decided to closely monitor the growth of the paddy in the fields to see the performance of this new variety. During the crop growth stages, they faced few problems related to pests and diseases, which were timely monitored and managed by preventive measures suggested by IRRI and KVK personnel, which helped boosting his confidence. During harvesting, he was amazed to see that the variety gave a yield of 15.5mon/bigha(46.5q/ha) at his uncle's field, whereas the traditional varieties yielded 9 mon/bigha(27 q/ha).

Assam Agribusiness and Rural Transformation Project

Scaling of mechanisation to cope with the labour scarcity

In the ongoing Sali season, 2020, Krishi Vigyan Kendra, Morigaon has demonstrated flood-tolerant rice varieties in 158.3ha land in Morigaon district under "Assam Agribusiness and Rural Transformation Project (APART)". For the purpose, a total of 5815kg certified seed of Ranjit-Sub 1, Bahadur-Sub 1, Swarna-Sub 1 and BINA Dhan 11 varieties were distributed among the farmers under IRRI (International Rice Research Institute) supported climate-resilient, market-led production demonstrations. These stress-tolerant rice varieties (STRVs) have the capacity of surviving complete water submergence for two weeks.

Activities in the field scaling of Mechanisation to cope with the labour scarcity

The performance of these STRVs since their introduction through APART demonstrations in 2018 has started to create an impact in the lives of Assam farmers, owing to their ability of survival under flash-flood condition. Therefore, KVK Morigaon in collaboration with IRRI is trying to popularize these varieties among farmers of Morigaon district. Besides the improved STRVs, IRRI along with KVK is also promoting mechanization in paddy cultivation among the farming community of the district, to meet the labour demand during peak scarcity period of agricultural operations. Different alternate crop establishment techniques like Mechanically Transplanted Rice (MTPR) and Direct Seeded Rice (DSR) using Mechanical Transplanter and Drum Seeder, respectively have been introduced in the district. Many other types of machinery for inter cultural operations, harvesting, threshing and other post harvest machinery have also been introduced under the APART.

Mechanically transplanting of rice has many advantages over traditional methods of transplanting, and most significantly time and labour saving. Last year, a Custom Hiring Centre (CHC) with a Farmer Producer Company (FPC) named "Poohar Agro Producer Company" was inaugurated with the technical support of Krishi Vigyan Kendra, Morigaon and IRRI in Manaha Kacharigaon under Mayong

REAPER: A GAME-CHANGER FOR HARVESTING PADDY IN CACHAR

Harvesting is an important phase and the farming community in Assam practice manual harvesting using a sickle, which is time-consuming and labour intensive. It takes around 28-30 labours to harvest 1 hectare of paddy land, with high drudgery and cost for those who need to harvest large fields in a limited period. Labour shortage is a major challenge during the peak harvesting time. To overcome these challenges in harvesting, the use of mechanized machines was considered as a good option. Taking forward the introduction of mechanized machines, paddy reaper was introduced in 9 districts of Assam including Cachar.

In the first year of the implementation under APART, Krishi Vigyan Kendra (KVK) Cachar with technical support from IRRI, organized the demonstration of harvesting with reaper to the farmers. The demonstration of the machine was quite effective and motivating, Abu Bakkar Barbhuiya of Barik Nagar (Part II), Cachar came forward to procure a reaper with an investment of INR 1, 75,000, in November 2019.

MINI TRACK-TYPE COMBINE HARVESTER: A NEW HOPE FOR ASSAM FARMERS

In Assam, during the harvesting period of Boro and Ahu rice, farmers have to face the incessant pre-monsoon rains. In the Sali season too due to heavy rainfall, harvesting gets delayed leading to over-maturity of crops, causing heavy shattering losses that eventually decreases the quality and quantity of the yield. The shortage of labour for harvesting also comes as an additional challenge for the farmers.

Mini combinne harvester in the field

To address this problem, mini track-type combine harvesters have been introduced in Assam under the Assam Agri-business and Rural Transformation Project (APART) in Kamrup and Jorhat districts by Assam Agricultural University (AAU) with technical support from the International Rice Research Institute (IRRI). The major advantages of the Mini combine harvester are:

- The machine has a provision of a track-type wheel system, to facilitate easy operation in a wet field condition, where a full feed combine harvester is unable to operate.
- By using this type of combine harvester, farmers get a full-length straw, like in the manual harvesting, which gives additional monetary support to farmers.
- The half feed threshing system in this harvester has two additional benefits:
  - Less impact force on the grains results in <1% broken grains in threshed paddy (In full feed combine harvesters, it generally varies between 10-12% of broken grains).
  - The straw is smooth and easy for chewing for the cattle.
- The machine has provision for harvesting, threshing, and cleaning paddy, wheat and barley.

A demonstration of the mini combine harvester was organized at village Nizhardia, Hajo, Kamrup involving 30 farmers, where Dr Kanwar Singh and Mr Jyoti Bikash Nath of IRRI explained the features and benefits of the newly introduced combine harvester to the farmers. Unlike the big combine harvester, the mini combine harvester can harvest crops on small plots (less than 1 ha), as it can take turn easily in small fields. During the demonstration, the paddy field had 2 feet of standing water where generally the farmers use boats to haul their paddy stalk. Farmers got motivated when the machine harvested the paddy in the standing water. During the demonstration, it took around 45 to 60 minutes to harvest 1 acre of land (Average 15 minutes per bigha). Fortunately, a big combine harvester was also operating near the demonstration site, which helped the farmers compare the features of both the harvesters. The farmers noticed that the mini size combine harvester is best suited for their fields, as it can be moved easily in small fields too.

Demonstration program on Combine harvester by KV Kamrup

Dr D. N Kalita, Head, KVK Kamrup expressed his satisfaction and explained to the farmers that the trackwheel and small size of this combine harvester suited the requirement of small/ marginal farmers of Assam.

Mr Gautam Deka, a farmer from Nizhardia, Hajo said, "During Boro season we have to harvest paddy by rowing a boat. Every year, we used to hire a big size combine harvester is brought to our village from West Bengal to harvest the paddy. But the challenge is that the harvester can't provide us full-length paddy straw which is required for our cattle. This season, I harvested 3.5 bighas of paddy using the mini combine harvester. We could get the paddy straw in the desired size and also experienced that it harvested one bigha of paddy in 15 minutes. We are happy to see that the mini combine harvester performs all the operations i.e. harvesting, threshing and cleaning at one go, and we expect such a machine to operate in our field every season!!"

Annexure – VI : Success stories published in APART newsletter Rice Value Chain

http://arias.in/newsletter.html

RICE VALUE CHAIN

QUARTERLY NEWSLETTER

ASSAM AGRIBUSINESS AND RURAL TRANSFORMATION PROJECT (APART) 4th Edition March 2020

ADOPTION OF NEW TECHNOLOGY BRINGS SMILES TO MS. PURNIMA OF RAHA, NAGAON

Ms Purnima Deka (40 years old) of Jungal Balahu gaon, Raha, Nagaon, is a progressive women farmer associated with KVK, Nagaon for past few years. In 2019, she opted to cultivate the Sali paddy variety Ranjit-Sub1 through direct seeding with the help of a seed-cum-fertilizer drill.

She was very happy to know that this method of rice establishment requires less time and is cost-effective as it cuts the cost of nursery raising, uprooting and transplanting of seedlings as compared to the traditional method of rice cultivation.

THE DSR TECHNOLOGY

The field was thoroughly ploughed 4 to 5 times followed by harrowing to obtain a fine seedbed. A day before sowing, 9 kg of MoP and 12 qt of FYM per bigha was applied in the field. Leveling and planking were done on the same day. Seeds were sown in the field @ 5 kg per bigha along with DAP 6 kg per bigha through the seed-cum-fertilizer drill. The seeds were sown in rows at 25 cm apart at 1.5 cm depth. Pre-emergence herbicide Pretilachlor with safener was sprayed. The first dose of urea (5.7 kg/bigha) was top-dressed 15 days after sowing (DAS). Likewise, the second and third top-dressing of urea (6 kg/bigha) were done after the first weeding and second weeding respectively. Pest and disease management was done as and when required.

The team from APART and IRRI were in constant contact with Ms Purnima and provided all necessary guidance, whenever required. Since the technology was very new to her, she was not sure about the result and most of the fellow farmers told that in DSR the weed infestation is more, as a result, she may fail to get sufficient yield from her plot. During the crop period, many farmers from her village and nearby villages visited her field to know about the performance of the newly introduced technology and

its impact on the overall yield of the crop.

She was very happy with the harvest, as she was able to harvest around 9 quintals of paddy per bigha against 7.5 quintals per bigha in last season from the same plot. It was quite a higher yield, and she decided to take forward the technology to the next season. *"It's a good learning for me. I have experienced the new technology and its advantages over the traditional method of cultivation. I am very much happy that I got the chance to experiment this method of rice growing and also introducing a new time- and cost-saving technology which will be an example for my fellow farmers. I am satisfied with the performance and result of this new technology, and I am interested to purchase a seed-cum-fertilizer drill machine in days to come. I would like to thank APART, KVK Nagaon and IRRI officials for their continuous support, encouragement and regular monitoring"* she said.

AAU AND IRRI CONDUCT CONTENT WRITESHOP FOR ASSAM RICE KNOWLEDGE BANK FOR DEVELOPING FACTSHEETS AND RICE PRODUCTION MANUAL

The year 2020 began with a Content Writeshop for the Assam Rice Knowledge Bank under Assam Agribusiness and Rural Transformation Project (APART), at Assam Agricultural University from Jan 06 to 08, 2020 with the technical support from International Rice Research Institute (IRRI). . The Write shop was aimed to localize the factsheets, Mechanical Transplanting Manual, Spray Techniques Manual and the Rice Production Manual with the input from scientists of Assam Agricultural University and Department of Agriculture, Govt. of Assam.

During the inaugural session, Ms Poornima Ravi Shankar, Lead Specialist - Knowledge Management and Outreach, IRRI gave a detailed presentation on the update of the Assam Rice Knowledge Bank development. Dr Kanwar Singh, Resident Consultant – APART and Senior Associate Scientist, in his speech, mentioned the importance of factsheets and the product manual. He also described the accomplishments and outcomes of the previous Assam Rice Knowledge Bank workshop. Dr Mrinal Saikia, Associate Director (Research), AAU underlined the importance of developing factsheets in the local language to minimize the gap between the farmers and the agricultural researchers and scientists. Dr Gopesh Tiwari, Head, IRRI Education ISARC also graced the occasion.

Dr Ashok Bhattacharya, Director of Research, Assam Agricultural University, stressed the need for organising such workshop on regular intervals for the capacity building of the scientists and the farmers. He also urged the scientists to reap the benefit of the Rice Knowledge Bank. It would be pertinent to mention here that the Package of Practices of different crops developed by Assam Agricultural University, with the inclusion of relevant IRRI input was launched on the second day of the Content Writeshop.

Forty participants from various organisations including IRRI, Assam Agricultural University and Department of Agriculture, Govt. of Assam attended the Content Writeshop. Participants worked on their projects to localize the factsheets and Rice Production Manual. Fifty factsheets were also translated on the same day. Attending the 2nd-day Content Write shop, Dr Arvind Kumar, Director, ISARC, IRRI expressed his satisfaction on the outcome of the workshop and hoped that the factsheets and the Rice Production Manual would help the farmer fraternity of Assam with easy access to knowledge.

BINA DHAN 11 PERFORMS WELL IN POST-FLOOD SITUATION

The occurrence of the flood is a common and regular feature in Assam, leading to human misery and devastation in agriculture. Flood disrupts the cropping season and reduces the cropping intensity of the state. One of the priority concerns in the agriculture sector of Assam is to strategize a policy to combat the regular flood. During July 2019, the devastating flood completely damaged the paddy fields in Barpeta district. The flash-flood completely washed away not only the paddy fields of Borbila village in Keotkuchi block of Barpeta district but also shattered the hopes and livelihood options of the farmers. Farmers were clueless where to go, or more particularly what to do for their survival. The project staff of APART at Krishi Vigyan Kendra under Assam Agricultural University, where International Rice Research Institute is the technical partner, was around the farmers throughout the year for providing the best technical options. They assured them to arrange a meeting with the AAU scientists for finding out the possible way to cope up with the situation. The farmers also realized that whatever compensations they would be getting from Govt. would not be sufficient for meeting their household requirements. Therefore, there was no other option but to grow short-duration paddy variety in the same field after flood recession, so that they don't lose the next cropping season. The meeting was fixed with the Director of Extension Education (DEE), Assam Agricultural University, and the criticality of the situation was analyzed. The DEE asked Krishi Vigyan Kendra, Barpeta to intervene and advised growing community nursery with a short-duration high yielding variety. The KVK team to expedite the directions quickly drew an action plan with the involvement of local people.

Community Nursery for Bina Dhan

every time with beneficiaries and non-beneficiaries across seasons considered altogether. Every survey will mandatorily include a "Basic Impact Assessment Module" to be repeated every time covering all sample respondents. The basic module essentially captures the development of all major outcome and impact indicators. This is planned to be followed with shorter "component-specific modules" limited to specific surveys and beneficiaries. Data collection will be made through the Enketo web version of Computer Assisted Personnel Interview (CAPI) based software called "Kobotoolbox".

A 5-day training of 35 enumerators including Project Scientist, Assistant Project Scientist and IRRI staff, who would be directly involved in ground-level data collection for the same, was organised at Horticultural Research Station, Kahilkuchi Guwahati on 25th to 29th February 2020. The training involved elaborate discussion, mock testing and piloting of questionnaire in the field with farmers. The first survey in the sequential set has been planned to start in the second week of March 2020 and expected to complete by May 2020.

It is expected that the results from this survey will help in demonstrating the impact of the project to the stakeholders, and also to learn the effectiveness of the agricultural research and extension process.

Training of enumerators for monitoring and evaluation

Annexure VII: Pre and Post Evaluation questionnaire

Annexure VII: Pre-and post-evaluation questionnaire

Objective – I : Pre-evaluation questionnaire (QSP trainings)

Venue: _____ Date: _____

Name: _____ Designation: _____

Do you currently carry out seed production activity in your paddy land?
Yes/No

Below given are a set of 12 questions related to quality seed production with 4 responses specified for each question. Please put a tick mark (√) against your chosen answer to give your response (Each question carries one mark)

Q1. Quality seed alone can contribute up to ------ % of yield enhancement	5-20 %	1-4%	20-25 %	Negligible contribution
Q2. What is quality seed?	It is genetically pure (No off-type, No other variety mixture)	It is physically pure (Clean, No adulteration, No other external elements etc.)	It has minimum 80% germination	All of these
Q3. What are seed cleaning methods	Manual sorting	Winnowing	Using urea and salt solution	All of these
Q4. What is the next progeny of certified seed?	Foundation seed	Nucleus seed	Breeder seed	None
Q5. Farmer should consult with which organization for certified seed production?	Assam State Seed Certification Agency	Assam Seeds Corporation Private Limited	Assam Agriculture University	All of these
Q6. What is the major difference between seed and grain?	Seed have genetic purity	Desired moisture content for storage is less in seed than grain	Seed physical purity is higher than grain	All of these

Q7. A variety needs to be discouraged for recommendation after---- years of its notification	10	5	15	20
Q8. What steps are involved in quality seed production?	Proper isolation distance	Rogueing at appropriate stages of crop growth	Use of standard package of practices	All of these
Q 9. What is minimum isolation distance for a good quality seed production of inbred rice varieties	1m	2m	3m	4m
Q10. Off-types/ rogues can be	Plants of the same variety with abnormal phenology	Plants of different variety of the same species	Plants of different species	All of these
Q11. For storage of more than one year, the quality seed should be dried to a moisture content of …..	<9 %	13 %	14 %	16 %
Q12. Which of the following are seed tests?	Genetic and physical purity test	Seed moisture and germination test	Seed viability test	All of these

Post-evaluation questionnaire (QSP trainings)

Venue: _____ Date:

Name: _____ Designation:

Below given are a set of 12 questions related to quality seed production with 4 responses specified for each question. Please put a tick mark (√) against your chosen answer to give your response (Each question carries one mark)

Q1. Quality seed alone can contribute up to ------ % of yield enhancement	5-20 %	1-4%	20-25 %	Negligible contribution
Q2. What is quality seed?	It is genetically pure (No off-type, NO other variety)	It is physically pure (Clean, No adulteration, No	It has minimum 80% germination	All of these

		other external elements etc.)		
Q3. Seed cleaning methods are …….	Manual sorting	Winnowing	Using urea and salt solution	All of these
Q4. What is the nest progeny of certified seed?	Foundation seed	Nucleus seed	Breeder seed	None
Q5. Farmer should consult with which organization for certified seed production?	Assam State Seed Certification Agency	Assam Seeds Corporation Private Limited	Assam Agriculture University	All of the above
Q6. What is the major difference between seed and grain?	Seed have genetic purity	Desired moisture content for storage is less in seed than grain	Seed physical purity is higher than grain	All of these
Q7. A variety needs to be discouraged for recommendation after---- years of its notification	10	5	15	20
Q8. What steps are involved in quality seed production?	Proper isolation distance	Rogueing at appropriate stages of crop growth	Use of standard package of practices	All of the above
Q 9. Minimum isolation distance for a good quality seed production of inbred rice varieties	1m	2m	3m	4m
Q10. Rogues/off-types can be	Plants of the same variety with abnormal phenology	Plants of different variety of the same species	Plants of different species	All of the above
Q11. For storage of more than one year, the quality seed should be dried to a moisture content of …..	<9 %	13 %	14 %	16 %
Q12. Which of the following are seed tests?	Genetic and physical purity test	Seed moisture and germination test	Seed viability test	All of these

Objective – II: Pre-evaluation questionnaire on DSR, MTR & IWM

Venue: Date:

Name of trainee: _____

Please put tick (✓) mark on the correct answers Total time: 15 minutes

Sr.	Question	Answer options		
1	What is ideal row spacing for direct seeding of rice?	10-15cm	20-25cm	35-40cm
2	What is the suitable time of sowing under direct seeding of rice in Sali season in Assam?	25 May-20 June	1 May to 25 May	25 June to 25 July
3	What is the seeding depth of rice under direct seeded rice?	4-5cm	2-3cm	6-7cm
4	What is the seed rate under direct seeding of rice with use of seed drill?	5-8kg/acre	12-16kg/acre	25-35kg/acre
5	In dry DSR	Avoid urea as basal dose	Avoid pre-soaked seeds for sowing	Avoid urea as basal dose & avoid pre-soaked seeds
6	What is required for mechanical transplanting	Flat-bed manual nursery	Raised-bed manual nursery	Mat-type nursery
7	How much area is required for raising mat nursery bed for transplanting of one-acre field?	100 m^2	50 m^2	30 m^2
8	What should be the ideal age for seedlings for machine transplanting?	14-18 days	21-30 days	31-40 days
9	Which chemical is used for seed treatment?	Bavistin	Pretilachlor	Bispyribac-sodium
10	How much standing water is required for machine transplanting?	1-2 cm	2-3 cm	3-5 cm
11	In general, how many rows are there in riding type transplanter?	8	10	16
12	Which part of the transplanter helps in maintaining straight rows while transplanting?	Planting marker	Clutch	Lever
13	When should phosphatic fertilizer be applied?	Panicle initiation	Active tillering	Basal/ at the time of filed preparation
14	What do weeds compete with crops for?	Space on field bunds	Water, oxygen, light,	Water, nutrients, and light
15	Which is not an appropriate nozzle for herbicides?	Flat fan	Flood jet	Hollow cones
16	When should you apply a pre-emergence herbicide?	After weeds are in the field	Before you irrigate	About 0-3 days after the crop is sown/transplanted
17	What is pre-emergence herbicide?	Herbicide applied before crop emergence	Herbicide applied after crop emergence	Herbicide applied after weed emergence
18	What is post-emergence herbicide?	Herbicide applied before crop emergence	Herbicide applied after crop emergence	Herbicide applied before weed emergence

19	How much overlap in spray swath should there be with a multiple spray boom?	30%	100%	50%
20	Which is NOT a principle of integrated weed management?	Cultural control	Use herbicides each time you plant	Mechanical method

Post-evaluation questionnaire on DSR, MTR & IWM

Venue: Date:

Name of trainee: _____

Please put tick (✓) mark on the correct answers Total time: 15 minutes

Sr.	Question	Answer options		
1	What is ideal row spacing for direct seeding of rice?	10-15cm	20-25cm	35-40cm
2	What is the suitable time of sowing under direct seeding of rice in kharif season?	25May-20June	1 May to 25 May	25 June to 25 July
3	Seeding depth of rice under direct seeded rice	4-5cm	2-3cm	6-7cm
4	What is the seed rate under direct seeding of rice with use of seed drill?	5-8kg/acre	12-16kg/acre	25-35kg/acre
5	In dry DSR	Avoid urea as basal dose	Avoid pre-soaked seeds for sowing	Avoid urea as basal and avoid pre-soaked seeds
6	What is required for mechanical transplanting	Flat-bed manual nursery	Raised-bed manual nursery	Mat-type nursery
7	How much area is required for raising mat nursery bed for transplanting of one-acre field?	100 m^2	50 m^2	30 m^2
8	What should be the ideal age for seedlings to be transplanted?	14-18 days	21-30 days	31-40 days
9	Which chemical is used for seed treatment?	Bavistin	Pretilachlor	Bispyribac Sodium
10	How much standing water is required for machine transplanting?	1-2 cm	2-3 cm	3-5 cm
11	In general, how many rows are there in riding type transplanter?	8	10	16
12	Which part of the transplanter helps in maintaining straight rows while transplanting?	Planting marker	Clutch	Lever
13	When should phosphatic fertilizer be applied?	Panicle initiation	Active tillering	Basal/ at the time of filed preparation
14	What do weeds compete with crops for?	Space on field bunds	Water, oxygen, light,	Water, nutrients, and light
15	Which is not an appropriate nozzle for herbicides?	Flat fan	Flood jet	Hollow cones
16	When should you apply a pre-emergent herbicide?	After weeds are in the field	Before you irrigate	About 0-3 days after the crop is sown
17	What is pre-emergence herbicide?	Herbicide applied before crop emergence	Herbicide applied after crop emergence	Herbicide applied after weed emergence

18	What is post-emergence herbicide?	Herbicide applied before crop emergence	Herbicide applied after crop emergence	Herbicide applied before weed emergence
19	How much overlap in spray swath should there by with a multiple spray boom?	30%	100%	50%
20	Which is NOT a principle of integrated weed management?	Cultural control	Use herbicides each time you plant	Mechanical method

Objective – III:

Pre-Evaluation Question (PHM)

Venue: _____ **Date:** _____

Name: _____

Designation: _____

1) **Machines used for harvesting paddy:** ধান চপাবলৈ ব্যবহাৰ কৰা মেচিন কোনটো ?
   a) **Thresher** c) **Reaper**
   b) **Rice Mill** d) **Seed drill**
2) **Moisture content for harvesting at proper time:**
   (শস্য চপোৱাৰ সময়ত ধানত থাকিব লগীয়া আৰ্দ্ৰতাৰ পৰিমাণ কিমান ?)
   a) **22-25%** c) **10-12%**
   b) **30-32%** d) **12-14 %**
3) **To maintain the quality during drying the rate should be ____% moisture reduced per hour**
   (বীজ শুকোৱাবলৈ আৰু তাৰ গুণাগুণ ঠিকে ৰাখিবলৈ আৰ্দ্ৰতাৰ পৰিমাণ প্ৰতি ঘণ্টাত কিমান কমিব লাগে ?)
   a) **2-3%** c) **0.5-1%**
   b) **> 3%** d) **1-2%**
1) **Ideal temperature range in °C for pest growth during storage is:**
   (বীজ সংৰক্ষণৰ সময়ত কিমান উষনতাত কীট পতংগৰ বৃদ্ধি বেছি হয় ?)
   a) **5 – 10** c) **25 – 50**
   b) **10 – 20** d) **20 – 40**
2) **Average Rice yield in Assam:**
   (অসমত ধান উৎপাদন গড়ে প্ৰতি হেক্টৰত কিমান ?)
   a) **5 ton** c) **Less than 1 ton**
   b) **More than 6 ton** d) **2-3 ton**
1) **What is the speed of operation for reaper in field?**
   (বিপাৰ এখন পথাৰত কিমান বেগত চলাব পাৰি ?)
   a) **2 km/hr** c) **6-7 km/hr**
   b) **5 km/hr** d) **1 km/hr**
7) **Ideal RPM of Axial flow thresher (tractor operated):**
   (এক্সিয়েল ফ্লু থ্ৰেছাৰ এখনৰ আৰ পি এম কিমান ?)
   a) **550-600 RPM** c) **900 RPM**
   b) **1000 RPM** d) **400 RPM**
8) **Which one of the following is not a Post-Harvest machine?**
   (তলৰ কোনটো ধান কটাৰ পিছৰ প্ৰযুক্তি নহয় ?)
   a) **Solar bubble dryer** c) **Open drum thresher**
   b) **Drum seeder** d) **Reaper**
9) **Type of roller used in modern rice mill for better milled rice:**
   (আধুনিক ধান বনা মেচিনত কি ধৰণৰ লগোৱা হয় ?)
   a) **Steel** c) **Iron**
   b) **Rubber** d) **Plastic**
10) **Proper moisture content of paddy to store for 6-12 months for seed:**
   (৬-১২ মাহলৈ শস্য সংৰক্ষনৰ বাবে ধানত আৰ্দ্ৰতা কিমান থাকিব লাগে ?)
   a) **9-12%** c) **> 14%**
   b) **13-14%** d) **5-7%**

Post-Evaluation Question (PHM)

Venue: _____ **Date:** _____

Name: _____

Designation: _____

1) Machines used for harvesting paddy: ধান চপাবলৈ ব্যবহাৰ কৰা মেচিন কোনটো ?
   a) Thresher
   b) Rice Mill
   c) Reaper
   d) Seed drill
2) Moisture content for harvesting at proper time:
   (শস্য চপোৱাৰ সময়ত ধানত থাকিব লগীয়া আৰ্দ্ৰতাৰ পৰিমাণ কিমান ?)
   e) 22-25%
   f) 30-32%
   g) 10-12%
   h) 12-14 %
3) To maintain the quality during drying the rate should be ____% moisture reduced per hour
   (বীজ শুকোৱাবলৈ আৰু তাৰ গুণাগুণ ঠিকে ৰাখিবলৈ আৰ্দ্ৰতাৰ পৰিমাণ প্ৰতি ঘণ্টাত কিমান কমিব লাগে ?)
   e) 2-3%
   f) > 3%
   g) 0.5-1%
   h) 1-2%
4) Ideal temperature range in °C for pest growth during storage is:
   (বীজ সংৰক্ষণৰ সময়ত কিমান উষ্ণতাত কীট পতংগৰ বৃদ্ধি বেছি হয় ?)
   e) 5 – 10
   f) 10 – 20
   g) 25 – 50
   h) 20 – 40
5) Average Rice yield in Assam:
   (অসমত ধান উৎপাদন গড়ে প্ৰতি হেক্টৰত কিমান ?)
   e) 5 ton
   f) More than 6 ton
   g) Less than 1 ton
   h) 2-3 ton
6) What is the speed of operation for reaper in field?
   (বিপাৰ এখন পথাৰত কিমান বেগত চলাব পাৰি ?)
   e) 2 km/hr
   f) 5 km/hr
   g) 6-7 km/hr
   h) 1 km/hr
7) Ideal RPM of Axial flow thresher (tractor operated):
   (এক্সিয়েল ফ্লু থ্ৰেছাৰ এখনৰ আৰ পি এম কিমান ?)
   e) 550-600 RPM
   f) 1000 RPM
   g) 900 RPM
   h) 400 RPM
8) Which one of the following is not a Post-Harvest machine?
   (তলৰ কোনটো ধান কটাৰ পিছৰ প্ৰযুক্তি নহয় ?)
   e) Solar bubble dryer
   f) Drum seeder
   g) Open drum thresher
   h) Reaper
9) Type of roller used in modern rice mill for better milled rice:
   (আধুনিক ধান বনা মেচিনত কি ধৰণৰ লগোৱা হয় ?)
   e) Steel
   f) Rubber
   g) Iron
   h) Plastic
10) Proper moisture content of paddy to store for 6-12 months for seed:
   (৬-১২ মাহলৈ শস্য সংৰক্ষণৰ বাবে ধানত আৰ্দ্ৰতা কিমান থাকিব লাগে ?)
   e) 9-12%
   f) 13-14%
   g) > 14%
   h) 5-7%

Feedback form

1) Was the training helpful to you

a. Excellent ( ) b. Good ( ) c. Satisfactory ( ) d. Not satisfactory ( )

2) What type of machine did you learn in this training?

_____

3) Which machine's live demonstration did you see during today's program

_____

4) Which machine do you like the most (mention only 2 machines' name)

_____

5) Was the technology helpful to you?

Yes ( ) No ( ) Don't know ( )

6) If yes, do you want to buy the machine?

Yes ( ) No ( ) Don't know ( )

7) Do you want to run a business by buying this machine

Yes ( ) No ( ) Don't know ( )

8) The time allotted for the training was sufficient

Excellent ( ) Good ( ) Satisfactory ( ) Not satisfactory ( )

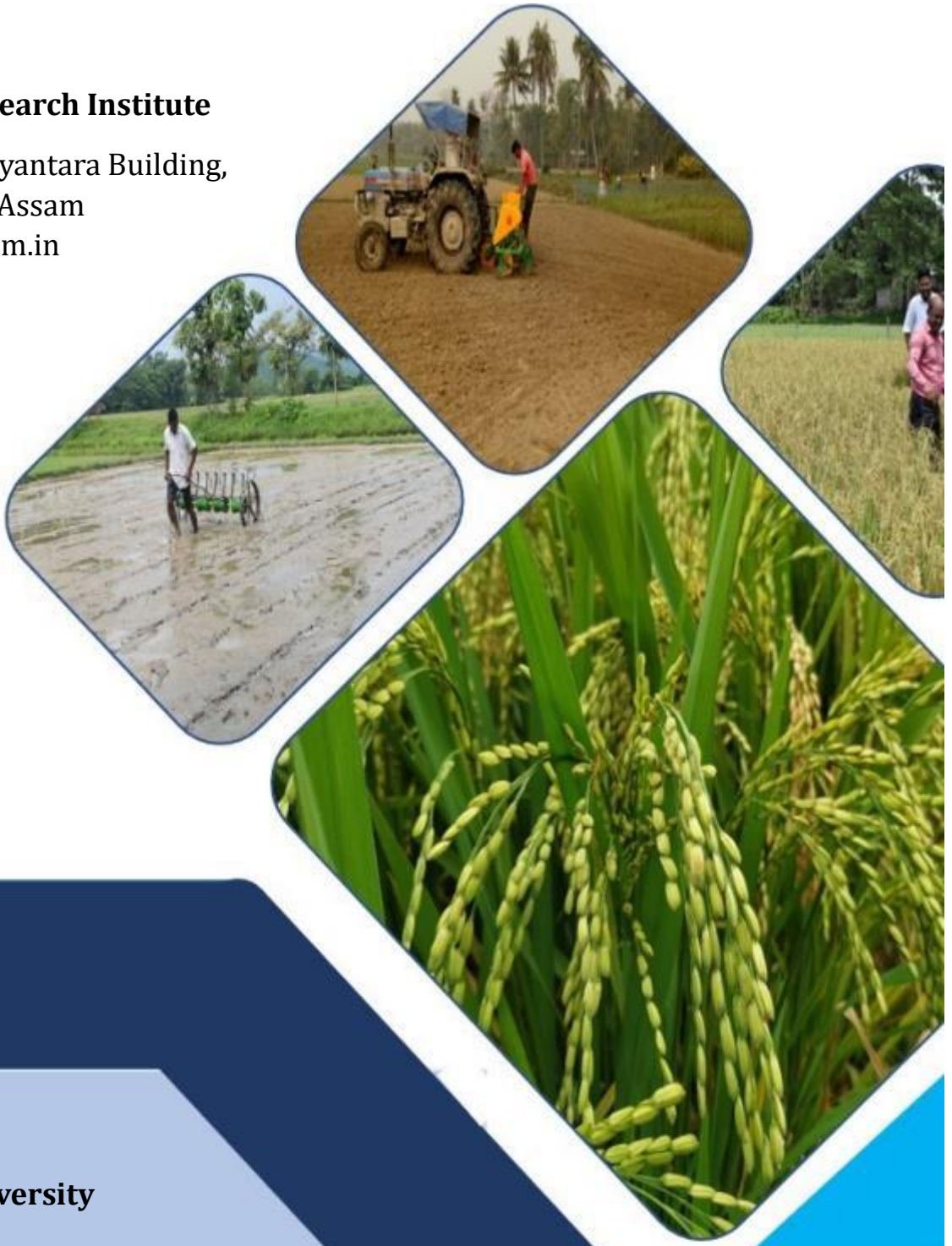
9) The training will be helpful for your own work

Excellent ( ) Good ( ) Satisfactory( ) Not satisfactory( )

10) Please provide us with your feedback so we can continue to improve (Additional comments)

International Rice Research Institute

5th Floor, SIPC Office, Nayantara Building,
Six Mile, Guwahati - 22, Assam
Email: contact@rkbassam.in



2019
2020

Contact

Assam Agricultural University
Jorhat, Assam

Directorate of Agriculture,
Khanapara, Guwahati, Assam

ARIAS Society
GOVERNMENT OF ASSAM
Assam Rural Infrastructure and Agricultural Services Society

ASSAM AGRICULTURAL UNIVERSITY

অসম চৰকাৰ
GOVERNMENT OF ASSAM

IRRI