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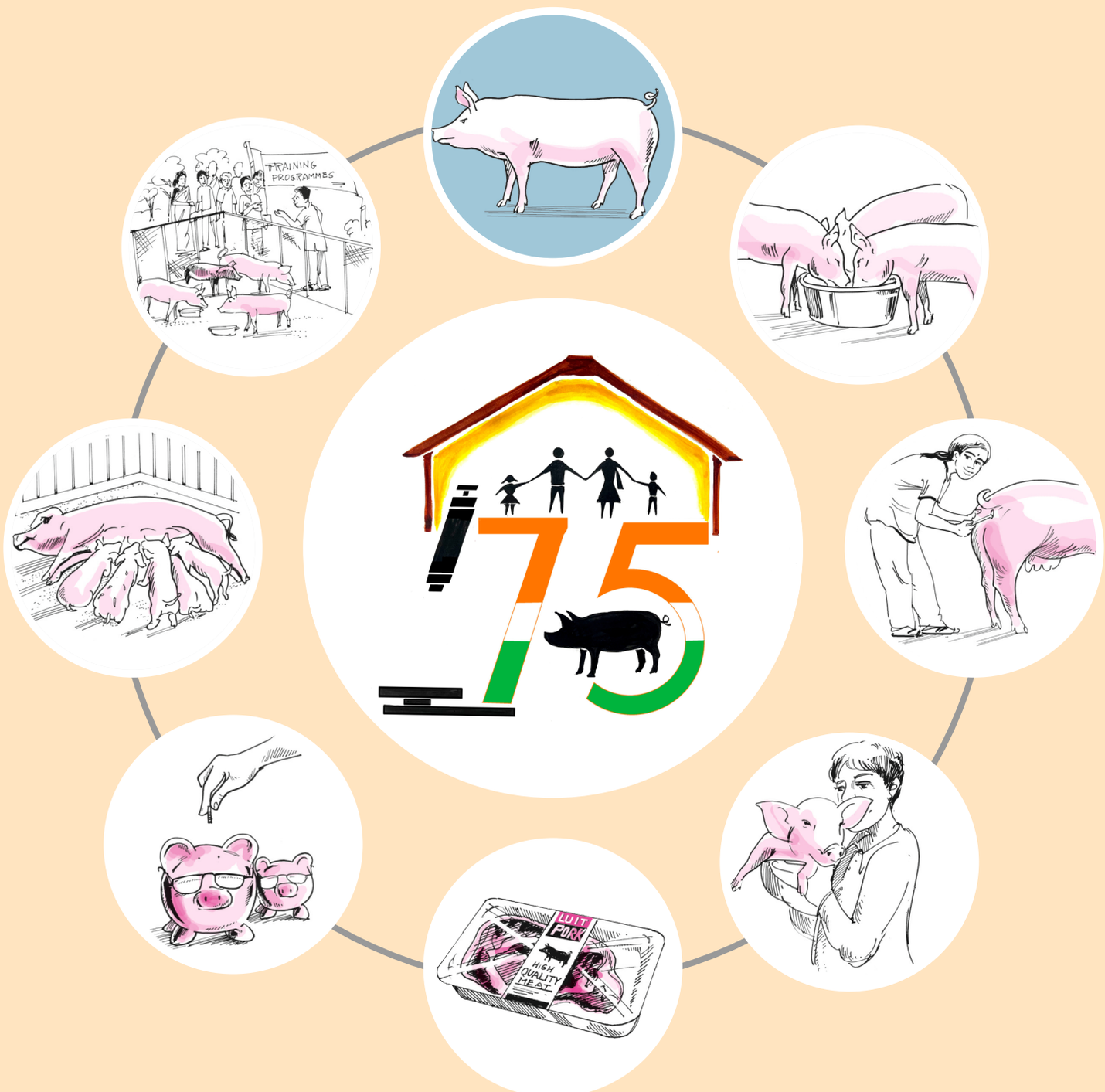
वार्षिक प्रतिवेदन
2021



ICAR-NATIONAL RESEARCH CENTRE ON PIG
Rani, Guwahati-781 131, Assam

भा.कृ.अनु.प.-राष्ट्रीय शूकर अनुसंधान केन्द्र
राणी, गुवाहाटी-781 131, असम

भाकृअनुप
ICAR

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राष्ट्रीय सुकर अनुसन्धान केन्द्र
NATIONAL RESEARCH CENTRE ON PIG
RANI GUWAHATI ASSAM

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Cover page theme
The graphic depicts the Institute's constant endeavor towards contributing to the upliftment of the piggery sector in the country and its relevance towards ensuring sustainable livelihood, nutritional secutity and income generation for the marginalized farmers on the occasion of 75 years of independence. It also depicts the efforts taken by the institute towards promoting the research activities in the areas of scientific pig production, reproduction, nutrition, health management, clean pork production, value addition of pork and capacity building activities in the country.

Cover page illustration by : Jishnu K. J.

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Message from The Director

Pigs are domesticated in various parts of India, especially in South-Central and North Eastern Region, each place has its own locally adapted pig breed, and most households raise at least one or two pigs each year. Although the long tradition of pork consumption in India includes variation across different times, places and social relations, the smallholder model of raising pigs as part of diverse crop and livestock agro-ecosystems, coupled with only occasional meat eating, defines much of the country's pig and pork history. The 21st century agricultural and dietary changes however represent radical departures from the small holder production system and consolidation of industry is clearly visible in the last two decades. It should be noted that the industrialization of pig production is a relatively recent phenomenon globally. In India, too, the speed and scale of change has been phenomenal, conditioned by policies, investments and the transforming economic system.

Pig rearing fits in very well with mixed farming and can also be complimentary to intensive crop production operations. In India pig farming has a special significance as it can play an important role in improving the socio-economic status of a sizeable section of the weaker rural community. With the adoption of improved pig rearing practices under rural conditions, there will be significant increase in the income of some of the poorest people in the country who traditionally rear pigs. Pigs could provide direct and indirect employment to the people, the direct cash returns by sale of live pigs and pork, and the indirect returns in terms of manure and fuel. Scientific piggery could not only contribute towards piling-up of quality animal protein at affordable prices in India but also could help in achieving multiplying the income of farmers in short periods. In entrepreneurship point of view pig farming requires smaller investment and gives quick as well as high return.

Major issues concerned with slow pace of growth in the Indian piggery sector are reduced availability of quality breeding germplasm, poor growth rate of the indigenous breeds, lack of sound breeding programs, increase incidence of diseases, lack of post-harvest infrastructure, lack of structured marketing channel etc. Thus, it is very much essential to undertake coordinated piggery development programs along with stakeholders to ensure nutrition and livelihood security to millions of people in the country.

During the last 19 years, ICAR-National research Centre on Pig is relentlessly working with the vision to bring in excellence in pig production, health and product processing through innovative research in order to provide technology backstopping for quality germplasm, enhanced pork production, employment generation and poverty reduction among socially and economically weaker sections through medium of pig husbandry. The Institute is coordinating 15 All India Coordinated Research Project on Pig and 06 Megaseed centres on pig, located in different parts of the country. Krishi Vigyan Kendra (KVK) of the institute is actively been engaged in conducting several programmes for extension personnel of line departments, entrepreneurs and farmers in different aspect of animal science, crop science, farm mechanization, fishery, home science, horticulture, plant protection, and soil and water conservation through training, OFTs and FLDs.

On human resource development front, the scientists and administrative staffs of the Institute were awarded/ honoured in various platforms. I wish to express my sincere thanks and gratitude for the constant support and encouragement received from Dr. Trilochan Mohapatra, Hon'ble Secretary, DARE & Director General, ICAR and Dr.B.N. Tripathi, Deputy Director General (Animal Sciences). I am thankful to Dr. V. K. Saxena, ADG (AP&B), Dr. A.K. Tyagi, ADG (ANP), Dr. Ashok Kumar, Assistant Director General (Animal Health) and other staff of Animal Science Division, ICAR, Krishi Bhawan, New Delhi for their continuous support in facilitating the activities at Head Quarter.

It will be unfair not to put on record the untiring effort of the scientists and other staff of the Institute. Their hard work and dedication have been duly reflected in this report. I congratulate the entire team of the Editorial board for bringing out this report as per the schedule.

It is my privilege to present you the salient achievements of the Institute in the form of annual report 2021 for your perusal and critical comments. The report will serve as a reference to those in the field of scientific pig production and pork processing.

(Vivek Kumar Gutpa)

कार्यकारी सारांश

भा.कृ.अनु.प.–राष्ट्रीय शूकर अनुसंधान केंद्र ने सफलतापूर्वक अपनी स्थापना के १९ साल पूरे किए हैं और शूकरपालन व्यवसाय तथा शूकर–मांस प्रसंस्करण उद्योग से जुड़े किसानों, प्रसार कर्मियों, नीति निर्माताओं में अपनी उत्कृष्टता बनाए रखी है । संस्थान ने अपनी स्थापना के समय से ही देश में वैज्ञानिक शूकर उत्पादन और शूकर माँस प्रसंस्करण को लोकप्रिय बनाने के साथ–साथ अपनी संबद्धता इकाइयों, कृषि विज्ञान केंद्र (केवीके), शूकर पर अखिल भारतीय समन्वित अनुसंधान परियोजना के पंद्रह केंद्रों तथा शूकर पर वृहत बीज परियोजना के छह केंद्र के साथ सम्पूर्ण भारत में शूकर पालन के सर्वांगीण विकास के लिए गंभीर प्रयास कर रहा है। वर्ष २०२१ के दौरान, संस्थान ने २० वैज्ञानिकों, ०६ तकनीकी कर्मचारियों और ०६ प्रशासनिक और लेखा कर्मियों के साथ कार्य किया। वित्तीय वर्ष के दौरान योजना गत और गैर–योजना गत बजट के अंतर्गत कुल आवंटन २३५४.४६ लाख था। संस्थान ने इस अवधि में ७२.३६ लाख रुपये राजस्व के रूप में अर्जित किया है। संस्थान के वैज्ञानिकों ने संस्थान के अधिदेश के अनुसार छह प्रमुख कार्यक्रमों के तहत परिभाषित अनुसंधान और प्रसार से संबंधित विभिन्न लक्ष्यों को प्राप्त करने के लिए अथक प्रयास किया।

शूकरों का संरक्षण और आनुवंशिक सुधार

भा.कृ.अनु.प.–राष्ट्रीय शूकर अनुसंधान केंद्र द्वारा हैम्पशायर (नर) और घुंघरू (मादा) शूकरों के उपयोग से विकसित उन्नत संकर नस्ल के शूकर 'रानी' ने संस्थान के फार्म में इंटर–से मेटिंग की आठवीं पीढ़ी पूरी कर ली है। पीढ़ी–वार आनुवंशिक प्रदर्शन को दर्ज किया गया और उसका मूल्यांकन किया गया। विकसित संकर किस्म के नस्ल लक्षणों को कई पीढ़ियों के लगातार क्रॉसब्रीडिंग के लिए स्थिर किया गया था। देशी शूकर की नस्लें अर्थात घुंघरू, अगोंडा गोवा, डूम और नियांग मेघा को आईएसएजी–एफएओ द्वारा अनुशंसित माइक्रोसेटेलाइट मार्करों द्वारा चिह्नित करने के लिए लक्षित किया गया था। प्रत्येक मार्कर के लिए शूकरों के जीनोटाइपिंग के लिए मल्टीप्लेक्स पीसीआर को मानकीकृत किया जा रहा है। शूकरों में प्रजनन गुणों के लिए प्रभावी मार्कर की पहचान के लिए संबंधित जीन में बहुरूपता की पहचान की गई। यह देखा गया कि इन्फ्रारेड थर्मोग्राफी का उपयोग गिल्ट तथा मादा शूकर में गर्मी की पहचान करने के लिए प्रभावी ढंग से किया जा सकता है । शूकर वाई गुणसूत्र के नर–विशिष्ट क्षेत्र की एक व्यापक कार्यात्मक रूपरेखा सुअर वाई गुणसूत्र की कार्यात्मक रूपरेखा को स्पष्ट करने के लिए की गई थी।

शूकर फार्म प्रबंधन प्रथाओं में सुधार

देसी और संकर शूकर के एथोग्राम विकास और कल्याण मूल्यांकन किया गया । घुंघरू, राणी और यॉर्कशायर शूकर का लगातार २४ घंटे तक का व्यवहार रिकॉर्ड किया गया। संगठित शूकर उत्पादन में जल पदचिह्न का आकलन किया। शूकर उत्पादन में चारा और बिजली पर वाटर फुट प्रिंट क्रमश: ५००.०६ और २०.६ होने का अनुमान लगाया गया था। शूकरों में वृद्धि के विभिन्न चरणों में आंत माइक्रोबायोम का आकलन करने, मौखिक एंटीबायोटिक दवाओं के साथ आंत माइक्रोबियल मॉड्यूलेशन को समझने और पोषक आहार का प्रभाव आंत प्रतिरक्षा का अध्ययन करने के प्रयास किए गए थे।

लाभदायक शूकर उत्पादन हेतु पोषण संबंधी हस्तक्षेप

सब्जी अपशिष्ट/फल अपशिष्ट आधारित शूकर आहार का विकास किया गया। यॉर्कशायर शूकर के आहार में मक्के के चारे का स्तर बढ़ने से आंत माइक्रोबायोटा में फाइबर डिग्रेडिंग बैक्टीरिया मुख्य रूप से फाइब्रोबैक्टर सक्किनोजेन्स की संख्या में वृद्धि होती है जो शूकरों की फ़ीड दक्षता बढ़ाने के लिए बहुत महत्वपूर्ण है। शूकरों में हरे मक्के के साइलेज से फाइबर के विभिन्न स्तरों का उपयोग करके इन विट्रो डीएम पाचनशक्ति का अध्ययन किया गया है। ८, १० और १२% फाइबर युक्त आहार के लिए इन विट्रो डीएम पाचनशक्ति क्रमशः ६६.४९, ६४.८३ और ६३.६०% पाई गई। पतली परत क्रोमैटोग्राफी का उपयोग करके एफ्लाटॉक्सिन आकलन के लिए प्रक्रिया को अनुकूलित किया गया है।

शूकर की शारीरिक क्रिया दक्षता में सुधार

शूकरों में उत्पादन तथा अनुकूलन लक्षणों से संबंधित २०३०० जीनों को शामिल करके एक जीन अभिव्यक्ति माइक्रोएरे को कस्टम डिज़ाइन शूकरों की जांच के लिए किया गया था। हीट शॉक सिग्नलिंग से संबंधित भावी ाळठछ–ी की पहचान की गई। क्बऋ–१ प्रोटीन पर इम्यूनोफ्लोरेसेंट अध्ययन से पता चलता है कि हीट शॉक प्रतिक्रिया के नियमन में ीील–ाळठ–१९३र–३ि की भूमिका है। प्रारंभिक प्रजनन मार्करों के विकास के लिए विभेदित रूप से व्यक्त जीन का विश्लेषण यह दर्शाता है कि उच्च प्रजनन क्षमता को बढ़ावा देने में घ्राण संकेतन, लाइसोसोमल कॉम्प्लेक्स के गठन और सेलुलर सिग्नलिंग से संबंधित ट्रांस्क्रिप्ट महत्वपूर्ण भूमिका अदा करतें हैं । शूकरों में डिम्बग्रंथि की भूमिका को विनियमित करने वाले इम्युनोजेनिक और एंजियोजेनिक वृद्धि कारकों की विशेषता का अध्ययन किया गया। क्रिसपर/कैश९ जीनोम एडिटिंग सिस्टम को पोर्सिन नॉक आउट ल्यूटियल और ग्रेन्युलोसा कोशिका को कल्चर सिस्टम की स्थापना के लिए अनुकूलित किया गया था ताकि मादा शूकर में ओवेरियन फिजियोलॉजी को विनियमित करने वाले तएऋऋ–, –ठ और ऋऊड जीन से जुड़े सिग्नलिंग पाथवे के कार्यात्मक सत्यापन हो सके ।

शूकरों की प्रजनन क्षमता में सुधार

तरल और जमे हुए अवस्था में विभिन्न योजकों का उपयोग करके शूकर वीर्य के संरक्षण पर अध्ययन से पता चला है कि झिल्ली स्टेबलाइजर, ट्रेहलोज के साथ लैक्टोस एग यॉक एक्सटेंडर (एलईवाई), ने अन्य संयोजनों की तुलना में ५ डिग्री सेल्सियस से ७२ घंटे तक भंडारण के दौरान शुक्राणु की उच्च गुणवत्ता बनाए रखी। शूकर पालकों और संगठित फार्म में शूकरों में कृत्रिम गर्भाधान के लिए कुल १९३४ तरल शूकर वीर्य खुराक का उत्पादन और आपूर्ति की गई। इसके अलावा, ९ (ई)–ऑक्टाडेसेनोइक एसिड (एलैडिक एसिड) को शूकरों में फेरोमोनल यौगिक के रूप में पहचाना गया और जैव–उत्तेजना उद्देश्य के लिए नाक स्प्रे या मलहम या जेल के रूप में इस्तेमाल किया जा सकता है।

शूकर रोग की निगरानी और पहचान

पीआरआरएसवी के भारतीय आइसोलेट के सभी तीन (एन, एम और जीपी५) जीन एक ही चरण में एक साथ प्रवर्धित करने हेतु एक मल्टीप्लेक्स पीसीआर पद्धति विकसित की गई है । पोर्सिन सर्कोवायरस टाइप २ के एक भारतीय आइसोलेट्स से कैप्सिड प्रोटीन बनाने वाले जीन (४८३ बीपी) को पीटीजेड ५७/आर प्रोकैरियोटिक क्लोनिंग वेक्टर में प्रवर्धित और क्लोन किया गया। कॉलोनी पीसीआर और अनुक्रमण द्वारा सकारात्मक क्लोन की पुष्टि की गई थी। यह देखा गया कि पोर्सिन सीडी१६३ होस्ट रिसेप्टर के एक्सॉन ७ पोर्सिन रेस्पिरेटरी एंड रिप्रोडक्टिव सिंड्रोम वायरस के ग्लाइकोप्रोटीन ४ (ऋऋ४) के साथ इंटरैक्ट कर सकता है। आम के पत्तों से उत्पादित कोलाइडल सिल्वर नैनोपार्टिकल्स (–सछझी) का उपयोग करके शूकर मांस में स्टैफिलोकोकस ऑरियस का तेजी से पता लगाने के लिए एक पार्श्व प्रवाह परख विकसित की गई । झउत२ख इंडियन आइसोलेट के कैप्सिड सीक्वेंस (जठऋर) को बैकोलोवायरस एक्सप्रेशन सिस्टम के लिए संश्लेषित और अनुकूलित किया गया था और संबंधित प्रतिबंध साइट और प्राइमर अनुक्रम को जोड़कर

५'शपव और ३'शपव पर संशोधित किया गया था। असम के विभिन्न जिलों में एएसएफ की व्यापकता के लिए प्रारंभिक सर्वेक्षण किए गए हैं। मवेशियों में उपयोग के लिए वाणिज्यिक एफएमडी वैक्सीन का टीका लगाने के प्रतिक्रिया से शूकरों में विशिष्ट सुरक्षात्मक एंटीबॉडी का आकलन करने के लिए, शूकरों में टीकाकरण के लिए एक कार्यक्रम तैयार किया गया है। मल के नमूनों को मिलाकर इनके विश्लेषण से संकेत मिलता है कि नवजात शूकरों में कोक्सीडायोसिस अधिक आम था, लेकिन कभी-कभी उत्पादक और फिनिशर शूकर भी प्रभावित होते थे।

शूकर मांस का प्रसंस्करण और मूल्यवर्धन

पोर्क और पोर्क उत्पादों में चयनित एफएसएसएआई सूचीबद्ध खाद्य जनित रोगजनकों की घटना को रोकने के लिए प्रसंस्करण की स्थिति को अनुकूलित किया। बायोफिल्म निर्माण का निषेध, कोरम सेंसिंग गतिविधि और एवरोह कारंबोला क्रूड अर्क के खिलाफ येर्सिनिया एंटरोकॉलिटिका के आणविक डॉकिंग अध्ययन का अध्ययन किया गया है। एवरोआ कैरम्बोला क्रूड एक्सट्रेक्ट की १००० माइक्रोग्राम/एमएल पर अधिकतम प्रभावकारिता थी जहां इसने ६२.७२% बायोफिल्म निर्माण को बाधित किया, हालांकि ५० माइक्रोग्राम/एमएल बायोफिल्म के ५८.९९% निषेध की दक्षता देखी गई थी। साल्मोनेला टाइफिमुरिम के व्यवहार का विभिन्न पीएच और तापमान पर मूल्यांकन किया गया। एस टाइफिम्यूरियम को एसिड संवेदनशील पाया गया और समय के साथ एक रैखिक माध्य कमी देखी गई। नींबू का रस तीनों उपचारों में से सबसे प्रभावी था और २४ घंटे के भीतर लॉग ३.८ की कमी देखी गई। किण्वित बांस की टहनी नींबू और स्टार फलों के रस की तुलना में कम प्रभावी थी। शेल्फ स्टेबल पोर्क उत्पादों जैसे कि पोर्क के साथ लाई, पोर्क के साथ तिल, पोर्क विंदालू, किण्वित बांस शूट एवं सूखी मिर्च के साथ पोर्क के प्रसंस्करण के लिए फॉर्मूलेशन और प्रसंस्करण चरणों को रिटॉर्ट तकनीक का उपयोग कर अनुकूलित किया गया था। गुणवत्ता नियंत्रण प्रयोगशाला की स्थापना की गई और खड/खएउ १७०२५:२०१७ प्रत्यायन प्राप्त किया।

प्रसार शिक्षा

असम के ३६० छोटे पैमाने के शूकर उत्पादकों का एक डेटा बेस तैयार किया गया था ताकि उनके ज्ञान और वैज्ञानिक सुअर उत्पादन प्रथाओं को अपनाने का आकलन किया जा सके । इस उद्देश्य के लिए एक ज्ञान परीक्षण और ग्राह्य क्षमता का सूचकांक विकसित किया गया । परिणाम से यह पता चला कि गोद लिए गए गांवों के किसानों द्वारा वैज्ञानिक शूकर उत्पादन प्रथाओं का ज्ञान और अपनाने की जानकारी गैर-दत्तक गांवों के किसानों की तुलना में काफी अधिक थी। असम में पोर्क मार्केटिंग शृंखला का आकलन करने के लिए, असम के ५ जिलों के ८३५ शूकर उत्पादकों, २५० पोर्क उपभोक्ताओं, ५० विक्रेताओं, २५ व्यापारियों / बिचौलियों और ६ प्रोसेसर का डेटा बेस तैयार किया गया था। डेटा से, ८ अलग-अलग पोर्क मार्केटिंग चेन की पहचान की गई। बैकयार्ड शूकर पालन में आदिवासी महिलाओं की भागीदारी का आकलन किया गया और एनएएसएफ परियोजना के तहत आवश्यकता आधारित क्षमता निर्माण कार्यक्रम आयोजित किए गए। आदिवासी महिलाओं के क्षमता विकास के लिए कामरूप जिले के रंगिया के बरमुरा गांव में २५ चयनित महिलाओं के लिए एक शूकर पालक फील्ड स्कूल की स्थापना की गई थी।

कंप्यूटर अनुप्रयोग और आईटी

जानवरों के साथ सीधे संपर्क से बचने और विकास के आकलन के लिए जनशक्ति की कमी से निपटने के लिए डिजिटल इमेज-आधारित एल्गोरिदम एक प्रभावी समाधान है। इमेज प्रोसेसिंग तकनीक का उपयोग कर शूकर के विकास दर का अनुमान के लिए अनुसंधान कार्य शुरू किया गया।

शूकर पर अखिल भारतीय समन्वित अनुसंधान परियोजना तथा वृहत बीज परियोजना

संस्थान ने परिषद के परामर्श और समीक्षा बैठक का आयोजन कर अखिल भारतीय समन्वित अनुसंधान परियोजना (१५ केंद्र) और वृहत बीज परियोजना (०६ केंद्र) की तकनीकी और वित्तीय निगरानी जारी रखी। वर्चुअल प्लेटफॉर्म के माध्यम से १६ फरवरी, २०२१ को शूकर पर अखिल भारतीय समन्वित अनुसंधान परियोजना और शूकर पर वृहत बीज परियोजना की वार्षिक समीक्षा बैठक आयोजित की गई । विभिन्न कृषि जलवायु परिस्थितियों में शूकरों के प्रदर्शन का अध्ययन करने, गुणवत्ता वाले जर्मप्लाज्म सहित प्रथाओं के क्षेत्र-विशिष्ट पैकेज को विकसित करने और स्वदेशी जर्मप्लाज्म के संरक्षण के लिए देश भर के विभिन्न केंद्रों में एआईसीआरपी परियोजना जारी है। शूकर पर वृहत बीज परियोजना के तहत, २०२१ के दौरान कुल ३८८९ उन्नत किस्म के शूकर का उत्पादन किया गया और हितधारकों को वितरित किया गया।

अनुसूचित जाति एवं जनजाति उप योजना

अनुसूचित जनजाति उप योजना के तहत २०२१ के दौरान कुल २२ शूकर स्वास्थ्य और जागरूकता शिविर सह इनपुट सामग्री वितरण कार्यक्रम आयोजित किया गया था। असम के कामरूप, नलबाड़ी, बक्सा, उदलगुरी और गोलपारा जिले के विभिन्न गांवों के २६१२ आदिवासी लाभार्थियों के बीच कुल ३४२४०१ किलोग्राम शूकर चारा वितरित किया गया। इसके अलावा, ६८ आदिवासी युवाओं और किसानों को लाभान्वित करने के लिए ०४ प्रशिक्षण आयोजित किए गए। अनुसूचित जाति उप योजना के तहत बेहतर गुणवत्ता वाले संकर शूकर के साथ-साथ शूकर चारे और दवाओं के साथ ५०० किसानों को आवश्यक जैव सुरक्षा सामग्री और पूरक आहार वितरित किए गए।

एबीआई और आईटीएमयू

संस्थान की संस्थान प्रौद्योगिकी प्रबंधन इकाई ने ३ प्रौद्योगिकियों को विकसित किए तथा इन प्रौद्योगिकियों के व्यावसायीकरण और हस्तांतरण के साथ-साथ परामर्श, अनुबंध अनुसंधान और अनुबंध सेवाओं जैसी विभिन्न सेवाओं के लिए विभिन्न उद्यमियों, स्टालधारकों और संगठनों के साथ तेरह समझौता ज्ञापनों पर हस्ताक्षर किए। संस्थान ने २०२१ के दौरान पांच पेटेंट, दस कॉपीराइट और दो डिजाइन के लिए आवेदन प्रेषित किया है। भा.कृ.अनु.प.-राष्ट्रीय शूकर अनुसंधान केंद्र ने ने २०२१ के दौरान एबीआई के तहत ०९ उद्यमियों/स्टार्ट अप को शामिल किया है। उद्यमियों के साथ कुल पंद्रह प्रौद्योगिकी हस्तांतरण समझौतों पर हस्ताक्षर किए गए हैं। प्रौद्योगिकी हस्तांतरण समझौता वाणिज्यिक शूकर पालन, संबद्ध सेवा क्षेत्रों और पोर्क में मूल्यवर्धन के क्षेत्रों में उद्यमिता कौशल विकास गतिविधियों सहित ऊष्मायन और व्यवसाय विकास कार्यक्रम पर केंद्रित थे । संस्थान ने उद्यमियों को तकनीकी परामर्श और सलाहकार कनेक्शन, मार्गदर्शन और प्रशिक्षण के रूप में व्यावसायिक डोमेन में आधुनिक तकनीक आधारित व्यावसायिक विचारों और मॉडलों को विकसित करने के लिए सक्रिय और मूल्य वर्धित व्यावसायिक सहायता प्रदान करके उनकी मदद की है ताकि उनके स्टार्ट-अप को प्रभावी ढंग से बढ़ाया जा सके।

कृषि विज्ञान केंद्र (केवीके)

वर्ष के दौरान कुल ९३ प्रशिक्षण कार्यक्रम आयोजित किए गए जिसमे २५३३ प्रतिभागियों ने सहभागिता की । कृषि विज्ञान केंद्र गोलपाड़ा ने नई उत्पन्न कृषि प्रौद्योगिकियों पर १२ कृषि परीक्षण आयोजित किए हैं। इसके अलावा तेरह एफएलडी और तीन सीएफएलडी आयोजित किए गए। कुल १५० मृदा स्वास्थ्य

कार्ड वितरित किए गए, २५६६ किसानों को शामिल करते हुए ५१५ मोबाइल परामर्श दिए गए और १२० सफलता की कहानियों का संकलन किया गया। इसके अलावा, केवीके ने विभिन्न योजनाओं/परियोजनाओं जैसे कि पोषण संवेदनशील कृषि संसाधन और नवाचार (एनएआरआई), जनजातीय क्षेत्रों में ज्ञान प्रणाली और होमस्टेड कृषि प्रबंधन (क्षमता), डबलिंग फ्रैमर इनकम (डीएफआई), मेरे गांव मेरा गौरव (एमजीएमजी) और स्वच्छता अभिया का आयोजन किया।

आजादी का अमृत महोत्सव

संस्थान ने विभिन्न हस्तक्षेपों के माध्यम से शूकर किसान की आय को दोगुना करने की १०० सफलता गाथा को अखिल भारतीय समन्वित अनुसंधान परियोजना एवं वृहत बीज परियोजना के २२ केंद्रों सहित संकलित किया है। भा.कृ.अनु.प.–राष्ट्रीय शूकर अनुसंधान केंद्र ने भारत की आजादी के ७५ साल के उपलक्ष्य में 'आजादी का अमृत महोत्सव' के एक भाग के रूप में व्याख्यानों की एक श्रृंखला का आयोजन किया है।

स्वच्छ भारत मिशन

स्वच्छ भारत मिशन के तहत विभिन्न प्रकार की गतिविधियां पूरे वर्ष आयोजित की गईं। इस कार्यक्रम के तहत स्वच्छता अभियान और जागरूकता कार्यक्रम आयोजित किए गए। नियमित स्वच्छता गतिविधियों के अलावा, ०२ अक्तूबर, २०२१ से ३१ अक्तूबर, २०२१ तक एक विशेष स्वच्छता अभियान और १६–३१ दिसंबर २०२१ तक एक स्वच्छता पखवाड़ा आयोजित किया गया। कार्यक्रम के दौरान, संस्थान के आसपास के गांवों में जन जागरूकता का आयोजन किया गया जिसके तहत स्कूलों में जागरूकता कार्यशालाएं, बच्चों और युवाओं के लिए भाषण प्रतियोगिता का आयोजन कर लोगों को सफाई के लिए प्रेरित किया गया ।

Executive Summary

ICAR-National Research Centre on Pig has successfully completed 19 years since inception and continued its excellence in catering the farmers, extension workers, policy makers and industries associated with pig farming and pork processing. The institute is taking sincere efforts for popularizing the scientific pig production and postharvest management in the country since its inception as well as all round development of the piggery sector along with its affiliation units, namely Krishi Vigyan Kendra (KVK), fifteen centers of All India Coordinated Research Project on Pig centres, and six centers of Mega seed Project on Pig, spread over different parts of the country. During the year 2021, the Institute functioned with 20 scientists, 06 technical staff and 06 administrative and accounts personnel. The total plan and non-plan budget allocations were 2354.46 lakh during the financial year. The institute has generated Rs 72.36 lakh as revenue during the period. The scientists of the Institute relentlessly worked for achieving various targets related to research and extension, defined under the six major programmes as per the mandate.

Conservation and genetic improvement of pigs

The improved crossbred pig variety 'Rani', developed by ICAR-NRC on Pig using Hampshire (male) and Ghoongroo (female) pigs, has completed the eighth generation of inter-se mating at the institute farm. The generation-wise genetic performance was recorded and evaluated. The breed characteristics of the developed variety were stabilized after consistent crossbreeding of several generations. The indigenous pig breeds viz. Ghoongroo, Agonda Goan, Doom and Niang Megha were targeted for molecular characterization by microsatellite markers recommended by ISAG–FAO. The multiplex PCR for genotyping the animals for each marker is being standardized. The SNP markers at candidate genes for reproduction traits were found to be polymorphic in indigenous breeds of pig. It was observed that infrared thermography can be used to identify gilts and sows in oestrus effectively. A comprehensive functional profiling of the male-specific region of the pig Y chromosome was done to elucidate the functional profiling of the pig Y chromosome.

Improvement in pig farm management practices

Ethogram development and welfare assessment of growing Desi and crossbred pig has been carried out. Behaviour of Ghoongroo, Rani and LWY were recorded for a continuous 24 hours. Assessed the water footprint in organized pig production. Water foot print on feed and electricity in pig production were estimated to be 500.06 and 20.6, respectively. Efforts were taken to assess the gut microbiome at various stages of growth in pigs, to understand the gut microbial modulations with oral antibiotics and to study the gut immunity in response to nutrient supplementation.

Nutritional interventions for profitable pig production

Developed vegetable waste/fruit waste-based pig feeds. It was found that increased level of maize fodder in the diet of LWY pigs enhances the growth of fibre degrading bacteria mainly Fibrobacter succinogenes in the gut microbiota which is very helpful for increasing feed efficiency in pigs. In vitro DM digestibility study has been carried out using different levels of fiber from maize fodder silage in pigs. The in vitro DM digestibility was found as 66.49, 64.83 and 63.60% respectively for diet containing 8, 10 and 12% crude fibre. Process has been optimized for aflatoxin estimation using Thin Layer Chromatography.

Improvement of physiological efficiency in pigs

A gene expression microarray was custom designed for screening animals incorporating 20300 genes related to production as well as adaptation traits. Putative miRNAs related to heat shock signling were identified. Immunofluorescent studies on HSF-1 protein suggests a role for ssc-miR-193a-3p in regulation of heat shock response. Analysis of differentially expressed genes for development of early fertility markers suggests important role for transcripts related to olfactory signaling, formation of lysosomal complex and cellular signaling in promoting higher fertility. Characterized the immunogenic and angiogenic growth factors regulating ovarian function in pigs. CRISPR/Cas9 genome editing system was optimized for establishment of porcine knock out luteal and granulosa cell culture system for functional validation of VEGFA, AR and FOSgene associated signalling pathways regulating ovarian physiology in sows.

Improvement of reproductive efficiency in pigs

Studies on preservation of boar semen using different additives in liquid and frozen state revealed that Lactose egg yolk extender (LEY) with the addition of membrane stabilizer, trehalose maintained higher quality of spermatozoa during storage at 5°C up to 72h than the other combinations. A total of 1934 liquid boar semen doses were produced and supplied for artificial insemination in pigs at the farmers' field and organized farms. Also, 9(E)-Octadecenoic acid (Elaidic acid) was identified as the novel pheromonal compound in pigs and can be used as nasal spray or ointment or gel for bio-stimulation purpose.

Pig disease monitoring and surveillance

A multiplex PCR methodology has been developed in which all the three (N, M & GP5) genes of PRRSV Indian isolate are simultaneously amplified in a single step. Capsid protein encoding gene (483 bp) from an Indian isolates of porcine circovirus type 2 was amplified and cloned in pTZ57/R prokaryotic cloning vector. The positive clones were confirmed by colony PCR and sequencing. It was observed that exon 7 of porcine CD163 host receptor can interact with glycoprotein 4 (GP4) of Porcine Respiratory and Reproductive Syndrome Virus. Developed a Lateral Flow assay for rapid detection of Staphylococcus aureus in pork using colloidal silver nanoparticles (AgNPs) produced from mango leaves. PCV2d_ Indian isolate capsid sequence (ORF2) was synthesized and optimized for baculovirus expression system and modified at the 5'end and 3'end by adding respective restriction site and primer sequence. Preliminary surveys have been conducted for prevalence of ASF in different Districts of Assam. In order to assess the specific protective antibody response induced in pigs vaccinated with commercial FMD vaccine intended for use in cattle, a schedule for vaccination in pigs has been devised. Pooled faecal samples analyses indicated that coccidiosis was more common in the suckling piglets but occasionally growers, finishers and boars were also affected.

Postharvest processing and value addition of pork

Optimized the processing conditions to prevent the occurrence of selected FSSAI listed food borne pathogens in pork and pork products. Inhibition of biofilm formation, quorum sensing activity and molecular docking study of Yersinia enterocolitica against Averrhoa carambola crude extracts has been studied. The maximum efficacy of the Averrhoa carambola crude extract at 1000µg/mL showed 62.72% of biofilm formation was inhibited however at the concentration of 50 µg/mL showed efficiency of 58.99% inhibition of biofilm was observed. Behaviour of Salmonella typhimurim to different pH and temperatures has been evaluated. S. Typhimurium was found to be acid sensitive and a linear mean reduction was observed over the time. It was indicated that lemon juice was most effective out of all three treatments and log 3.8 reductions was observed within 24 h. Fermented bamboo shoot was least effective compared to lemon and star fruit juice. The formulation and processing steps were optimized for processing the shelf stable pork products viz. Pork with lai, Pork with till, Pork vindaloo, Pork with fermented bamboo shoot and dried chillies, using retort technology. Established the Quality Control Lab and obtained IS/IEC 17025:2017 Accreditation.

Extension

A data base of 360 small scale pig producers from Assam was prepared for assessing their knowledge and adoption of scientific pig production practices. A knowledge test and adoption index were developed for this purpose. The result showed that the knowledge and adoption of scientific pig production practices by the farmers of adopted villages was significantly higher than the farmers of non-adopted villages. For assessing the pork marketing chains in Assam, a data base of 835 pig producers, 250 pork consumers, 50 sellers, 25 traders/middlemen and 6 processors from 5 districts of Assam was prepared. From the data, 8 different pork marketing chains were identified. The participation of tribal women in backyard piggery was assessed and need based capacity building programs were organized under the NASF project. A piggery farmer field school was established at Barmura village, Rangia, Kamrup District for the capacity development of 25 selected tribal women.

Computer Applications and IT

Research work for growth rate estimation using image processing technique was started during the year. Digital image-based algorithm is

one of an effective solution to avoid direct contact with the animals and to deal with shortage of manpower for growth estimation.

AICRP and Mega Seed on Pig

The Institute continued regular monitoring of the progress of AICRP on Pig project (15 centers) and Mega seed project on pig (06 centers) through technical and financial monitoring in consultation with the council and conduction of review meet. The Annual Review Meeting of "ICAR-AICRP on Pig" and "MSP on Pig" held on 16th February, 2021 via virtual platform. The AICRP project is continuing in different centers across the country to study the performance of pigs in different agroclimatic condition, to develop region-specific package of practices including quality germplasm and to conserve the indigenous germplasm. Under MSP on pig, a total 3889 piglet of improved variety were produced and distributed to the stakeholders during 2021.

TSP and SCSP

A total of 22 numbers of pig health and awareness camps cum input distribution programmes were conducted during 2021 under TSP. Total 342401 kg of pig feed was distributed among 2612 tribal beneficiaries of different villages of Kamrup, Nalbari, Baksa, udalguri and Goalpara district of Assam. Further, 04 trainings were organized for benefitting 68 tribal youths and farmers. Under SCSP superior quality crossbred Pig along with pig feed and medicines, essential biosecurity items and feed supplements were distributed to 500 farmers.

ABI and ITMU

Institute Technology Management Unit of the institute has developed 3 technologies and signed thirteen MoUs with different entrepreneurs, stallholders and organization to commercialise and transfer these technologies as well as for various services like consultancy, contract research and contract services. Institute has applied five Patents, ten Copyrights and two Designs during 2021. ICAR-National Research Centre on Pig has inducted 09 numbers of Entrepreneurs/Startups under ABI during 2021. A total of fifteen numbers of technology transfer agreements has been signed with the entrepreneurs. The technology transfer agreement focuses on incubation and business development programme including entrepreneurship skill development activities in the areas of commercial piggery, allied service sectors and value addition in pork. Institute has also helped the entrepreneurs by providing them pro-active and value-added business support in terms of technical consultancy and mentor connections, guidance and trainings to develop modern technology-based business ideas and models in business domains in order to scale their start-ups effectively.

Krishi Vigyan Kendra (KVK)

A total of 93 training programmes were conducted covering 2533 number of participants during the year. The Krishi Vigyan Kendra Goalpara has conducted 12 On farm Trial on newly generated agricultural technologies. Thirteen numbers of FLDs and three CFLDs were conducted during the reported period. A total of 150 soil health cards were distributed, 515 mobile advisories were done covering 2566 numbers of farmers and documented 120 numbers of success stories. In addition, KVK has organized different schemes/ projects viz. Nutrition Sensitive Agriculture Resources and Innovation (NARI), Knowledge Systems and Homestead Agriculture Management in Tribal Areas (KSHAMTA), Doubling Framers Income (DFI), Mere Gaon Mera Gaurav (MGMG) and Swchhata Abhiyan.

Azadi Ka Amrut Mahotsav

The institute has compiled 100 success stories of doubling pig farmer's income through different interventions including the success stories of AICRP and MSP centres. ICAR- NRC on Pig has organized a series of lectures as a part of the 'Azadi Ka Amrit Mahotsav' commemorating India's 75 years of independence.

Swachh Bharat

The activities under Swachh Bharat mission were conducted throughout the year. Under this programme the cleanliness drive and awareness programmes were conducted. Apart from regular activities, one special swachhata Campaign from 02nd October, 2021 to 31st October, 2021 and one swachhata Pakhwada was conducted from 16-31st December 2021. During the programme, the public awareness was created in the nearby villages of the institute by conducting awareness workshops in schools, elocution competition for children and youths.

Salient Achievements During 2021

- The improved crossbred pig variety 'Rani', developed by ICAR-NRC on Pig using Hampshire (male) and Ghoongroo (female) pigs, has completed the eighth generation of inter-se mating at the institute farm. The breed characters of the developed variety were stabilized for consistent crossbreeding of several generations.
- The indigenous pig breeds viz. Ghoongroo, Agonda Goan, Doom and Niang Megha were characterized by microsatellite markers recommended by ISAG–FAO. The multiplex PCR for genotyping the animals for each marker is being standardized.
- A comprehensive functional profiling of the male-specific region of the pig Y chromosome was done to elucidate the functional profiling of the pig Y chromosome.
- Ethogram development and welfare assessment of growing Desi and crossbred pig has been carried out. Assessed the water footprint in organized pig production.
- Developed vegetable waste/fruit waste based pig feeds. Process has been optimized for aflatoxin estimation using Thin Layer Chromatography.
- A gene expression microarray was custom designed for screening animals incorporating 20300 genes related to production as well as adaptation traits. Putative miRNAs related to heat shock signling were identified. Immunofluorescent studies on HSF-1 protein suggests a role for ssc-miR-193a-3p in regulation of heat shock response.
- Characterized the immunogenic and angiogenic growth factors regulating ovarian function in pigs. CRISPR/Cas9 genome editing system was optimized for establishment of porcine knock out luteal and granulosa cell culture system for functional validation of VEGFA, AR and FOSgene associated signalling pathways regulating ovarian physiology in sows.
- Preservation studies of boar semen using different additives in liquid and frozen state revealed that Lactose egg yolk extender (LEY) with the addition of membrane stabilizer, trehalose maintained higher quality of spermatozoa during storage at 5°C up to 72h than the other combinations.
- A total of 1934 liquid boar semen doses were produced and supplied for artificial insemination in pigs at the farmers' field and organized farms. Also, 9(E)-Octadecenoic acid (Elaidic acid) was identified as the novel pheromonal compound in pigs and can be used as nasal spray or ointment or gel for bio-stimulation purpose.
- A multiplex PCR methodology has been developed in which all the three (N, M & GP5) genes of PRRSV Indian isolate are simultaneously amplified in a single step. Capsid protein encoding gene (483 bp) from an Indian isolates of porcine circovirus type 2 was amplified and cloned in pTZ57/R prokaryotic cloning vector.
- Developed a Lateral Flow assay for rapid detection of Staphylococcus aureus in pork using colloidal silver nanoparticles (AgNPs) produced from mango leaves. PCV2d_ Indian isolate capsid sequence (ORF2) was synthesized and optimized for baculovirus expression system and modified at the 5'end and 3'end by adding respective restriction site and primer sequence.
- Optimized the processing conditions to prevent the occurrence of selected FSSAI listed food borne pathogens in pork and pork products. Inhibition of biofilm formation, quorum sensing activity and molecular docking study of Yersinia enterocolitica against Averrhoa carambola crude extracts has been studied.
- Completed the establishment of Quality Control Lab and obtained IS/IEC 17025:2017 Accreditation (NABL Accreditation).
- A data base of 360 small scale pig producers from Assam was prepared for assessing their knowledge and adoption of scientific pig production practices. A knowledge test and adoption index were developed for this purpose. A piggery Farmer Field School was established at Barmura village, Rangia, Kamrup, Assam for capacity building of 25 selected tribal women.
- The AICRP on pig project is strengthened in

different centers across the country to study the performance of pigs in different agro-climatic condition, to develop region-specific package of practices including quality germplasm and to conserve the indigenous germplasm. Under mega seed project on pig, improved variety of piglets were produced and distributed to the farmers.

- A total 22 numbers of pig health and awareness camp cum input distribution was conducted during 2021 under TSP. Total 342401 kg of pig feed was distributed among 2612 tribal beneficiaries.
- Institute has applied for five patents, ten copyrights and two designs during 2021. Also, the institute has inducted 09 numbers of Entrepreneurs/Startups and a total of fifteen numbers of technology transfer agreements has been signed with the entrepreneurs.
- Institute has regularly conducted activities under “Swachh Bharat Abhiyan” with the resolution to work towards realizing the Mahatma Gandhi's dream of “Swachh Bharat”. In order to extend the scientific expertise for the benefit of farmers, the Institute has implemented MeraGaon- Mera Gaurav programme.
- The Krishi Vigyan Kendra of ICAR-NRC on Pig has conducted 12 On Farm Trials (OFT) and 13 Front Line Demonstrations (FLD) under various disciplines to promote the technology transfer. A total of 150 soil health cards were distributed, 515 mobile advisories were done covering 2566 numbers of farmers and documented 120 numbers of success stories.

Introduction

The ICAR-National Research Centre on Pig (ICAR-NRCP) was established in 2002 under the aegis of the Indian Council of Agricultural Research (ICAR) to bring in excellence in pig production, health and product processing through innovative research in order to provide technology backstopping for enhanced pork production, employment generation and poverty reduction among socially and economically weaker sections through the medium of pig husbandry. The institute has been trying its level best for popularizing the scientific pig production and post harvest management in the country since its inception as well as all round development of the piggery sector along with its affiliation units, namely Krishi Vigyan Kendra (KVK), fifteen centres of All India Coordinated Research Project (AICRP) on Pig, and six centres of Mega seed Project on Pig, spread over different parts of the country. All India Coordinated Research Project on Pig and Mega seed Project on Pig are the flagship programmes for which the Institute acts as a nodal agency. Development of region-specific pig production technologies and filling the critical gap of demand for superior pig genetics are the focus of the two programmes respectively.

Location

The institute is located at Rani, Guwahati in the state of Assam. The institute is approximately 35 kms away from the Guwahati City Railway Station and 12 kms from the Lokpriya Gopinath Bordoloi International Airport.

Faculty and Staff

The Institute is headed by the Director and currently 19 scientists, 06 adiministrative/supporting and 06 technical staffs are in position.

Staff Position

RMP Cadre and Scientist Cadre

Sl. No.	Name of the post	Sanctioned post	In - position	Vacant
1	RMP Cadre -Director	01	01	00
2	Principal Scientist	02	01	01
3	Senior Scientist	04	04	00
4	Scientist	18	14	04
	Total	25	20	05

Administrative Cadre

Sl. No.	Name of the post	Sanctioned post		Total	In - position	Vacant
		ICAR -NRC on Pig	KVK - Goalpara			
1	LDC	01	00	01	01	00
2	UDC	01	00	01	01	00
3	Stenographer Grade III	00	01	01	00	01
4	PA	02	00	02	02	00
5	Assistant	05	01	06	00	06
6	AAO	01	00	01	01	00
7	AO	01	00	01	00	01
8	FAO	01	00	01	00	01

Technical Cadre and Skilled Supporting Staff Cadre

Sl. No.	Name of the post	Sanctioned post		Total	In - position	Vacant
		ICAR - NRC on Pig	KVK - Goalpara			
1	T - 1	03	02	05	04	01
2	T - 3	04	00	04	03	01
3	T - 4	00	03	03	03	00
4	SMS/STO/T - 6	00	06	06	05	01
5	Skilled Supporting Staff	04	02	06	03	03

Priority Setting & Management

The Institute has a high-powered Research Advisory Committee (RAC) comprising of eminent scientists and professor, who guide the research agenda of the institute and set research priorities. Dr. N. Balraman, Former Vice-Chancellor, Tamil Nadu Veterinary and Animal Science University, Chennai is the chairman of the committee. The other members include scientists and professors from the field of Animal Genetics and Breeding, Animal Health, Animal Nutrition, Animal Physiology, Extension and Livestock Products Technology. The functioning of the institute is supervised by Institute Managemental Committee (IMC) headed by the Director of the institute as Chairman and members drawn from state government, university and public personnel. A number of internal committees such as Purchase, Library, Works, Official Language Implementation, ISO 9001- 2015 Implementation, Grievance, Publication, Priority Setting Monitoring and Evaluation Cell, Staff Welfare Club, IPR Cell, Institute Technology Management Unit, Agri-Business Incubation and ICC (women committee) have been constituted to decentralize the management with developed responsibilities for smooth functioning of the institute. The Institute Joint Staff Council has been constituted for promoting healthy and congenial work environment. The Institute Research Council (IRC) provides a platform for effective professional interactions in respect of review and implementation of various research projects.

VISION

To bring in excellence in pig production, health and product processing through innovative research in order to provide technology backstopping for enhanced pork production, employment generation and poverty reduction among socially and economically weaker sections through the medium of pig husbandry.

MISSION

Performance appraisal and genetic cataloguing of indigenous pigs, development of improved pig variety together with production, health, product processing and pig based integrated farming system technologies to facilitate the pig rearers of the country for achieving household food, nutritional and economic security.

MANDATE

The mandate of the institute is:

- To undertake basic and applied research for enhancing pig production
- To act as a repository of information on pig production
- Capacity building

RESEARCH PROGRAMMES

Flagship Programme : Artificial Insemination in Pigs

Programme-1 : Conservation and genetic improvement of indigenous pigs

Programme-2 : Optimization of physiological and reproductive efficiency including identifying markers for early detection of fertility

Programme-3 : Characterization of production system, feeding practices and their optimization for enhancing pig production, especially under field conditions.

Programme-4 : Continuous monitoring, recording of pig diseases and development of disease management protocol

Programme-5 : Technology development for improved post-harvest handling, processing and value addition of pig products

Programme-6 : Institute-stakeholder linkages and skill development

Expenditure Statement

BUDGET VISA-A-VIS EXPENDITURE 2021

Rs. in lakh

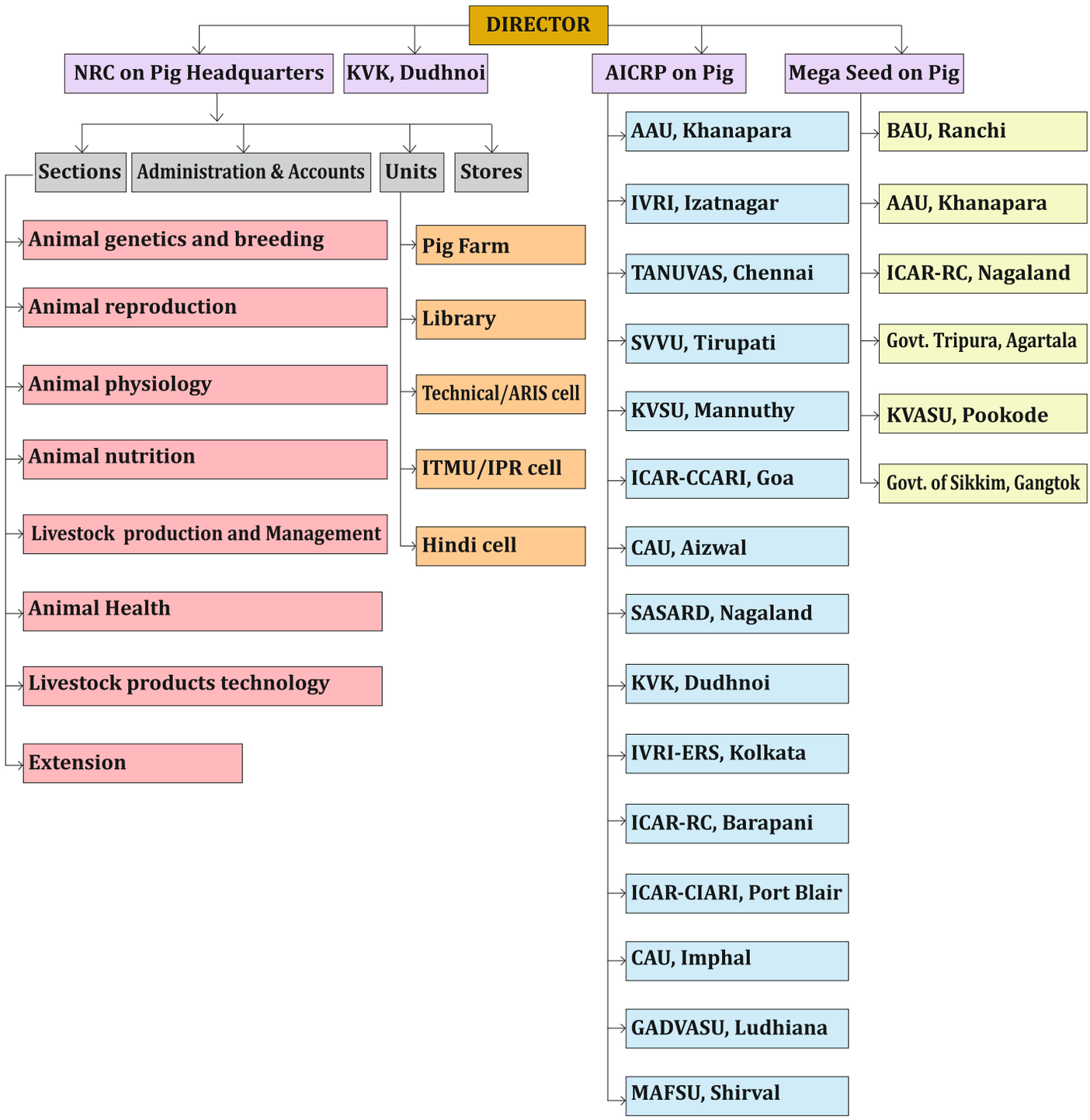
NAME OF THE SCHEME /PROJECT	DETAILED	PAY & ALLOWANCES	GENERAL	CAPITAL	TOTAL
ICAR-NRC ON PIG, MAIN SCHEME	R.E.	659.300	585.000	149.100	1393.400
	EXP.	659.300	585.000	149.100	1393.320
AICRP ON PIG PROJECT	R.E.	102.310	445.000	81.190	628.500
	EXP.	102.310	445.000	81.190	628.500
MEGASEED ON PIG PROJECT	R.E.	0.00	299.5	33.06	332.56
	EXP.	0.00	299.5	33.06	332.56

Revenue Generation

Rs. in lakh

REVENUE TARGET DURING 2021	Not assigned
REVENUE GENERATION DURING 2021	72.36

Organizational Setup



The matrix mode of management is adopted in the research activities which provide devolved responsibilities for effective implementation of multidisciplinary/interdisciplinary programmes. Director is the Head of the Institute, supported by administrative and financial wings. To strengthen the local decision-making and research monitoring, Research Advisory Committee, Institute Management Committee, Institute Research Council and PME Cell play a vital role through periodical meetings

Physical Progress

Modern boar semen production centre

A modern boar semen production centre has been established with funding support from North East Council, Ministry of DoNER, Govt. of India. The unit is equipped with modern semen processing equipments like CASA, automatic sperm concentration counter, automatic straw filling and sealing machine etc.

Operation Theatre (OT) for Pigs

An operation theatre has been constructed in the institute campus with well-equipped facilities for conducting aseptic surgeries on pigs.

Feed Store

A feed store with 25 ton capacity was constructed for storing the pig feed in bulk.

Manure pit and waste water storage tank

A manure pit and waste water storage tank has been constructed in the farm complex for the disposal of pig waste. A brick drain has also been constructed for removing the waste from the pig sheds to the manure pits.

Internal approach road

An internal approach road has been constructed to the unutilized area of the farm complex.

CONSERVATION AND GENETIC IMPROVEMENT OF PIGS

Evaluated generation-wise genetic performance of rani crosses : An improved crossbred pig variety 'Rani', developed by ICAR-NRC on Pig using Hampshire (male) and Ghoongroo (female) pigs, has completed the eighth generation of inter-se mating at the institute farm. The generation-wise genetic performance was recorded and evaluated. The generation-wise genetic evaluation revealed stability in the performance of the developed variety over the generations. In order to maintain the developed crossbred variety, rigorous selection both in sire and dam line is done followed by inter-se-mating. The breed characters of the developed variety were stabilized for consistent crossbreeding of several generations. During the reporting period the Rani variety has completed ninth generations of inter-se mating. The generation-wise genetic performance of different productive, reproductive, adaptive and carcass characteristics of developed cross was carefully recorded and evaluated for the study. Ten sire lines of Hampshire and 19 dam line of Ghungroo was initially used to develop the Rani animals. Mating ratio of 1:2.5 (M: F) was followed. Top 3 and 8 percent of male and female were selected for producing subsequent generation based on performance traits. Generation interval was estimate as 1.5 years. Presently the tenth generation animals are maintained at the farm. The generation-wise genetic gain and performance of Rani cross are given in Table 1 and 2, respectively. Large scale propagation of these developed varieties coupled with use of scientific package of practices was done by distribution of animals through different mandated institute activities and through artificial insemination which ensured sustainable livelihood among the tribal masses.

Rani pig at farmer's field

Rani sow with piglet at the institute

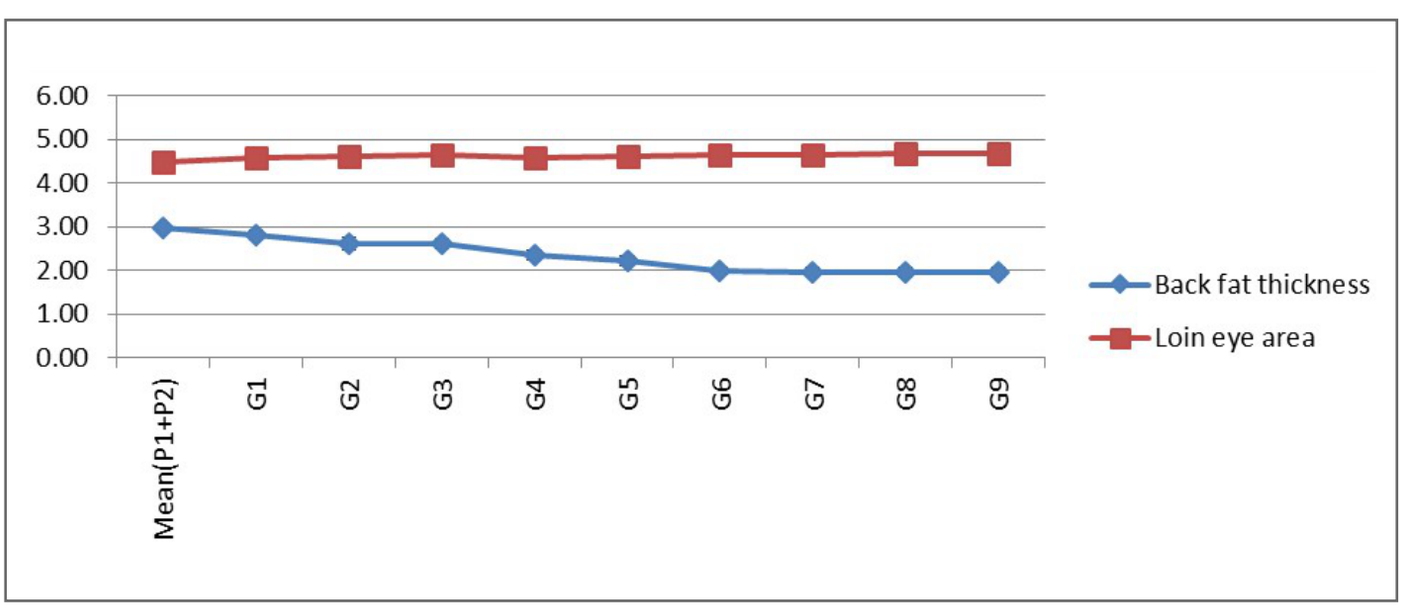
Table 1. Generation-wise genetic gain of Rani cross

Generation Wise Genetic Gain									
	GG 1GEN	GG 1GEN	GG 1GEN	GG 1GEN	GG 1GEN	GG 1GEN	GG 1GEN	GG 1GEN	GG 1GEN
(Re)productive traits									
Litter size at birth	12.96	1.58	0.41	-1.96	3.16	0.61	0.10	0.30	0.10
Litter weight at birth	27.82	4.12	0.38	-1.97	2.39	1.78	0.55	1.55	0.72
Litter size at weaning	13.79	4.85	-0.58	-1.16	2.94	0.69	0.23	0.79	0.22
Litter weight at weaning	17.31	1.19	1.61	-1.46	3.85	4.10	3.92	5.16	3.64
Individual weaning weight	0.61	-3.47	1.41	0.92	0.76	5.00	1.15	1.43	0.56
Pre-weaning growth rate (g/d)	-1.50	-4.62	1.71	1.12	1.07	5.76	1.29	1.46	0.55
Post-weaning growth rate (g/d)	10.54	0.89	-4.47	4.48	1.60	2.48	1.17	0.20	1.05
Weight at 8 month	9.54	0.49	-3.95	4.14	1.52	2.70	1.17	0.32	1.01
FCR	-7.54	-0.26	0.53	1.84	-2.06	-1.32	-1.33	-0.54	-0.82
Adaptive traits									
Pre weaning mortality rate	-13.11	-5.66	2.00	13.73	-10.34	0.00	0.00	-2.88	-1.98
Carcass trait									
Dressing percentage	1.73	-0.01	0.44	0.56	0.00	0.13	-0.13	0.16	0.04
Carcass length	3.17	0.95	-0.32	1.27	1.89	2.81	0.02	0.01	0.20
Back fat thickness	-6.02	-7.12	0.38	-10.31	-5.53	-10.81	-0.51	-0.51	0.00
Loin eye area	2.23	0.65	0.22	-0.86	0.65	0.22	0.43	0.22	0.21

Table 2. Performance of Rani cross

	Parental Generation			Filial Generation								
	P_2(H)	P_1(G)	Mean P_1+P_2	G_1	G_2	G_3	G_4	G_5	G_6	G_7	G_8	G_9
(Re)productive traits												
Litter size at birth	7.91± 0.23	8.91± 0.15	8.41	9.50± 0.22	9.65± 0.35	9.69± 0.39	9.50± 0.68	9.80± 0.42	9.86± 0.32	9.87± 0.40	9.90± 0.34	9.91± 0.40
Litter weight at birth	8.01± 0.34	7.95± 0.22	7.98	10.20± 0.26	10.62± 0.22	10.66± 0.35	10.45± 0.75	10.70± 0.52	10.89± 0.42	10.95± 0.50	11.12± 0.37	11.2± 0.42
Litter size at weaning	7.00± 0.22	7.5± 0.15	7.25	8.25± 0.15	8.65± 0.32	8.60± 0.57	8.50± 0.55	8.75± 0.35	8.81± 0.23	8.83± 0.31	8.90± 0.42	8.92± 0.32
Litter weight at weaning	50.28± 3.52	42.93 ±3.29	46.61	54.67± 3.55	55.32± 2.87	56.21± 3.84	55.39± 3.99	57.52± 3.11	59.88± 2.56	62.23± 3.55	65.44± 3.62	67.82± 3.41
Weaning weight	7.23± 0.42	5.95± 0.52	6.59	6.63± 0.35	6.40± 0.62	6.49± 0.52	6.55± 0.75	6.60± 0.43	6.93± 0.39	7.01± 0.32	7.11± 0.31	7.15± 0.41
Pre-weaning growth rate (g/d)	148.4 3±12.36	126.4 4±10.53	137.4 35	138.91 ±12.55	132.49± 11.1	134.75± 9.83	136.25± 13.45	137.70± 10.53	145.64± 9.32	147.51± 12.35	149.67± 10.83	150.50 ±11.19
Post-weaning growth rate (g/d)	308.6 ±16.75	280.8 ±20.43	294.7	325.75 ±21.53	328.65± 24.52	313.95± 29.35	328.00± 25.63	333.25± 23.53	341.5 026.35±	345.50± 23.85	346.20± 26.55	349.85 ±25.55
Weight at 8 month	68.95 ±3.89	62.11 ±4.28	65.53	71.78± 3.29	72.13± 3.52	69.28± 4.29	72.15± 4.56	73.25± 3.88	75.23± 3.72	76.11± 4.22	76.35± 4.07	77.12± 4.11
FCR	4.01± 0.25	4.21± 0.23	4.11	3.80± 0.28	3.79± 0.31	3.81± 0.19	3.88± 0.17	3.80± 0.33	3.75± 0.23	3.70± 0.20	3.68± 0.19	3.65± 0.20
Adaptive traits												
	6.0± 0.52	6.2±. 65	6.1	5.30± 0.45	5.00± 0.67	5.10± 0.32	5.80± 0.44	5.20± 0.52	5.20± 0.51	5.20± 0.50	5.05± 0.32	4.95± 0.40
Carcass trait												
Dressing percentage	74.00± 2.33	72.00± 3.12	73	74.26± 2.11	74.25± 2.22	74.58± 2.58	75.00± 3.21	75.00± 2.99	75.10± 3.01	75.00± 2.81	75.12± 2.55	75.15± 2.95
Carcass length	90.10± 4.58	78.55± 5.89	84.325	87.00± 4.92	87.83± 5.22	87.55± 4.32	88.66± 5.98	90.34± 5.62	92.88± 4.87	92.90± 4.02	92.91± 4.31	93.1± 4.20
Back fat thickness	2.78± 0.15	3.20± 0.12	2.99	2.81± 0.11	2.61± 0.15	2.62± 0.12	2.35± 0.11	2.22± 0.12	1.98± 0.08	1.97± 0.10	1.96± 0.11	1.96± 0.11
Loin eye area	4.59± 0.13	4.39± 0.23	4.49	4.59± 0.12	4.62± 0.14	4.63± 0.13	4.59± 0.11	4.62± 0.22	4.63± 0.09	4.65± 0.11	4.66± 0.12	4.67± 0.14

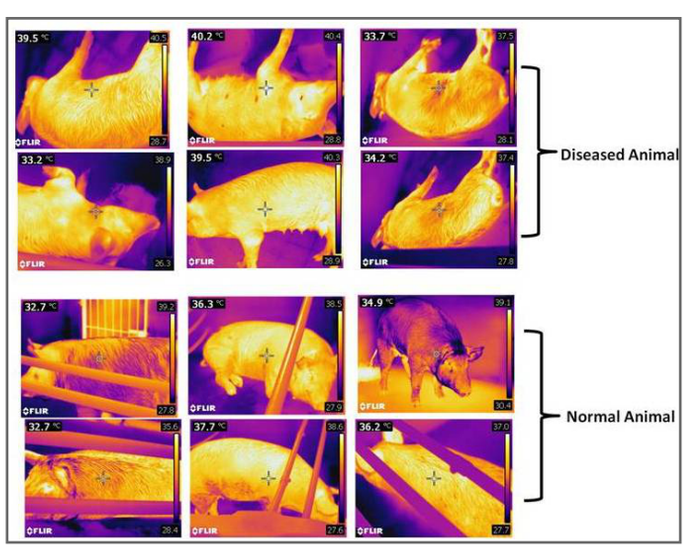
The developed Rani crossbred variety showed stable performances over the generations. The animals also showed stability in performance traits in field evaluation.



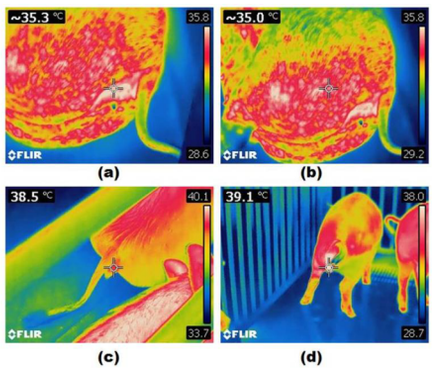
Graphical representation of generation-wise performance of different (re)productive traits

Developed IRT image-based systems for examining the health status of pigs : Infrared thermography has been used to establish the causes of injuries, inflammations, and lameness; to diagnose infectious diseases, oestrus, and pregnancy; ectoparasite infestation in livestock animals; to study animal welfare and environmental and physiological stress levels. The advantage of using the thermal camera in disease diagnostics is its non-invasive nature i.e. it perceives heat emissions and does not require direct physical contact with the surface examined, thus allowing the monitoring of temperature distribution non-invasively. Because of its fast, non-invasive, reliable and non-contact requirement nature, it is considered a safety device for the animals and the veterinarian. It considerably lowers the risk of spreading infections, since touching the subject is needless and also in animals, this is advantageous as handling and restraint increase stress, causing an effect on the surface temperature. The study was undertaken to identify the thermal profile of normal healthy pigs for diagnosis of the thermal behaviour of diseased pigs compared to the normal as well as to identify a sow /gilt who are in an oestrous stage or are pregnant thus addressing the thermal profile of female reproductive parameters. Since IR thermography was performed by taking into anticipated temperature differences viz., diurnal changes, pig breed-specific variations and differences between healthy and diseased pigs (suffering some health conditions). Healthy farm pigs (n=1000) of ICAR NRC on Pig were used for recording IR thermography between January to December 2021. Variation in pig's body temperature during different times of the day was recorded; IRT images were captured at three different locations viz., head, chest and back on three different occasions in a day viz., morning, afternoon and evening. The recorded IR thermography in pigs shows that the lowest and highest temperatures were observed during morning and afternoon hours. Temperatures recorded from different body parts differed significantly with the highest temperature at the back and lowest at the head. To determine the ovulation period, it has been shown earlier that oestrogen administration can induce an increase in vaginal blood flow measured through a rise in vaginal thermal conduction. The results of the study indicated significant differences among oestrus and non-oestrus animals for different temperature (oC) parameters estimated such as VST (36.78± 0.29 Vs 35.94±0.19), GST (33.44± 0.24 Vs 35.51±0.14) and VGT (3.34± 0.26 Vs 0.43±0.11). In conclusion, infrared thermography can be used to identify gilts and sows in oestrus effectively.

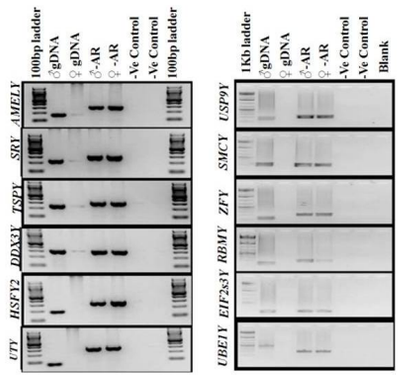
Characterization and expression profiling of Pig MSY genes for boar fertility : Comprehensive functional profiling of the male-specific region of the pig Y chromosome was generated to elucidate the functional profiling of the pig Y chromosome. The amplification of testis-expressed genes and the identification of a novel sequence class provide novel insights into the evolution and function of this unique chromosome. Fresh blood and tissue samples from slaughtered pigs have been collected aseptically and both DNA & RNA have been isolated following standard protocol. For amplification of MSY genes primers have been designed for twelve MSY genes, and 6 control genes from Pig. Targeted genes were amplified in male and female genomic DNA and confirmed the male-derived specificity. The tissue panel from the pig, as well as sperm, have been collected to understand the novel complexity of these MSY genes in expression profiling. Moreover, testis-specific expression of MSY genes was distinct among the different tested tissues viz. liver, lung, kidney, pancreas, heart, spleen, skeletal muscle, ovary and testis. The identified MSY genes can be used to establish male-specific characteristics of pigs and to differentiate male and female pigs genotypically.



Infrared thermographic images of healthy and normal at different times and seasons.

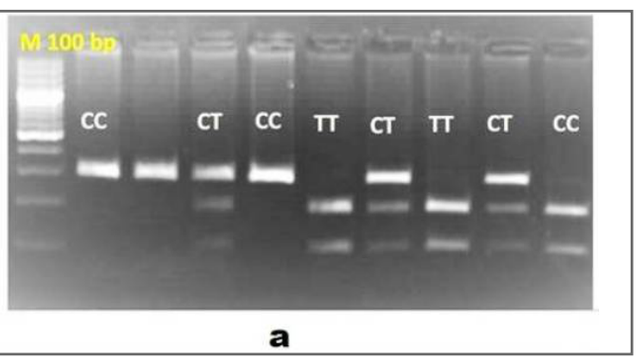


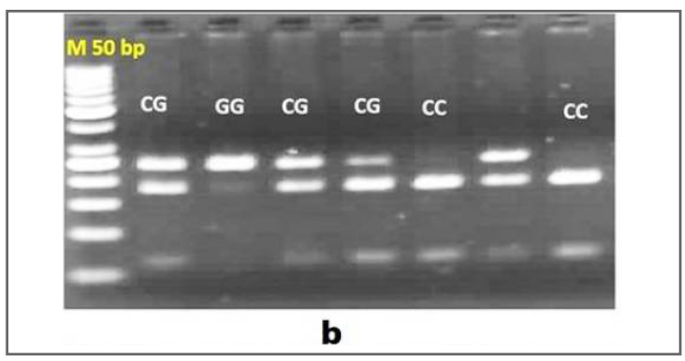
Infrared thermographic images of sows. (a) Vulvar skin temperature of the non-estrus sow, (b) Gluteal skin temperature of the non-estrus sow, (c and d) Vulvar skin temperature of the oestrous sow.

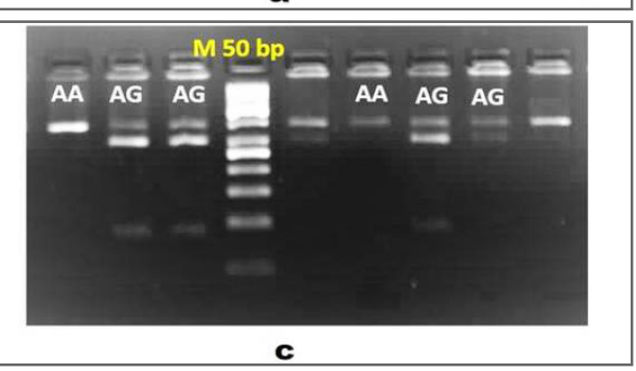


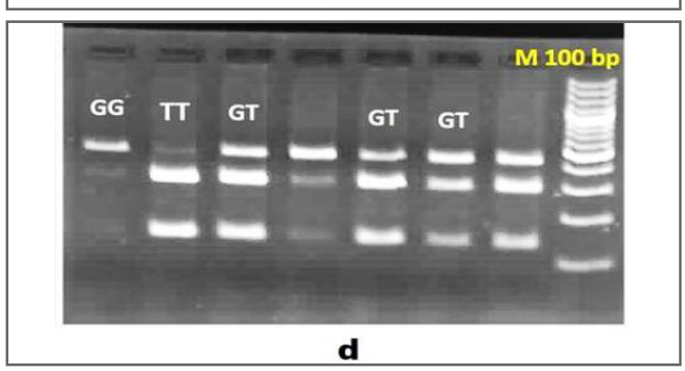
Amplification of 12 MSY genes in the pig genome

Genetic variability in different candidate genes and their association with re(production) traits in pigs : To explore the genetic variability in the FSHB, Leptin, ESR1, ESR2, Leptin Receptor (LEPR), RBP4, PRLR Gene and their association with reproduction traits in indigenous pig population, all the SNPs in exonic region of these genes were targeted. The SNPs accessible by PCR-RFLP technique were selected and suitable primers were designed by Primer3 online available software. A total of 25 set of primers were standardized by gradient PCR for appropriate annealing temperature for genotyping of 38 SNPs. The primers were amplified by PCR using Thermocycler such that it comprises the desired SNPs. The genotyping of SNPs was done by PCR-RFLP technique. The amplified PCR product was digested using specific Restriction enzyme. The RE was selected using online available software NEBcutter V2.0. On the basis of the resolved gel images and presence of different fragments, the genotype of each animal was determined for all the SNPs. The genotyping of SNPs shown that out of 38 SNPs 30 were polymorphic in the many SNPs were polymorphic in our population. The association of polymorphic SNPs with reproduction traits is under process.





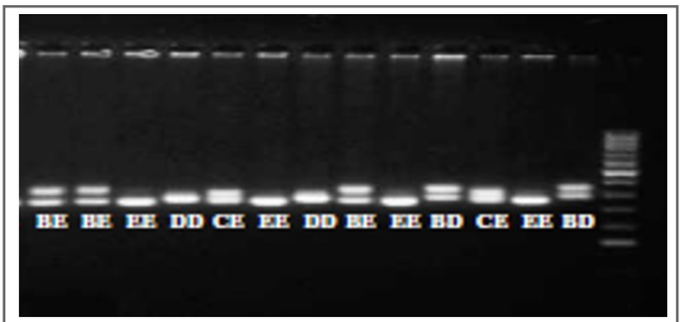




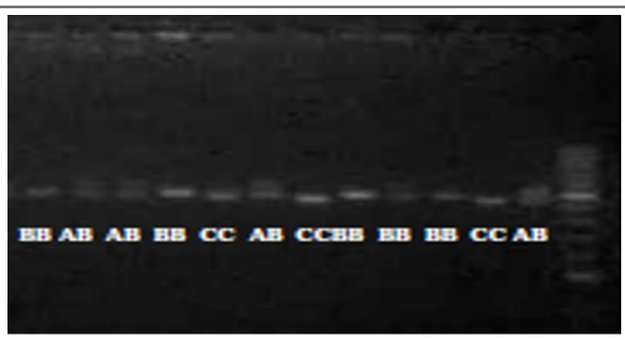
Genotypic profile of SNPs a) rs789053059 in ESR1/AccI b) rs11112875579 in ESR2/BclI c) rs80995712 in RBP4/Hpy166II d) rs1110706811 in LEP/TaqI by PCR-RFLP

Molecular Characterization Of Indigenous Pig Breeds : The indigenous pig breeds viz. Ghoongroo, Agonda Goan, Doom and Niang Megha were targeted to characterize by microsatellite markers. The markers used for molecular characterization were selected based on ISAG–FAO recommendation. The primers were standardized for suitable annealing temperature by thermo cycler gradient temperature. The primers that were amplified in our indigenous population were labelled by fluorescent tag for multiplex PCR. The multiplex PCR for genotyping the animals for each marker is being standardized.

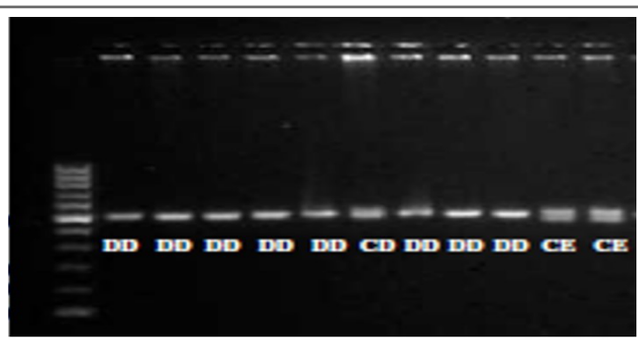
Allelic profile of S0026 MS Locus



Allelic profile of Sw240 MS Locus



Allelic profile of S0355 MS Locus



Allelic profile of S0002 MS Locus

Allelic profile of Microsatellite markers in Ghoongroo pigs a) S0026 b) Sw240 c) S0355 d) S0002

IMPROVEMENT IN PIG FARM MANAGEMENT PRACTICES

Developed ethogram and assessed welfare of desi and crossbred growing pig : The behaviour of Ghungroo, Rani and large White Yorkshire (LWY) were recorded for a continuous 24 hours. For this purpose, behaviors were recorded for six days from six pigs of each breed. The observations were taken on a scanned sampling basis at 10-minute intervals. A total of 144 observations were taken from each pig every day. The lying, sitting, feeding, movement, exploration of the environment, exploratory, agonistic, interaction with pen mate and sexual behaviour were observed. The grower pig spent most of their time in lying conditions followed by exploratory behaviour. The Ghongroo, Rani and LWY spent 73.9%, 74.1% and 65.2% time in lying conditions, respectively. In the daytime (morning 6:00 am to evening 18:00 am) also, Ghungroo and Rani pig spent most of their time in lying condition. The Ghungroo, LWY and Rani pig spent 54.5%, 41.8% and 53.2% of their day time in lying condition, respectively. Other than lying, 12.8%, 25.7% and 11.3% of day time was spent in exploratory behaviour in Ghungroo, LWY and Rani grower pigs. The time budget allotment of grower pigs may broadly be divided into resting time, feeding time, interaction with pen mates, environment exploration and sexual behaviour.

Diurnal zeitgebers of body temperature of neonatal piglets : Assessed whether the newborn piglet follows the diurnal circadian rhythmicity in their body temperature in early life. For these purposes, the rectal temperature of 130 newborn piglets was recorded for consecutive three days from the day after their birth (day 0 is birthday) i.e. day 1, day 2 and day 3 at 2 hours intervals from morning 06:00h to evening 16:00h. The highest

body temperature was found at 14:00 h of the day i.e. 38.7° C, 39.0° C and 39.1° C on day 1, day 2 and day 3, respectively, when the environmental temperature was also the maximum of the day. Their body temperatures also significantly (P<0.01) increased as the day's progressed in their life. The body temperature of day 1, day 2 and day 3 were 38.2° C, 38.6° C and 38.8° C, respectively. The cosinor analysis showed circadian rhythmicity (P<0.01) of body temperature in day 1, day 2 and day 3.

Table : Time budget in different behavior in 24 hr

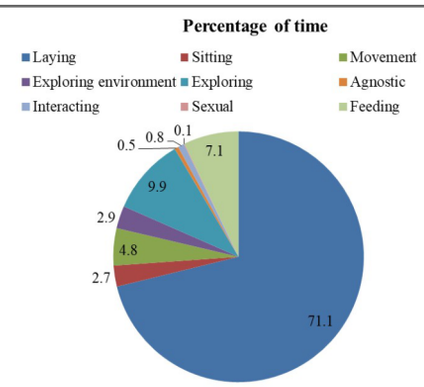
	Lying	Siting	Feeding	Movement	Fence	Exploratory	Agonistic	Interacting	Sex
Ghungroo	1065±13.5	34.86±5.8	109.18±6.3	48.10±5.6	46.21±4.1	108.10±10.9	14.86±1.8	13.51±1.9	0.54±0.7
LWY	939.5±13.0	53.25±5.6	116±6.0	49.5±5.4	29.75±3.9	232.25±10.5	4.5±1.7	14.5±1.9	0.75±0.7
Rani	1066±16.4	30±7.0	82±7.6	107.6±6.8	50±5	88.8±13.2	3.6±2.2	8.4±2.3	3.2±0.9

All the data were presented in minutes

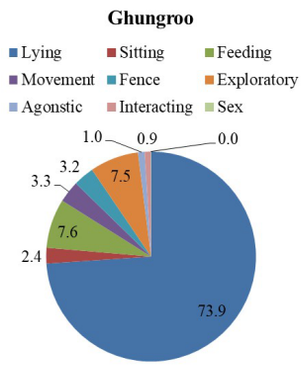
Table: Time budget in different behavior in day time

	Lying	Siting	Feeding	Movement	Fence	Exploratory	Agonistic	Interacting	Sex
Ghungroo	398.108±11.5	31.622±5.1	00	00	00	00	00	00	00
LWY	305.5±11	44.5±4.9							
Rani	388±13.9	29.2±6.2							

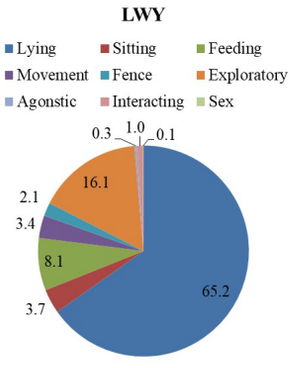
All the data were presented in minutes



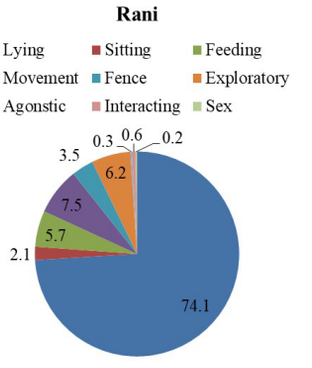
Percentage of times spent in different behaviour in grower pigs.



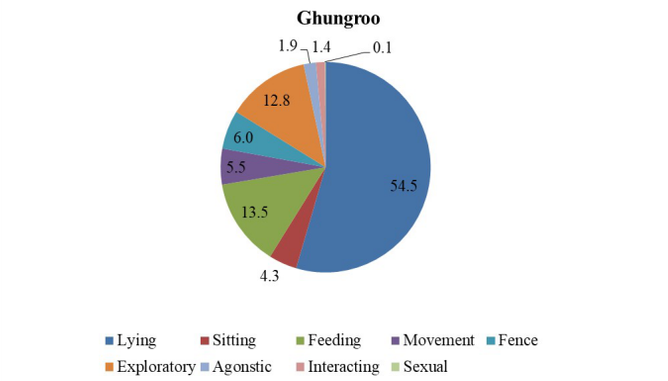
Percentages of time spent by growing Ghungroo Pig



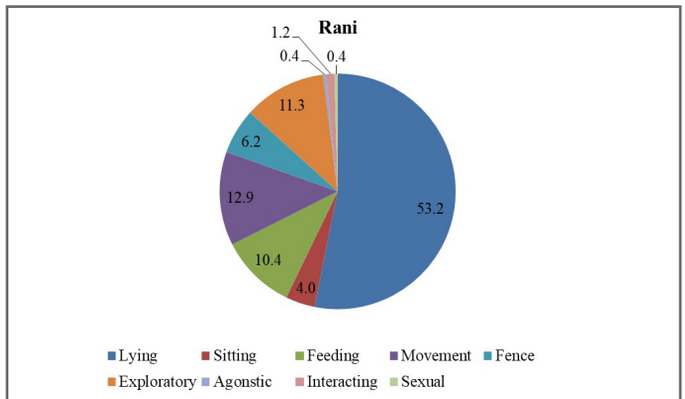
Percentages of time spent by growing Large White Yorkshire Pig



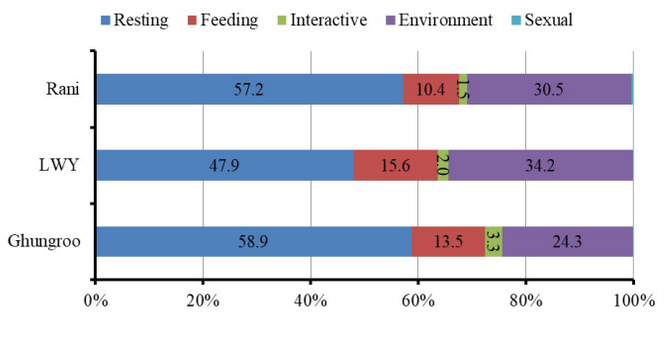
Percentages of time spent by growing Rani Pig



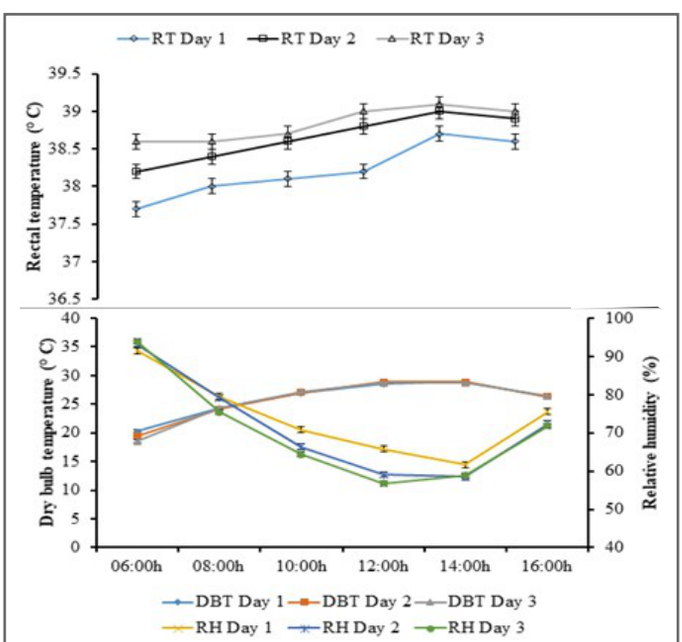
Percentages of time spent by growing Ghungroo Pig during day time (between moring 6:00 h to evening 18:00h)



Percentages of time spent by growing Rani Pig during day time (between moring 6:00 h to evening 18:00h)

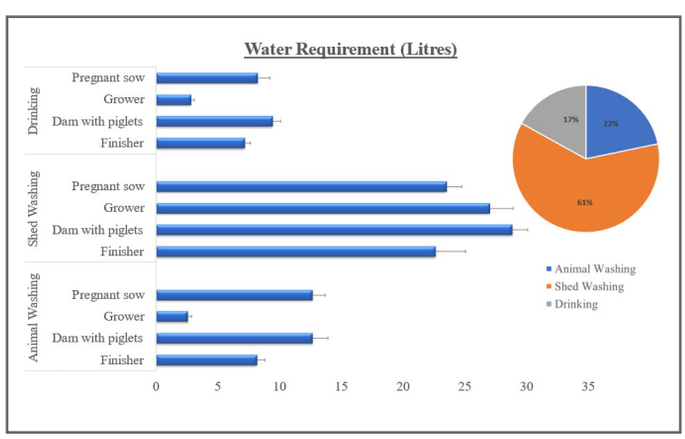


Percentage of time spent in different behaviour in grower pigs during daytime



Body temperature of neonatal piglets, environmental temperature and humidity during different days of early life

Water foot print in pig production and pork processing : Water usage pattern in routine management activities in organized pig farms for Ghungroo pigs at various stages of life were assessed. Measurements were taken using a standard water meter attached to the delivering pipes. Water usage for animal washing, shed cleaning, and drinking purposes were evaluated. Drinking water assessment based on estimation of water disappearance in drinker bowls by subtracting the residual water from supplied quantity was employed. Mean daily water requirement for drinking, animal washing and shed washing were estimated to be 6.9±0.53, 8.8±0.84 and 25.1±1.11 litres, respectively. Water usage for animal washing were 2.5±0.29, 8.15±0.64, 12.6±1.02 and 12.6±1.25 litres, respectively for growers, finishers, pregnant sows and dams with neonates. Meanwhile, for drinking purpose mean water requirement of Ghungroo pigs were estimated to be 2.8±0.27, 7.2±0.44, 8.2±1.01 and 9.4±0.66 litres, respectively for growers, finishers, pregnant sows and dams with neonates.

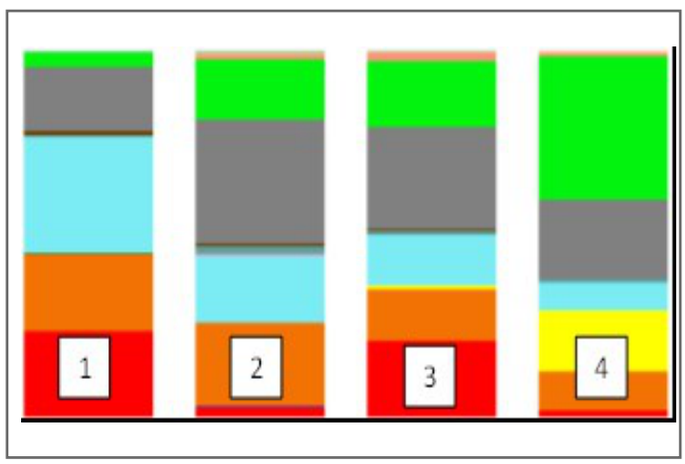


Effect of parenteral antibiotic administration on growth rates of neonates : In order to assess the effect of parenteral antibiotic administration on growth rates of littermates, Group A – of neonates treated with parenteral antibiotic treatment were compared with normal group (Group B). Study was carried out from day 3 to day 10 post-partum, with streptopencillilin injection intramuscularly at 12-hour intervals. No significant difference in growth rates (P >0.05) were observed during the period between the groups. Fecal and salivary samples of pigs reared with probiotic supplementation was compared with normal animals and the samples were sent for whole genome metagenomic analysis to understand the gut microbiome dynamics.

NUTRITIONAL INTERVENTIONS FOR PROFITABLE PIG PRODUCTION

Effect of different fiber levels from vegetable waste silage on in vitro digestibility : Silage has been prepared following standard procedure from vegetable wastes adding jaggery (gur) at the rate of 3kg per 100kg raw chaffed vegetable waste for suitable anaerobic fermentation in silage bags. After 3 weeks silage bags were opened and representative samples were taken for estimation of proximate principles. Vegetable waste silage contained DM, CP, EE, CF, NFE and ash as 67.5, 18.25, 1.95, 18.5, 49.1 and 12.2 per cent on DM basis, respectively. Three types of feed mixtures were prepared using different levels of vegetable wastes silage in such a way that feeds contained about 8, 10 and 12% crude fibre (CF). The feeds so prepared were used for in-vitro digestibility trials using pig faecal inoculum. The in vitro DM digestibility was found as 69.34, 67.26 and 65.61% respectively for feeds containing 8, 10 and 12% crude fibre (CF) level.

Effect of maize fodder supplementation on faecal microbiome of Large White Yorkshire pigs : A high throughput sequencing of pig metagenomes was conducted to investigate the increase in gut beneficial bacteria found in the faecal contents of grower pigs fed with green maize fodder supplemented diet. The study delineates the comparative analysis of the faecal samples of grower pigs at phylum, class, order, family, genus and species level as well as identify the beneficial faecal microbiota involved in fibre degradation and their abundance in the gastrointestinal tract. From this study, it was found that increased level of maize fodder in the diet of Large White Yorkshire pigs enhances the growth of fibre degrading bacteria mainly Fibrobacter succinogenes in the gut microbiota which is very helpful for pigs for increasing feed efficiency.



Stacked Bar chart showing the relative abundance of each phylum within each sample (1=Random), 2=0% Maize, 3=5% Maize, 4=10% Maize). Colour legends indicate abundance different phylum in different samples.

Legend	Taxonomy	1 (%)	2 (%)	3 (%)	4 (%)
	k_Bacteria;p_Firmicutes	31.7	18.1	14	7.5
	k_Bacteria;p_Euryarchaeota	23.4	2.7	20.8	1.8
	k_Bacteria;p_Bacteroidetes	21.1	22.9	14.1	10.6
	k_Bacteria;p_Proteobacteria	17.2	33.8	28	21.5
	k_Bacteria;p_Spirochaetes	4	16.4	17.8	39.1
	k_Bacteria;p_Planctomycetes	1.3	0.8	0.6	0.1
	k_Bacteria;p_Verrucomicrobia	0.5	0.4	0.4	0.1
	k_Bacteria;p_Lentisphaerae	0.4	2	0.9	1
	k_Bacteria;p_Fibrobacters	0	0	0.9	16.8
	k_Bacteria;p_Fusobacteria	0	0.6	0	0
	k_Bacteria;p_Synergistetes	0	1.3	2.4	0.7
	k_Bacteria;p_Tenericutes	0	0.6	0.2	0.7

In vitro dry matter digestibility study using different level of fiber from maize fodder silage in pigs : Three types of diets were prepared using different levels of maize fodder silage in such a way that feeds contained about 8, 10 and 12% crude fibre (CF). The feeds so prepared were used for in-vitro digestibility trials using pig faecal inoculum. The in vitro DM digestibility was found as 66.49, 64.83 and 63.60% respectively for diet containing 8, 10 and 12% crude fibre.

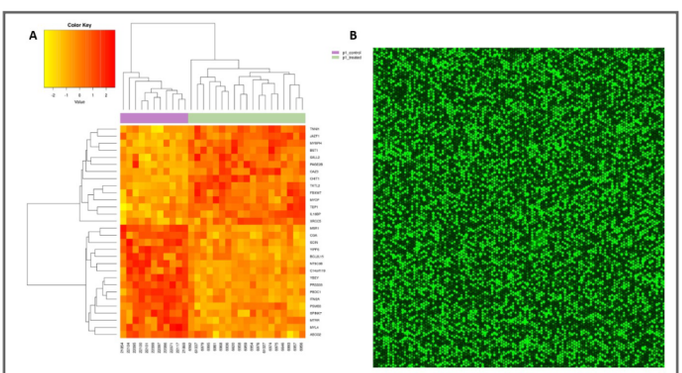
Silage prepared with 3% Jaggery and 0.25 % salt

Maize fodder silage

Standardization of aflatoxin estimation using TLC : Aflatoxin B1 is extracted from finely ground sample with chloroform. It is further purified using column chromatography and then purified extract is condensed by evaporating it to a known volume and then determine its concentration using thin layer chromatography. The feed samples were collected from the farm godown. The samples were finely ground after drying. About 50 g samples were weighed and transferred to 500 ml conical flask. Then added 300 ml of water : chloroform mixture (25 ml : 250 ml). Then the flask was kept in shaker for 30 min. Filtered through whatman filter paper 1 and then 50 ml clear filtrate is collected and condensed to 3-4 ml in hot water bath. Then 2 ml concentrated extract is allowed to percolate through a glass column chromatography (bottom to Top: 1.0 g anhydrous sodium sulphate, 2 g silica gel amd 1.5 g anhydrous sodium sulphate in presence of 20 ml chlroform). The concentrated extract was added as soon as chloroform crosses the layer of sodium sulpate-silica gel-sodium sulphate. Then it was washed with solvent mixture (3:1- diethyether :hexane) and discarded it. Then eluted with 60 ml eluting solvent mixture (97:3) chloroform : ethanol. The eluted mixture was collected in a conical flask. The eluted mixture was evaporated to dryness and dissolved in 200µl chloroform. About 5 µl of sample extract was spot in a pre-activated TLC plate (20x20 cm) along with 5 µl of aflatoxin B1 standard containing 2,4 and 6 ng of toxin per 5 µl. The plate was then kept in a glass jar containing Chloroform: Methanol (95:5) for developing. After 40 min of developing the plate was removed and air dried and spot was visualized under UV chamber. The spot containing aflatoxin B1 was glowing in bluish colour.

IMPROVEMENT OF PHYSIOLOGICAL EFFICIENCY IN PIGS

Development of microarray and screening of animals : A microarray for screening animals with relative increased tolerance as well as minimum level of major production traits adaptation traits was developed. For identification and development of heat tolerant animals, pigs from different breeds (Large White Yorkshire and Ghungroo) reared at ICAR-NRC on Pigs were identified and screening for presence/expression levels of thermotolerance related genes. The animals were selected based on performance of parents and individual animal for maker screening. The study of selected 32 animals shows significant difference the gene expression profile between indigenous and exotic animals. The pigs were also subjected to variable temperature and humidity in a controlled climate chamber with different temperature humidity index (THI) and blood collected for further studies.



Expression analysis of indigenous (Ghungroo) and Exotic (Large White Yorkshire) pigs. A. Heatmap showing relative expression profile upregulated and downregulated genes in 32 animals. B. A representative array picture showing differences in the fluorescent intensity.

Identification of microRNA ssc-miR-193a-3p in heat shock signaling : From the miRNAs, the role of miR-193a-3p in HSF-1 mediated heat shock signalling was evaluated. Specific antisense oligonucleotides were custom synthesised to inhibit miR-193a-3p. The inhibitor and controls were transfected in the porcine fibroblasts and subsequently subjected to heat shock. Immunofluorescent studies on HSF-1 protein suggests a role for ssc-miR-193a-3p in regulation of heat shock response.

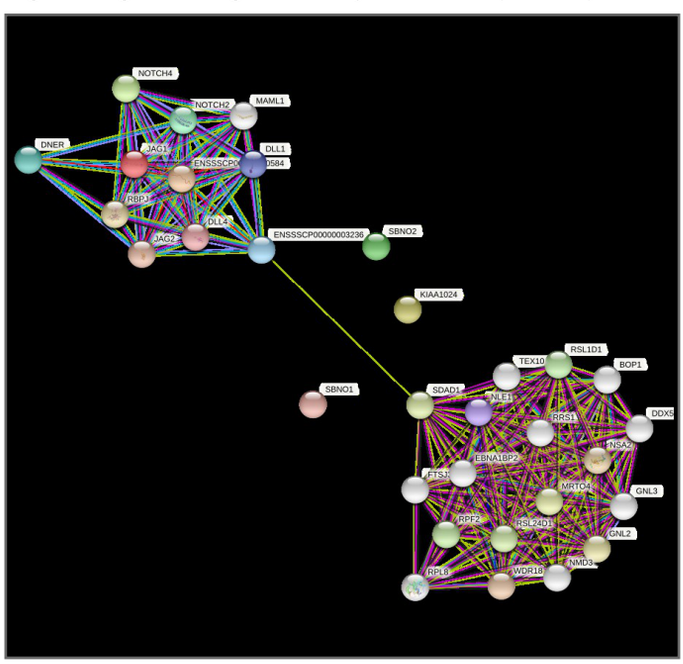
Differential methylation of genome : To identify differential methylation, Methylated DNA immunoprecipitation (MeDIP) was employed to isolate methylated DNA fragments via an antibody raised against 5-methylcytosine (5mC). The purified fraction of methylated DNA was analyzed using next generation DNA sequencing. Porcine DNA isolated from blood during summer/winter season of indigenous Mali breed was processed to identify changes in methylation of genome. The sequenced data was processed and aligned with recent build of pig genome (Sus Scrofa 11.1) to identify differentially methylated regions (DMRs). The analysis reveals 225 DMRs (80 down and 145 upregulated regions) out of which 179 were intergenic, 36 intragenic, 7 in 5`promoter and 2 in 5`UTR regions. The study suggests seasonal differences in methylation.

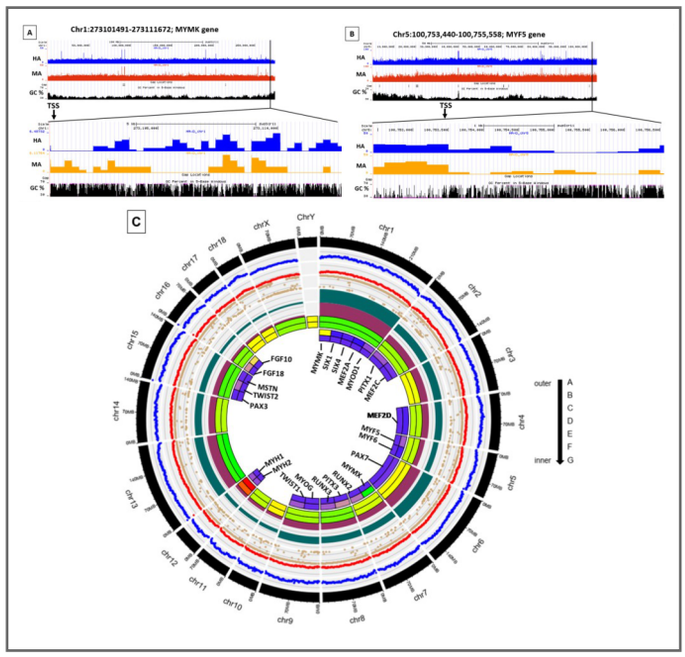
Whole genome sequencing of pig genetic material : Whole genome of indigenous (Ghungroo and Mali) and exotic (Hampshire and Large White Yorkshire) was undertaken using Next Generation Sequencing in Illumina Platform with approximately 50X depth. The processed raw data were aligned to Sus Scrofa 11.1 reference genome to identify variants. The study identified 15809 common SNVs in indigenous pig breeds as against 4145 in exotic animals. Unique variants of heat shock protein genes were identified in Mali (23 nos) and Ghungroo (42 nos) genome, with implications on adaptability of indigenous animals.

Early fertility markers in pigs : Evaluation of semen quality through microscopic analysis of morphology, acrosome, cell membrane and functional tests such as spermatozoal motility, methylene blue reduction, mitochondrial potential has been used effectively assess the male fertility and fertilisation related events. However, increasing number of idiopathic infertility and inability of explain differential fertility of boars with similar motility and morphological parameters points to the inadequacy of conventional methods for more precise assessment of fertility. In the present study, boar semen from 4 more animals examined to assess spermatozoal transcriptome using RNA-seq and compared with the fertility status of boars used in the AI programme of the institute. The expression statistics of genes during spermatozoal RNA sequencing was reported earlier. Based on the transcriptome, genes were selected representing roles in the spermatogenesis, spermatozoa, fertilization and zygote development. The expression profile of the spermatozoa genes in the semen of 18 boars with known fertility status to validate the transcriptome study. In the present period of report, semen from 6 boars animals was examined to assess spermatozoal transcriptome using RNA-seq and compared with the fertility status of boars used in the AI programme of the institute. A total of 27881 and 27997 transcripts were detected in boars with low and high fertility, respectively. There were 27018 common genes with 979 genes unique to animals with high fertility. Analysis of differentially expressed genes suggests important role for transcripts related to olfactory signaling, formation of lysosomal complex and cellular signaling in promoting higher fertility. Enriched pathways in high fertile animals included Gonadotropin-releasing hormone receptor pathway (P06664), De novo pyrimidine deoxyribonucleotide biosynthesis (P02739), Histamine H1 receptor mediated signaling pathway (P04385), De novo purine biosynthesis (P02738), Apoptosis signaling pathway (P00006), Cortocotropin releasing factor receptor signaling pathway (P04380), p53 pathway (P00059), Inflammation mediated by chemokine and cytokine signaling pathway (P00031), Opioid proopiomelanocortin pathway (P05917), 5HT2 type receptor mediated signaling pathway (P04374), ATP synthesis (P02721), Thyrotropin-releasing hormone receptor signaling pathway (P04394), Oxytocin receptor mediated signaling pathway (P04391).

Concurrent transcriptome and methylome analysis of pig breeds with varying muscularity: Improvement of muscle traits is an important priority of pig breeding programmes and there is considerable variability in muscularity among the

pig breeds. The objective of the study was to obtain insights into myogenesis in two breeds of pigs with divergent muscularity (Mali and Hampshire). Muscle transcriptome and methylome data was integrated with histology, immunofluorescence and meat yield) to identify difference between breeds during early growth phase. Muscle transcriptome identified 20226 mRNAs out of which 15170 were across the samples. Expression of genes related to early determination (MYF5, MYOD1) and myoblast fusion (MYMX and MYMK) were higher in Hampshire than Mali even though levels of several myogenesis related genes (MYF6, MYOG, MSTN) were similar. During the study 1549 differentially methylated regions (P<0.1) were identified. The number of fibers per fascicle and expression of myogenic marker proteins (MYOD1, MYOG and PAX7) was more in Hampshire as compared to Mali breed of pig. Common transcripts both in Mali and Hampshire muscle samples revealed enrichment of genes (P<0.01; >1.5 fold enrichment) related to various myogenic process (myotube development, myoblast proliferation, fusion, myosin complex, cytoskeleton and myofibril development, regulation of morphogenesis, muscle fibre adaptation and satellite cell regulation, cellular response to cytokine stimulus). Among cellular pathways, JAK-STAT signalling, WNT ligand, biogenesis and trafficking, regulation of pluripotency, myogenesis, RUNX, Mitogen-Activated Protein Kinase (MAPK) Hedehog signalling were significantly enriched (P<0.01)

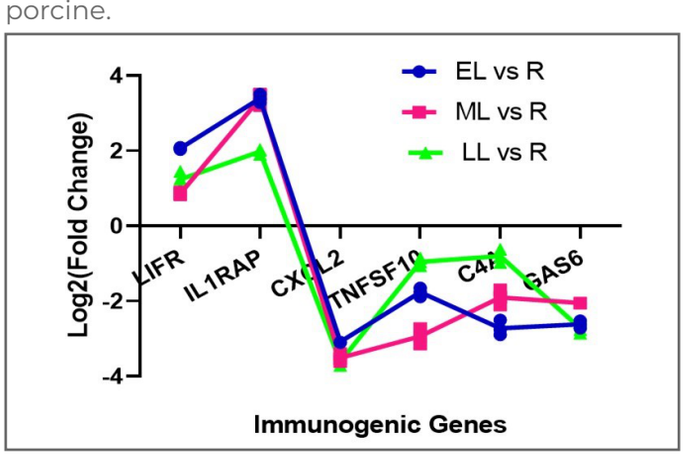




Methylation of genome in relation with expression of myogenesis associated genes A.Methylation in the promoter region of MYMK gene in Mali as compared to Hampshire breed of pig.;B. No difference in the methylation in the promoter region could be observed with respect to MYF5 gene; C. Circos plot showing genome wide methylation in Mali and Hampshire breed of pigs. Legend within circos plot are: A-Chromosome-wise methylation in Mali; B-Chromosome-wise methylation in Hampshire; C-p-value distribution of methylation across chromosomes. The inner dots indicate lowest p-values; D-Distribution of CpG methylations in Mali; E-Distribution of CpG methylations in Hampshire; F: Relative enrichment of CpGs as compared to reference genome- green-yellow-red indicating low-medium- high values; G- Relative expression of genes in Mali (outer circle) as compared to Hampshire (inner circle) (blue-yellow-green indicating low-medium- high values). TSS- transcription start site.

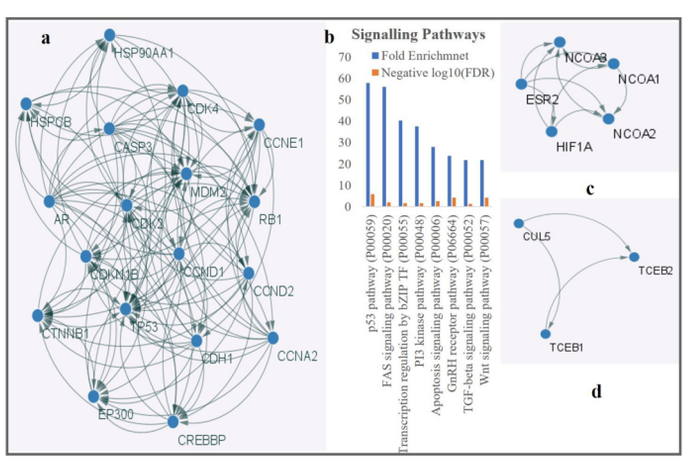
Expression dynamics of immunogenic genes in ovarian follicles and corpus luteum during ovarian cyclicity in the pigs : To better understand the involvement of immune-system behind the follicular to luteal transition in porcine, analysis of transcriptome profile of different developmental stages of ovarian follicles (OF) viz. small follicle (SF) and large follicle (LF) and corpus luteum (CL) viz. early (EL), mid (ML), late (LL) and regressed (R) luteal stages during estrous cycle was carried out. Individual transcripts were assembled, differentially expressed genes (DEGs) were identified, functionally annotated and subsequently analysed

for immune related genes, immunogenic pathways and protein-protein interaction (PPI) network analysis. The findings in ovarian follicles indicated that genes related to humoral immune response and immune system process viz. OAS1, ZP4, SLA-DQB1, CXCL16, LTA, C5, LHCGR, AIF1, S100A12, TYROBP and IFI3 were upregulated in large follicular stage. In CL, the immunogenic genes like TNFRSF12A, IL1RAP, LIFR, NTRK1, semaphorins and CD83 were upregulated in EL during luteal stage whereas CD36, cathepsinL, NFATC2, CXCL14, FCER1G, NDRG2, C4A, C7, CXCL2, TNFSF10, AMHR2 and EDA genes were downregulated during EL stage. In the ML stage all these genes were downregulated except TNFRSF12A and IL1RAP, which were upregulated while in LL stage only TNFRSF12A, CD83, F11R and KIT genes were upregulated. None of these genes were expressed in ovarian follicles, indicating their unique expression in luteal stages. PPI network and pathway analysis revealed that IL1B gene regulates expression of IL1R1 and IL1RAP and further upregulates the expression of rate-limiting enzymes, prostaglandin synthase 1 (PTGS1) and PTGS2 critical for endometrial synthesis of prostaglandins during the peri-implantation period for the successful establishment of pregnancy in porcine.



The expression profile of key immunogenic genes in CL wherein LIFR and IL1RAP were upregulated whereas CXCL2, TNFSF10, C4A, and GAS6 genes were downregulated during different luteal stages in porcine.

Pathway analysis of androgen receptor (AR) signalling in corpus luteum in pigs : To explore the role of hub gene, androgen receptor (AR) in early luteal stage, AR KO luteal cell culture system were established by CRISPR/Cas9 genome editing technique. The downstream effects of deficiency of AR gene in luteal cells were studied with respect to steroidogenic genes by qPCR, ELISA for progesterone and cell viability using annexin assay. Further, the cross-talking proteins of AR was retrieved and the PPI network based on Sus scrofa protein was predicted. The genes in the network were further explored by functional annotation study for gene ontology (GO) for biological process (BP), molecular function (MF) and cellular component (CC) along with pathway mapping of the genes by KEGG and Reactome database, employing enrichment strength and false discovery rate (FDR) p-values ($p<0.05$) corrected for multiple testing within each category using the Benjamini–Hochberg procedure. The network was then imported into Cytoscape and top 10 hubba nodes in the network were ranked using topological measure betweenness in Cytohubba plugin. Cluster analysis was performed to club the genes of similar biological function using MCODE plugin. The genes in the cluster were further subjected to functional pathway analysis in the PANTHER database. The qPCR and annexin assay results along with bioinformatics analysis mapped AR gene to signalling pathways associated with luteal cell functionality mainly steroidogenesis, growth, proliferation and secretion.



MCODE cluster in a protein-protein interaction network. (a) Cluster 1; (b) PANTHER pathways of cluster 1; (c) Cluster 2; (d) Cluster 3 as the highly interconnected subnetwork within the network.

Transcriptome analysis reveals novel genes regulating developmental process : To better understand the molecular basis of follicular development and function, comprehensive transcriptome profiling of porcine follicles was conducted using NovaSeq600 sequencing platform. Transcriptome analysis showed a total of 11,993 genes commonly expressed in both the follicle groups, while 709 and 479 genes were unique to SF and LF stages, respectively. Differentially expressed genes (DEGs) were identified using DESeq2 with threshold of padj<=0.05 and log2FoldChange>=0.0, which revealed 284 upregulated and 223 downregulated genes in LF compared with SF. DEGs were significantly (p<0.05) enriched in KEGG and Reactome pathways and were enriched in immune system process, steroid metabolism and response to stimulus, depicting intra-follicular control of diverse ovarian function. Gene ontology enrichment revealed that ovarian steroidogenesis, steroid hormone biosynthesis, retinol metabolism and IL7 signalling was the top enriched pathway in the LF stage, indicating steroidogenic advantage of LF over SF. This study identified the putative novel genes regulating follicular dynamics from SF to LF stage, which receives the ovulatory stimulus and releases oocyte for fertilization and this has important bearing on litter size in sows.

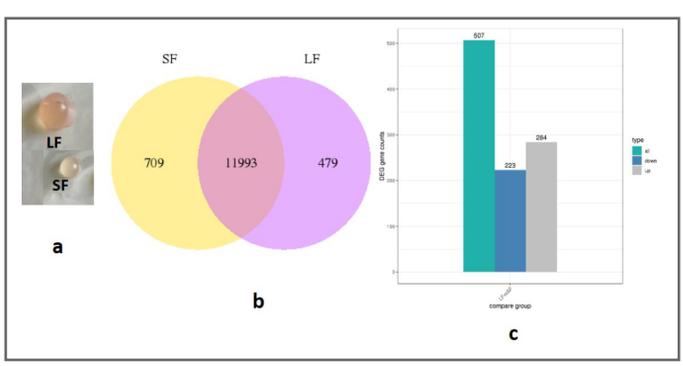
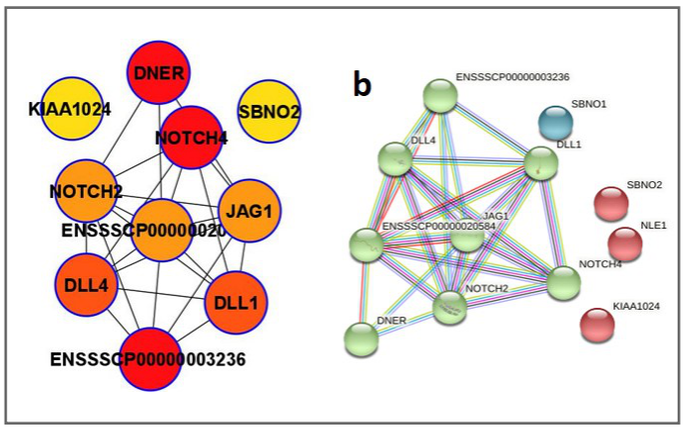
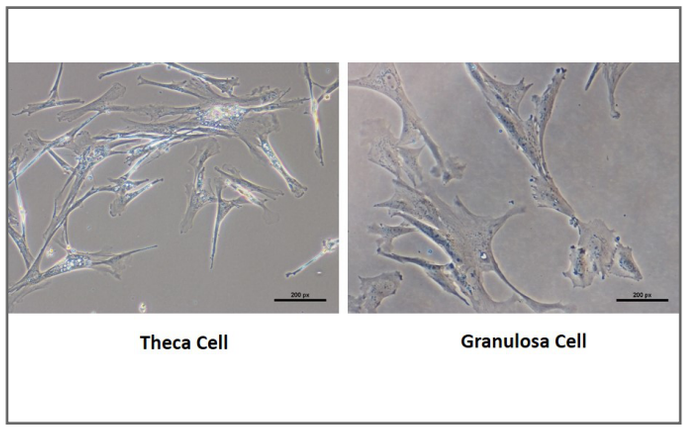


Image showing (a) large follicle (LF) and small follicle (SF) used for transcriptome analysis (b) Venn Diagram showing transcript abundance during different follicular stage (c) Bar chart showing number of DEGs, up- and down-regulated during different follicular stage comparison

Exploration of Notch system pathways during early luteal development in porcine : The RNA-Seq data from different luteal stages of development was mined to explore Notch system, which revealed expression of Notch Receptor 2, Notch Receptor 3, Notch Receptor 4 genes and their ligands Delta like canonical Notch ligand 1, Delta like canonical Notch ligand 3, Delta like canonical Notch ligand 4 and Jagged canonical Notch ligand 1 along with other genes. The genes were further explored for their protein-protein-interaction (PPI) analysis using STRING, which revealed functional association between all the genes of the notch system with number of nodes: 32, number of edges: 201, average node degree: 12.6, average local clustering coefficient: 0.866, PPI enrichment p Value: <1.0e-16 and 10 number of 1st and 2nd shell interactors. The network was then imported into Cytoscape and top 5 hubba nodes in the network were ranked using Clustering Coefficient in Cytohubba plugin, which indicated Notch 4 and Delta/notch like EGF repeat containing (DNER) as the hub genes regulating multiple pathways associated with notch signalling. In addition, cluster analysis was performed to club the genes of similar biological function using K-means clustering in STRING, which yielded 3 clusters of which Cluster 2 had significant role in regulatory network. The genes in the cluster were further subjected to functional pathway analysis using Sus scrofa as reference list applying Fisher's exact test with FDR correction, which indicated role of Notch signalling in binding, development, differentiation and morphogenesis. These functions are associated with luteal cell growth and proliferation and hints at critical role of Notch signalling in porcine ovary. To further study the juxtacrine mechanism of Notch system during follicular development, in vitro porcine granulosa and theca cell culture system was established from small and large developmental follicles, treatments were given to cells for particular temperature-time duration and subsequently cell pellet were obtained by trypsinization for total RNA and protein isolation for downstream analysis.



Protein-Protein Interaction Study. (a) Hub-gene analysis using Cytohubba in Cytoscape. Nodes are ranked according to the Clustering Coefficient. Darker colour in red indicates hub genes. (b) Cluster analysis using K-means clustering of the genes of Notch system with similar biological function.



Images from porcine Theca and Granulosa cell culture (20X)

IMPROVEMENT OF REPRODUCTIVE EFFICIENCY IN PIGS

Preservation of boar semen using different additives in liquid and frozen state : Boar spermatozoa are highly susceptible to cold and cryo shock owing to the high protein to phospholipid and low cholesterol to phospholipid ratios in the sperm plasma membranes. Therefore, fresh and liquid boar semen are exclusively used in pig artificial insemination. Maintenance of fertilizing capacity of the stored boar spermatozoa at low and sub-zero temperature for longer duration is difficult.

The present study was planned to improve the quality of boar spermatozoa during storage at 5℃, which is also the temperature of equilibration prior to cryopreservation. Semen samples with optimum quality was stored at 5℃ in a refrigerator up to 72h in Lactose Egg yolk (LEY), Androhep and GEPS extender with or without addition of a membrane stabilizer, Trehalose in each extender. The quality of the stored semen sample was evaluated for sperm, motility, viability, intact acrosome and membrane integrity at 0 (immediately after dilution), 24, 48 and 72h of preservation.

Table : Effect of membrane stabilizer on the motility of boar spermatozoa during storage at 5°C

Treatment	Preservation period (h)			
	0h	24h	48h	72h
Androhep	82.08±0.74	44.61a±1.21	33.75b ±0.56	5.46 a ±0.47
Androhep +Trehalose	82.91±0.74	45.09 a ±1.03	40.08 d ±0.59	8.12 c ±0.67
GEPS	80.83±1.03	44.07a ±1.81	31.08 a ±0.45	4.37a ±0.18
GEPS+ Trehalose	83.00±0.67	47.02a ±1.43	36.32 c ±0.81	6.04ab ±0.40
LEY	83.33±0.71	52.14b ±1.81	38.55d ±1.03	7.77bc ±0.81
LEY + Trehalose	84.16±0.56	56.08 b ±1.86	42.41 e ±0.87	10.28 d±1.08
Overall	82.72±0.32	48.17±0.81	37.03±0.54	7.01±0.35

Sperm motility was significantly higher ($p<0.05$) in all extenders supplemented with Trehalose than without supplementation from 48h to 72h of preservation at 5 . The acceptable motility of ⩽50% was found up to 24 h of preservation at 5 in semen sample extended in Lactose Egg Yolk Extender (LEY) with or without addition of Trehalose. However, LEY extender with the supplementation of Trehalose showed the highest sperm motility followed by Androhep extender with the addition of

Trehalose. Percentage of live spermatozoa differed significantly ($p \leq 0.05$) between the extenders at different hours of preservation from 0 through 72h. Highest live sperm count of boar spermatozoa was found in LEY extender with the addition of Trehalose. Addition of trehalose also improved the sperm viability in all extenders during preservation at 5° up to 72h of preservation.

Table: Effect of membrane stabilizer on the viability of boar spermatozoa during storage at 5°C

Treatment	Preservation period (h)			
	0h	24h	48h	72h
Androhep	82.08±0.74	44.61a±1.21	33.75b ±0.56	5.46 a ±0.47
Androhep +Trehalose	82.91±0.74	45.09 a ±1.03	40.08 d ±0.59	8.12 c ±0.67
GEPS	80.83±1.03	44.07a ±1.81	31.08 a ±0.45	4.37a ±0.18
GEPS+ Trehalose	83.00±0.67	47.02a ±1.43	36.32 c ±0.81	6.04ab ±0.40
LEY	83.33±0.71	52.14b ±1.81	38.55d ±1.03	7.77bc ±0.81
LEY + Trehalose	84.16±0.56	56.08 b ±1.86	42.41 e ±0.87	10.28 d±1.08
Overall	82.72±0.32	48.17±0.81	37.03±0.54	7.01±0.35

Table: Effect of membrane stabilizer on the percentage of intact acrosome of boar spermatozoa during storage at 5℃

Treatment	Preservation period (h)			
	0h	24h	48h	72h
Androhep	69.77 ab ±1.13	41.78 a ±1.32	30.28 b ±0.79	5.07 ab ±0.27
Androhep +Trehalose	73.80 cd ±0.98	47.02 b ±0.94	34.22 c ±0.82	6.77 bcd ±0.58
GEPS	66.81 a ±1.09	39.84 a ±1.21	27.27 a ±0.96	4.25 a ±0.21
GEPS+ Trehalose	71.14 bc ±0.99	43.40 a ±1.15	31.42 b ±0.86	6.29 bc ±0.59
LEY	72.29 bcd ±1.34	47.54 b ±1.26	34.32 c ±0.98	7.38 cd ±0.74
LEY + Trehalose	75.45 d ±1.04	52.11 c ±1.32	36.92 d ±0.88	8.23 d ±0.79
Overall	71.54±0.54	45.28±0.68	32.41±0.51	6.33±0.27

Percentage of intact acrosome in boar spermatozoa differed significantly ($p \leq 0.05$) between the extenders with or without addition of Trehalose during preservation at 5℃. LEY extender maintained highest percentage of intact acrosome than the other combinations at different hour of preservation up to 72 h. Androhep with the addition of trehalose showed significantly higher percentage of intact acrosome than the GEPS extender during storage at 5℃.

Table: Effect of membrane stabilizer on the membrane integrity of boar spermatozoa during storage at 5°

Treatment	Preservation period (h)			
	0h	24h	48h	72h
Androhep	67.33 a ±1.50	44.25 ab ±1.29	32.33 a ±0.66	4.78 ab ±0.33
Androhep +Trehalose	72.08 b ±1.29	50.33 cd ±1.23	36.66 b ±0.71	6.39 bc ±0.85
GEPS	67.00 a ±1.41	41.08 a ±1.15	31.56 a ±0.77	4.21 a ±0.35
GEPS+ Trehalose	70.59 ab ±1.00	47.31 bc ±1.33	33.25 a ±0.69	5.64 ab ±0.56
LEY	71.27 ab ±1.86	49.60 c ±1.33	37.70 b ±0.71	6.53 bc ±0.82
LEY + Trehalose	74.64b±1.70	53.46 d ±1.13	40.30 c ±0.75	7.93c±0.95
Overall	70.48±0.66	47.67±0.69	35.30±0.46	5.91±0.30

Percentage of HOST reactive spermatozoa differed significantly between the extenders at different hours of preservation from 0 through 72h. The acceptable HOST reactive spermatozoa of <50% was found up to 24 h of preservation at 5℃ in semen sample extended in LEY and Androhep extenders with the addition of Trehalose. Highest membrane integrity was observed in the spermatozoa in LEY extender with the addition of Trehalose. From the findings of the study, it is revealed that Lactose egg yolk extender (LEY) with the addition of membrane stabilizer, trehalose maintained higher quality of boar spermatozoa during storage at 5°C up to 72h than the other combinations. Addition of trehalose improved the quality of boar spermatozoa during storage at 5°C in all the extenders studied. Addition of trehalose in LEY and Androhep extenders maintained optimum sperm quality required for A.I up to 24h of preservation at 5℃. Therefore, addition of trehalose may be helpful in improving quality of boar spermatozoa during cryopreservation.

Propagation of Artificial Insemination at farmers' field : A total of 757 ejaculates were collected from healthy boars during the year and a total of 1934 liquid boar semen doses were produced and supplied by the Institute for artificial insemination in pigs at the farmers' field and organized farms. One National Training on Artificial Insemination in Pig was conducted for farmers across the country. Demonstrations and lectures on artificial insemination in pigs were delivered in different trainings and awareness programmes conducted under SCSP, TSP, EDP etc. organized by ICAR-NRC on Pig, Rani. Regular advisory services were provided to the farmers at their doorstep and also through telephonic conversations. In addition, several farmers were demonstrated A.I. in Pig and they were provided AI doses and insemination was done. Some of the sows and gilts farrowed. Pregnancy diagnostic and necessary veterinary aids were provided whenever needed. Mineral Mixture, Anti-helminthics and liver tonics were supplied to some of needy farmers. Main emphasis was given on providing the technical knowledge for establishment of units. Knowledge scaling up of farmers. Synchronization of animals also done.The success stories of two farmers were submitted as a part of India@75: Azadi Ka Amrit Mahotsav. Currently, the one unit have achieved self sustaining 6+1 sow unit. Previously, one unit also achieved 6+1 sow units animals but some animals were lost due to sudden mortality and sale of some animals due to fear of incoming outbreak in the herd. The different constrains faced by the farmers are also studied. The main constraint was the inability to purchase the dry concentrate feed followed by timely lack of Veterinary aids. Further multiplication of pigs at their units is in progress.

Ultrasonographic Pregnancy diagnosis and Piglets Produced using A.I. at multiplier units

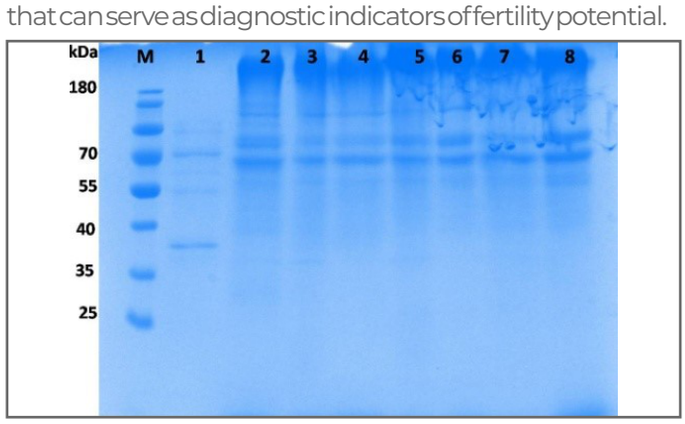
Low cost boar semen preservation tools : Low cost semen preservation tools has been standardized and evaluated for the maintenance of controlled temperature required for boar semen preservation. The devices have been designed as portable one as well as for laboratory use also. The accuracy of temperature maintained is excellent at par with standards. Two types of tools have been standardized. First is Boar semen storage and transportation box and second is Boar semen storage cabinet.

Low cost estrus induction and synchronization methods for optimizing reproductive efficiency : Estrous synchronization was done in female pigs (n=39) at farmers' field. The estrus induction was done using combination of chorulon and folligon (PG 600) and using Folligon alone (FSH/PMSG). Both protocols were compared in terms of estrus induction rate (%), conception rate (CR %), Cost per animal (Rs.) and Injection to estrus induced interval (IEI in Hours).

Table: Comparison of PG600 and PMSG (FSH) protocols used for estrus induction

SN	n	Protocol	Estrus Induction (%)	IEI (hr)	CR%	Cost (Rs.)	Benefit
1	11	PG600	63.36	121.54±3.60	71.42	350	Cumbersome to use
2	28	PMSG	78.57	78.52±4.50	68.18	300	Easier to use

Proteomic analysis in sperm and seminal plasma of low and high fertile boars : Boars were categorized as low and high fertile based on the preliminary evaluation of sperm fertility and field fertility parameters. The procedure of proteomic analysis was carried out as per standardized protocols. After ejaculation and separation of aliquots for sperm evaluation, the remaining semen samples were immediately mixed with a protease inhibitor cocktail containing. Boar semen was then centrifuged at 800 X g for 15 minutes to separate the sperm cell. The supernatant seminal fluid was placed into a new tube and centrifuged at 5000 X g for 60 minutes. The resulting supernatant was aliquoted and stored at -20°C until use. The sperm pellet (300 × 106 spermatozoa) was also stored at -20°C until use. Proteins were extracted from spermatozoa using RIPA buffer with standardized protocol. Single dimensional electrophoresis was carried out and the gel was coomassie blue stained as depicted in Fig. In the present study, no band differentiation was achieved between boar number 2, 3 and 4. The further experiments are in progress. Preliminary results indicated that some of the sperm pellet protein bands in the molecular weight ranging from 35 to 140 kDa and in seminal plasma from 50 to 180 kDa were observed. A total of 5 protein bands with different molecular weight were observed in sperm pellet while in seminal plasma 6 protein bands of different molecular weight were observed. Some of the protein fractions found in seminal plasma were not detectable in sperm pellet. The identification of fertility associated proteins in the porcine semen will be of much useful for selection of breeding boars for AI purpose. The biological effects of seminal plasma proteins on sperm function are complex and not fully understood. It is generally accepted that the binding of seminal plasma proteins to spermatozoa stabilizes the components of the plasmalemma, mask antigens exposed to cell surface and prevent a premature acrosome reaction. Seminal plasma components have been shown to elicit inflammatory response in the female reproductive tract, including altered patterns of cytokine secretions, which may be important for embryo development and implantation. The presented functions of proteins have prompted researchers to search for biochemical markers of seminal plasma that can serve as diagnostic indicators of fertility potential.



Protein profile of Boar Semen in SDS-PAGE. Lane M: Protein Marker; Lane 1-4: Sperm pellet for Boar 1, 2, 3, & 4 respectively. Lane 5-8: Seminal plasma for Boar 1, 2, 3 & 4 respectively

Metabolomic analysis in sperm and seminal plasma of low and high fertile boars : Metabolite profiling of sperm cell and seminal plasma can help in identification of potential indicator of sperm dysfunctions among ejaculates. Gel free ejaculates were collected by double gloved hand method. Separated seminal plasma form ejaculates of high and low fertile boars were subjected to metabolite profiling as per standardized procedures. The identified metabolites were analyzed using MetaboAnalyst 5.0. In the results, it was found that most of the metabolites are involved in metabolism of galactose, amines (glutamine, arginine, histadine, alanine, arginine and proline) and amides (glutamate, aspartate), nitrogem, butanoate, sucrose, glutathione, glyoxylate, dicarboxylate, nucleotide sugar and amino acyl-tRNA biosynthesis. Spermatozoa is a specialized cell with specialized mechanisms of energy production and ion transport. Hence, it is concluded that the identified metabolites are involved in different sperm function and functional processes. The current study may help in identification of metabolites and increased knowledge of their biological functions and differential expression associated with fertile and infertile male semen qualities, serving as biomarker candidates. The differentially expressed metabolites analysis is in progress and pathway enrichment analysis for the mechanisms underlying the metabolic pathway changes in low and high fertile boars.

Standardization of Chemiluminance based assay for demarcating low and high fertile boars: A Chemiluminance based assay for discrimination between low and high fertile ejaculates was standardized. The assay is very simple and easy to perform. It gives a direct cut off value between the low and high fertile boar's semen sample. The sensitivity, specificity and other accuracy evaluation parameters are under standardization. g) Refinement of A.I. technique: Boar liquid semen preservation extender was standardized using cholesterol loaded cyclodextrin (CLC), Vitamin A (Vit-A), Cyanocobalamin (Vit-B), Ascorbic acid (Vit-C), Glutathione (Glt), Linoleic acid (LA), Melatonin (MLT), Mercaptoethanol (MEN). A total of three ejaculates were collected by gloved hand method from healthy fertile boars and processed as per standardized procedures. Extender was prepared using dextrose, EDTA, buffers and three different concentrations of cholesterol loaded cyclodextrin (CLC), Vitamin A (Vit-A), Cyanocobalamin (Vit-B), Ascorbic acid (Vit-C), Glutathione (Glt), Linoleic acid (LA), Melatonin (MLT), Mercaptoethanol (MEN) was added in the prepared extender. As only three ejaculates were used in the study, statistical correlation was not analysed with respect significance of component added in comparison to other components and control. However, preliminary results indicates that cholesterol loaded cyclodextrin (CLC), Cyanocobalamin (Vit-B) and Ascorbic acid (Vit-C) and particularly cholesterol loaded cyclodextrin (CLC) ca nbe provide opportunities for refinement of A.I. technique. Addition of these component can be used to develop a modified long term extender. Further, melatonine, mercaptoethanol and Vitamin A were found non effective components for boar semen preservation. Glutathione and Linoleic acid have moderate positive effective on boar semen preservation. The current study will be extended to develop a new long term extender.

Table. Sperm Motility (%) in boar semen preserved with different components

Component	Treatment (T)	Progressive motility (%)				
		24 hr	48 hr	72 hr	96 hr	120 hr
Control	T0	73.33±6.66	63.33±6.66	35±7.63	26.66±3.33	3.33±1.66
CLC	T1	83.33±3.33	70±3.33	63.33±3.33	56.66±0	46.66±0
Vit-A	T2	56.66±3.33	46.66±3.33	23.33±3.33	10±0	0
Vit-B	T3	73.33±3.33	66.66±4.40	31.66±6.00	23.33±3.33	10±2.88
Vit-C	T4	78.33±4.40	70±5.77	53.33±6.66	25±2.88	6.66±1.66
Glt	T5	70±0	46.66±3.33	35±2.88	23.33±3.33	10±0
LA	T6	66.66±3.33	38.33±1.66	21.66±4.40	16.66±3.33	8.33±1.66
MLT	T7	73.33±3.33	56.66±3.33	13.33±3.33	6.66±0	0
MEN	T8	45±2.88	30±0	10±0	0	0

Characterized the boar seminal gel for biostimulation in pigs: Semen was collected from adult healthy trained boars by double gloved hand method per standard protocol. The SG mass was separated over the collection flask topped with a filter during semen collection. The drooling saliva of boars was collected in sterile vials during semen collection. Initially, for GC-MS analysis, the gel mass, saliva and semen were kept immediately at -20oC for 24 hours. The biological exposure was given twice daily 30 minutes for 15 days by keeping the exposure material in the pen of female near to snout as much as possible. After exposure, interval (hrs) from first exposure to exhibition of interest in smell, restlessness, urination, homosexual mounting, vulvar swelling, redness of vulva and positive back pressure were noted. The estrus was confirmed by back pressure test.

Mass spectrometric analysis of boar seminal gel, saliva and semen: The boar seminal gel, saliva, and semen were subjected to chemical analysis by using optimized GC-MS parameters and the resultant gas chromatograms for seminal gel (a), saliva (b) and semen (c) are presented in Fig. The compositions of the chemical compounds present in boar seminal gel, saliva, and semen identified by GC-MS analysis with their retention time (RT), molecular formula, molecular weight and area (%) are presented in Table. The identified compounds were subjected to metabolite analysis using MetaboAnalyst 5.0 and it was found that the identified compound belongs to categories of alkanes, hydrocarbons, amino acids, sugar alcohols, unsaturated fatty acids, branched fatty acids and fatty alcohols. The enrichment ratio indicated that the highest concentration was of alkanes followed by sugar alcohols, then hydrocarbons, amino acids and fatty acids.

Table 1.Compounds identified in boar seminal gel, saliva and semen using GC-MS analysis#

SN	Compound	M.wt.	M.F	RT	Area(%)	Score
a	**Seminal Gel**					
1	Nonadecane	268	C19H40	6.933	0.46	96.49
2	Tridecenol	198	C13H26O	10.678	0.09	96.81
3	9-(E)-octadecenoic acid	282	C18H34O2	12.263	1.52	95.20
4	Undecane	156	C11H24	12.996	56.23	95.18
5	4-heptanol-2-methyl	130	C8H18O	14.097	0.89	80.04
6	2-isopropyl-5-methyl-1-heptanol	172	C11H24O	17.146	1.98	94.90
7	Hexadecane	226	C16H34	17.645	2.01	71.24
8	3-ethyl-3-methyl heptane	142	C10H22	20.712	5.23	75.68
9	Tetracosane	338	C24H50	22.199	0.24	86.65
10	Henicosane	296	C21H44	23.442	2.98	85.08
11	Dodecane	170	C12H26	24.557	0.89	58.95
12	Nonane	128	C9H20	24.992	100	71.35
13	2,3-butanediol	90	C4H10O2	27.188	3.25	95.20
14	2-methyl butyric acid	102	C5H10O2	28.601	1.23	95.18
15	3-isopropyl-5-methyl-2-hexanone	156	C10H20O	29.557	0.09	91.40
16	2-furanol	84	C4H4O2	30.995	6.23	51.92
17	2,6 dimethyl decane	170	C12H26	31.805	0.51	89.19
18	3,4-hexanedione	114	C6H10O2	32.356	6.89	88.00
19	3-isopropyl-6,10-dimethyl undecane-2-ol	242	C16H34O	34.647	0.08	82.94
20	2-bromotetradecane	277	C14H29Br	36.197	4.56	95.14
b	**Saliva**					
1	Glycerol	92	C3H8O3	8.008	0.25	90.38
2	DL-alanine	89	C3H7NO2	10.712	0.51	95.08
3	4-bromobutyric acid	167	C4H7BrO2	12.263	45.26	96.60
4	Undecane	156	C11H24	15.122	1.89	95.08
5	5-chloro-thiopene-2-carbonyl chloride	181	C5H2Cl2OS	17.146	1.34	96.49

6	6-fluoro-2-trifluoromethyl benzoic acid	360	C20H12F4O2	17.809	1.95	80.04
7	Dodecane	170	C12H26	18.326	1.38	94.90
8	D-fructose	180	C6H12O6	20.229	0.76	71.24
9	Hexadecane	226	C16H34	20.703	1.23	95.48
10	Chiro-inositol	180	C6H12O6	21.289	2.12	88.13
11	3-ethyl-3-methyl heptane	142	C10H22	23.959	1.82	70.43
12	Cyclobutylamine	71	C4H9N	24.992	18.96	83.15
13	Androst-16 en-3-ol	274	C19H30O	25.526	1.02	80.11
14	1-octanol	130	C8H18O	27.076	3.26	73.63
15	3-hexanone	100	C6H12O	28.584	0.09	83.23
c	**Semen**					
1	D-penitol	194	C7H14O6	12.254	0.09	77.99
2	Methyl-alpha-glucofuranoside	194	C7H14O6	16.242	0.11	84.70
3	beta-D-galactofuranose	180	C6H12O6	17.912	0.06	92.94
4	Tetradecane	198	C14H30	20.703	0.04	82.69
5	Ethylenimine	43	C2H5N	23.123	0.09	63.99
6	L-proline	115	C5H9NO2	23.855	0.02	84.27
7	Alanine	89	C3H7NO2	24.268	2.56	96.14
8	L-glutamic acid	147	C5H9NO4	24.725	19.26	95.08
9	3-hexanone	100	C6H12O	25.130	0.13	96.49
10	Undecane	156	C11H24	25.543	100	90.42
11	3-heptanone	114	C7H14O	26.387	0.08	96.81
12	Octane	114	C8H18	27.188	0.03	70.76
13	Dodecane	170	C12H26	27.559	0.12	88.95
14	Hexadecane	226	C16H34	28.170	0.05	83.23
15	2-bromo dodecane	249	C12H25Br	28.601	0.07	71.30
16	1-butene	56	C4H8	31.030	0.04	77.99
17	Eicosane	282	C20H42	31.805	0.09	85.68
18	Tetracosane	338	C24H50	32.296	0.8	86.65
19	2-propanol	60	C3H8O	36.241	0.6	91.25

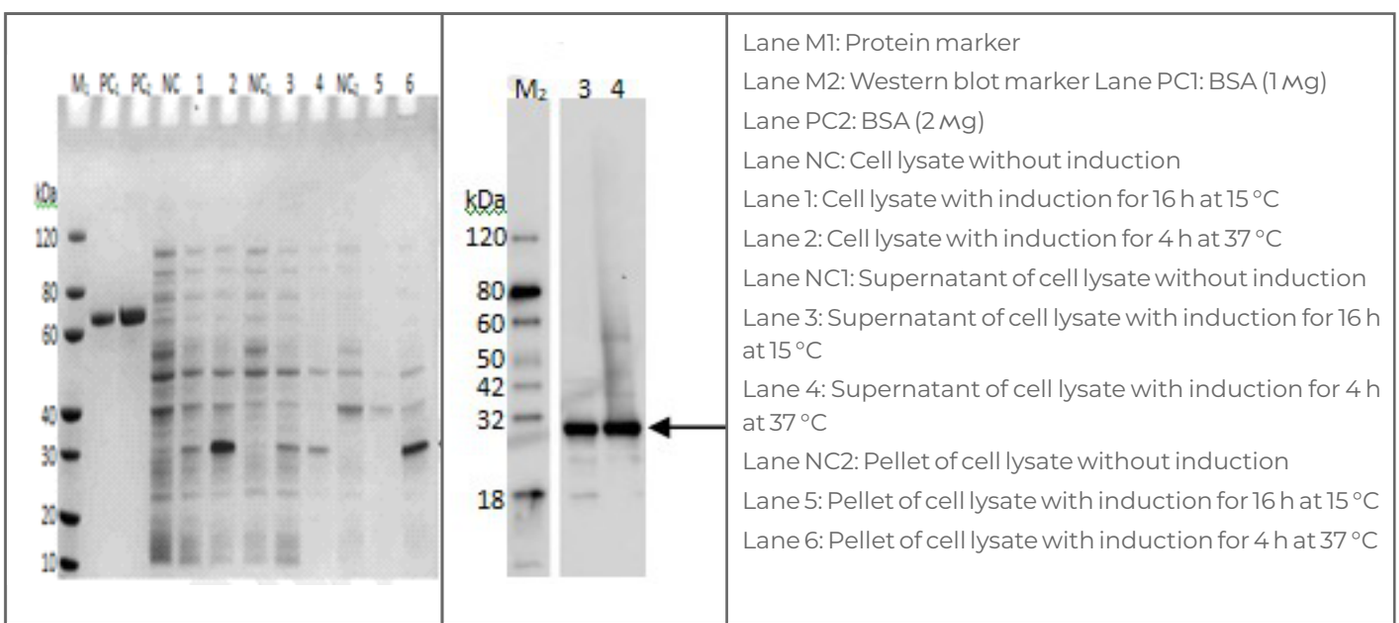
Mass spectrometry analysis of boar seminal gel, saliva and semen was done to identify the novel compounds having pheromonal properties in pigs. It is found that 9(E)-Octadecenoic acid (Elaidic acid) is the novel pheromonal compound identified in pigs that can be used as biostimulatory enhance reproductive efficiency as well as may be explored further to validate its commercial application in pigs. It can be used an exploit as a nasal spray, ointment or gel for biostimulation purposes. Further, other identified compounds such as tridecenol, undecane, 4-heptane-2-methyl, 2-isopropyl 5-methyl-1-heptanol, hexadecone, 3-ethyl-3 methyl heptone, eicosane, tetracosane etc. may be used in combination as pheromones in pigs. Seminal gel, saliva and semen and their combination can be used to induce oestrus and synchronization in females and training of males for artificial insemination purposes in swine. The combination of seminal gel and saliva has a more intense biostimulation effect than gel alone for the training of males as well as induction of estrus in gilts and sows. Newer commercial preparation with identified compounds may provide a breakthrough for oestrous induction and synchronization in swine reproduction.

PIG DISEASE MONITORING AND SURVEILLANCE

LAMP assay for Clostridium difficile : A LAMP assay has been developed for rapid visual detection of Clostridium difficile from pigs. In addition, the assay which was developed for rapid detection of Streptococcus suis from pigs has been further validated using different biological samples from pigs.

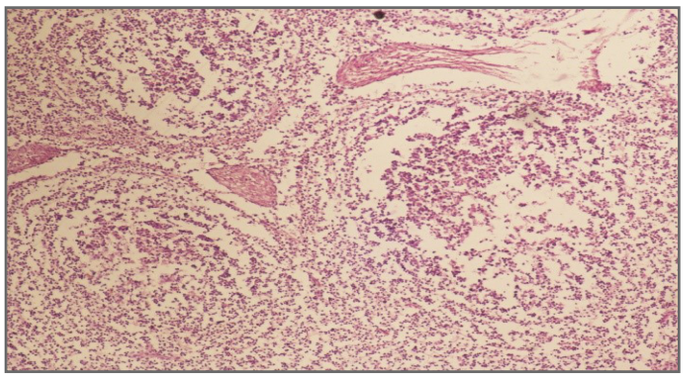
One Health approach to address Zoonotic and Transboundary diseases in India: The number of confirmed cases recorded in the State of Assam (for whole Assam) for selected diseases such as brucellosis, tuberculosis, Japanese encephalitis (JE), cysticercosis, lumpy skin disease (LSD), African swine fever (ASF), porcine reproductive and respiratory disease syndrome (PRRS), listeriosis and salmonellosis were 143, 2, 75, 23, 12, 167, 2, 12 and 146, respectively. The number of confirmed cases recorded for brucellosis and Japanese encephalitis in the state of Sikkim were 59 and 3, respectively. Outbreaks of African swine fever (confirmed cases: 43 nos.) and Porcine reproductive and respiratory disease syndrome (confirmed cases: 6 nos.) have been recoded from Sikkim and this is the first report of occurrence of these two diseases (ASF and PRRS) in the state of Sikkim. In addition, during the reported period we have collected 147 serum samples from the area under study including 26 serum samples from Sikkim. Besides, 25 nasal swabs and 22 tissue samples were also collected in suspected cases.

Development of pen-side tests (lateral flow assays) for detection of JEV, CSF, and PCV2 antigen: E.coli BL21 StarTM (DE3) competent cells were transformed with the recombinant plasmid having 28.689 kDa Porcine Circovirus (PCV) Capsid Protein gene. A single colony was inoculated into LB medium containing kanamycin. Cultures were incubated at 37 °C at 200 rpm. When the culture turbidy reached to OD=0.6-0.8 at 600 nm, 0.5 mM IPTG was introduced for induction in culture. SDS-PAGE and Western blot were used to monitor the expression of 28.689 kDa Porcine Circovirus (PCV) Capsid Protein.

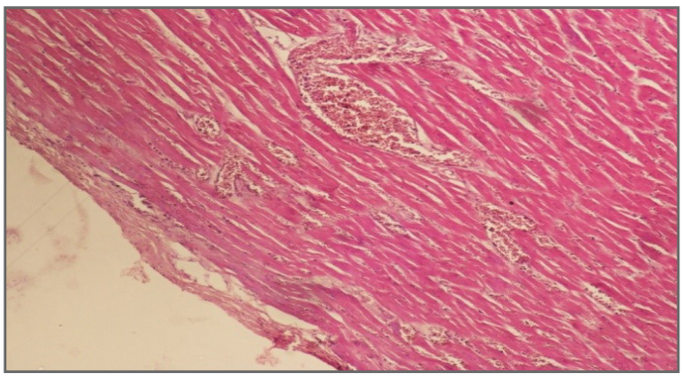


SDS-PAGE (left) and Western blot (right, using anti-His antibody analysis of Porcine Circovirus Capsid Protein in E.coli expression in construct pET30a.

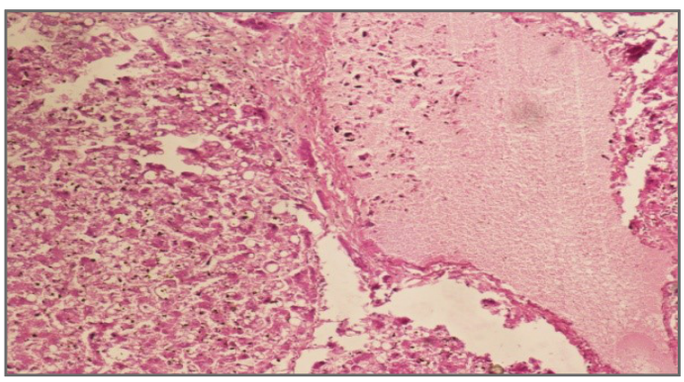
Sero-prevalence and molecular epidemiology of important porcine viral diseases in pigs in NER: A total of 211 nos. of serum samples were screened against CSFV, ASFV, PCV-2, PRRS and JEV from Assam, Meghalaya & Manipur. Sample positive for JEV(61) in serum and PCV-2 positive in 12 samples. A total number of 48 tissue and 31 blood samples were analyzed and 4 sample positive for PCV2 and 2 sample positive for PRRS, 2 sample positive for CSVF and 2 sample positive for ASFV. Histopathological analysis of formalin fixed tissue samples, positive for viral infection for ASFV, PRRSV & PCV2 from slaughter house and field were demonstrated in the H&E stained slides.



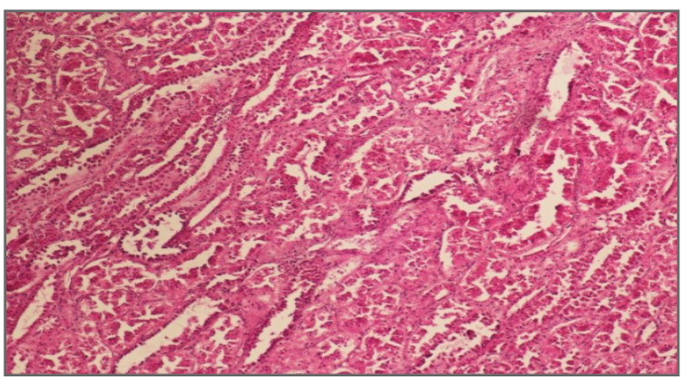
Depletion of lymphocyte from the lymphoid follicle in Lymphnode in ASFV infection.



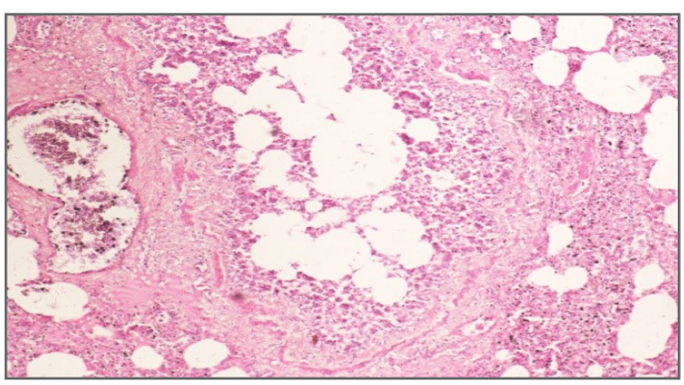
Haemorrhage in the heart muscle (arrow) in ASFV infection.



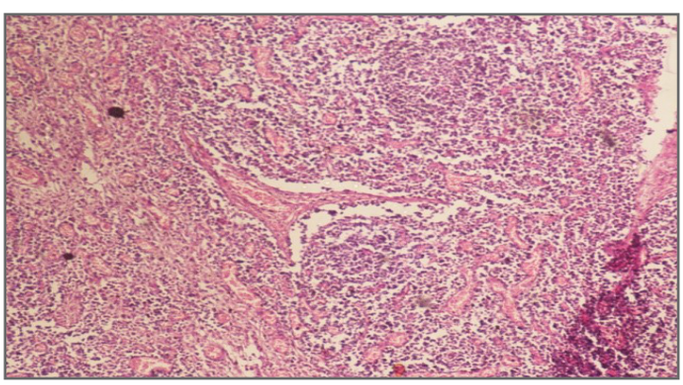
Extensive haemorrhage in the liver (arrow) in ASFV infection



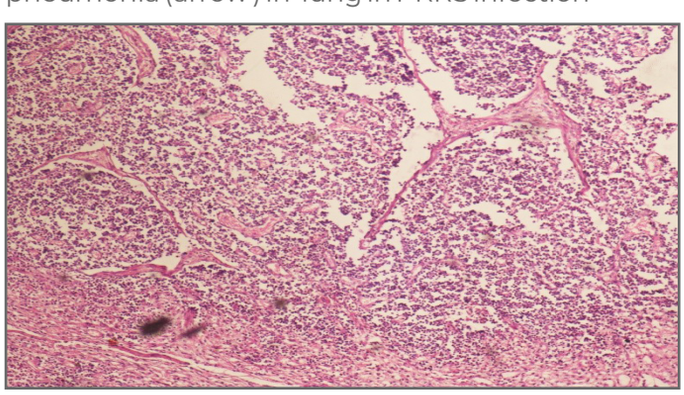
Tubular degeneration and haemorrhage in the kindney (arrow) in ASFV infection.



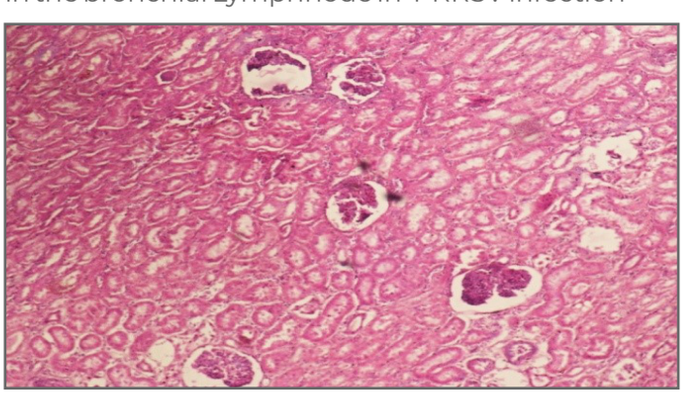
Thickened inter alveolar septa due to interstitial pneumonia (arrow) in lung in PRRS infection



Depletion of lymphocyte from the lymphoid follicle in the bronchial Lymphnode in PRRSV infection

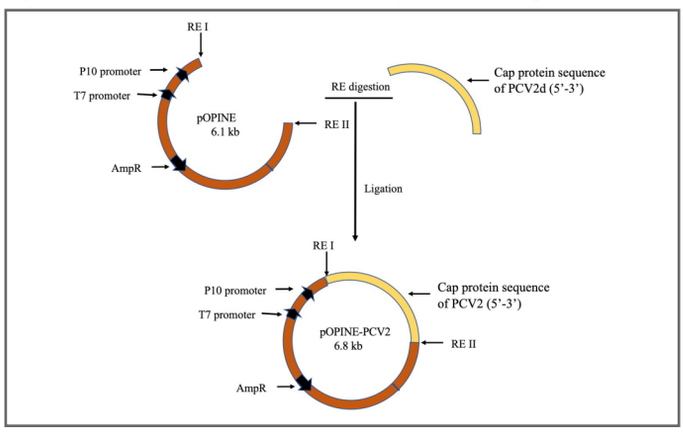


Depletion of lymphocyte from the lymphoid follicle in Lymphnode in PCV2 infection

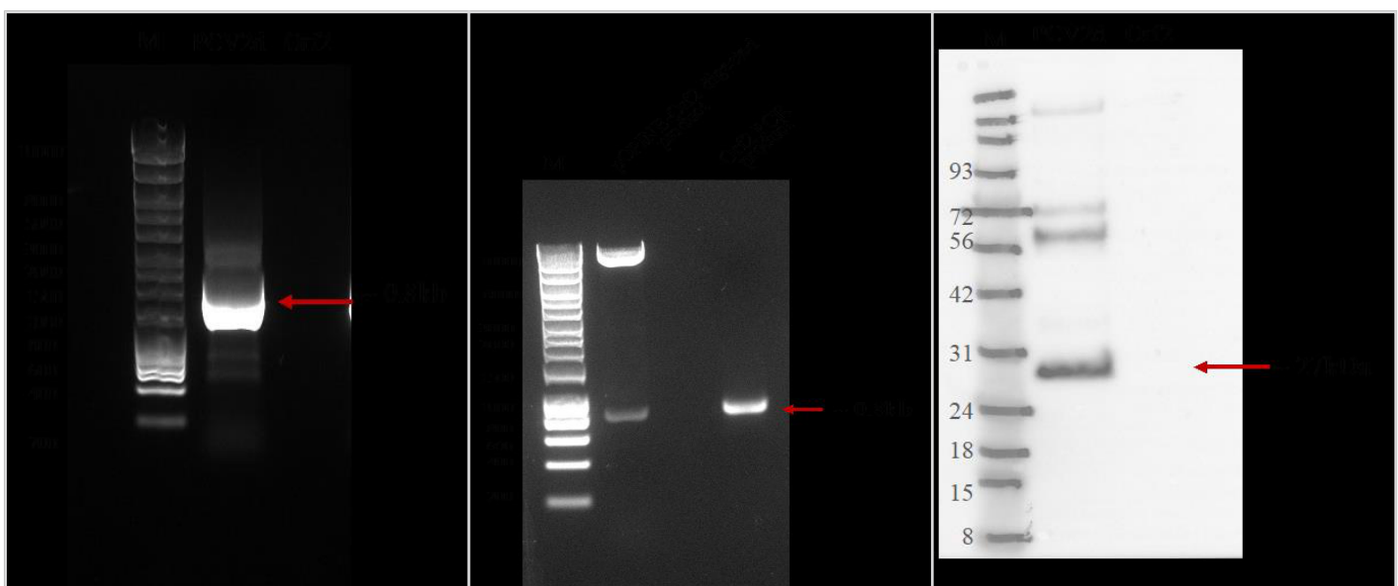


Glomerular and tubular degeneration in the kidney (arrow) in PCV2 infection

Development of a virus like particle- based vaccine against Indian isolate of Porcine Circovirus: PCV2d_ Indian isolate capsid sequence (ORF2) has been selected for synthesis (720bp) (Parthiban et al., 2021). The sequence has been optimised for baculovirus expression system and modified at the 5'end and 3'end by adding respective restriction site and primer sequence. The synthesised orf2 sequence was amplified by PCR. The synthesized sequence subsequently cloned into pOPINE vector (6.1kb), a modified pTruEx1.1plasmid vector (Addgene, USA) to produce recombinant plasmid containing PCV2d capsid sequence (ORF2), as pOPINE_orf2 recombinant plasmid. The cloned pOPINE_orf2 recombinant plasmid was confirmed by lysis with BstEII and NotI fast digest enzymes (NEB, UK). The purified mutant recombinant plasmids along with baculovirus DNA using flashBAC GOLD (OET, UK) were co-transfected in sf9 cells using baculovirus expression system to produce recombinant baculovirus. The recombinant baculovirus were infected into sf9 cells kept for at 27°C for 3 days and confirmed the expression of ORF2 protein form the lysed cell by western blot.



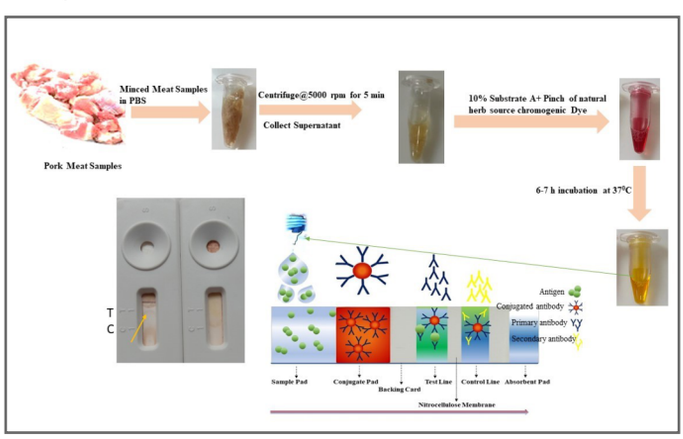
Cloning of cap protein sequence of PCV2d gene in pOPINE Vector



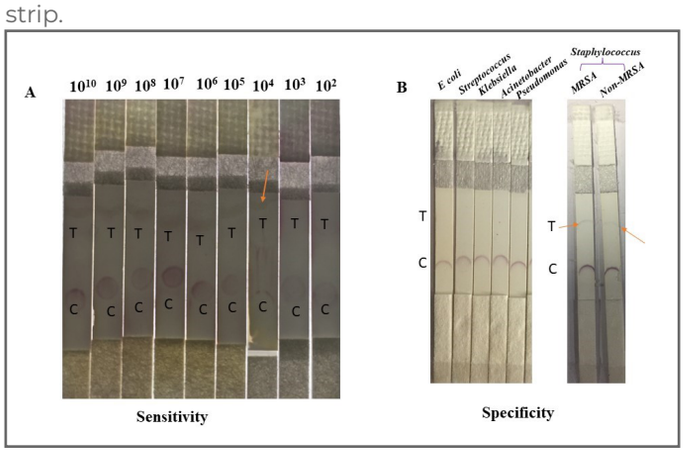
Polymerase chain reaction synthesized PCV2d capsid sequence (ORF2)	Restriction enzyme digestion of pOPINE- PCV2d_Orf2 capsid sequence	Expression of PCV2d_ ORF2 protein by baculovirus expression system in insect cell

Development of Lateral Flow assay for rapid detection of Staphylococcus aureus in pork meat samples: Staphylococcus aureus are one of the most common food-borne zoonotic diseases in humans and thus screening food samples including pork meat samples for the presence of the pathogens has been classified as a legal testing item across the world in order to ensure food safety. The current work used mango (Mangifera indica) leaves to synthesize silver nanoparticles for developing LFIA. Using colloidal silver nanoparticles (AgNPs) produced from mango leaves, a competitive LFIA was developed for detection of Staphylococcus aureus in spiked pork meat samples. UV scanning spectral profiling, Zeta analyzer, and FT-IR spectrum were used to analyze AgNPs isolated from mango leaves. Specific Staphylococcus aureus recombinant protein was utilised to generate hyperimmune sera for conjugation with AgNPs. In the test and control

lines, antigen and anti-rabbit IgG were employed, respectively. Minced pork samples were centrifuged and the supernatant was mixed with 10% substrate A and pinch of certain herbal chromogenic dye was added followed by incubation at 370C for 6-7 h. Once the color become yellowish, sample was loaded in sample pad of the paper strip. Sensitivity of the assay was determined after spiking of the meat samples with different (1010-102) CFU/ml bacteria. It was observed that upto 104 CFU/ml bacteria can be detected from the spiked meat samples. Specificity of the assay was determined from the spiked meat samples with different bacterial cultures. The developed assay is rapid, specific and sensitive. In low-resource contexts, such as regions or nations, the developed LFIA has the potential to become a widely utilised technique for diagnosing Staphylococcus aureus in pork meat samples.



Sample preparation from Pork meat samples. Collected samples were subjected for mincing with homogenizer. Minced samples were centrifuged and the supernatant was mixed with 10% substrate A and pinch of certain herbal chromogenic dye was added followed by incubation at 370C for 6-7 h. Once the color become yellowish, sample was loaded in sample pad of the paper strip.



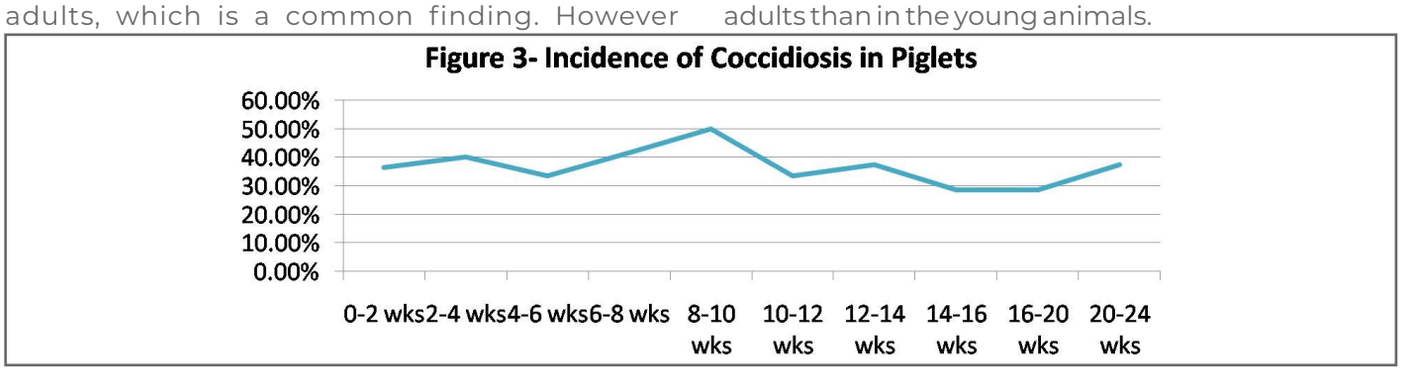
Specificity and sensitivity determination of the Lateral Flow assay for detecting Staphylococcus species in Pork meat samples. A: Sensitivity of the assay was determined after spiking of the meat samples with different (1010-102) CFU/ml bacteria. It was observed that upto 104 CFU/ml bacteria can be detected from the spiked meat samples. B: Specificity of the assay was determined from the spiked meat samples with different bacterial cultures.

Detection and characterization of Porcine Parvovirus: A total of 64 samples were collected (whole blood, serum, nasal, semen and tissue) from an outbreak of disease in Kamrup district in Assam. The samples were screened by serological and molecular assay for detection of PPV. Out of forty (40) serum samples tested for detection of antibodies against Porcine Parvovirus, the sero-positivity rate was found to be were 30 %. (Commercial ELISA kit). This high sero-positivity rate may be attributed to the uneven sample size, more samples have to be collected and tested for getting a clear picture. Out of the total of 11 samples (tissue samples) screened by PCR for detection of PPV antigen, 5 samples were found positive. Positive samples showed amplification 242bp specific to NSP1 gene of PPV.

Epidemiology and Molecular Epidemiology of African Swine Fever virus: Format for data collection, considering National and O.I.E. guidelines, has been designed to collate data to estimate the prevalence of ASF. Preliminary surveys have been conducted for prevalence of ASF in Dhemaji, Nalbari and Baksa Districts of Assam. Clinical samples (n=74) were collected and samples suspected for CSFV (n= 14) were screened for ASFV by PCR assay using O.I.E. recommended primers for p72 gene amplification. Further, molecular diversity studies of ASFV isolates are in progress.

Epidemiology of Intestinal protozoan parasitic diseases of Pigs: As a first step, the animals in the herd were observed for probable clinical signs related to intestinal protozoan infection. In the next step pooled faecal samples were collected from enclosures where few pigs showed the related signs like roughness of hair coat, reduced growth rate, unthrieftiness etc. Stoll's technique was standardized with minor operative modifications. Saturated Sodium Chloride (NaCl) floatation was also standardized for qualitative faecal examination. Attempts were made to distribute samples evenly

throughout the year so that the seasonal influence on incidence of infection could be ascertained. The samples from the adults were taken randomly, irrespective of signs of diarrhoea, however samples were collected from periparturient sows as they become asymptomatic shredders during that period. The samples from piglets, growers, finishers were taken on the basis of diarrhoea, roughness of hair coat, reduced growth rate, weakness, loss of body weight etc. Samples from farms situated outside were also collected to assess the via-a-vis level of environmental contamination in farm and field conditions. Analysis of individual samples revealed that the incidence of intestinal protozoan infection was higher in younger animals than the adults, which is a common finding. However another aspect to be kept in mind is that these asymptomatic adult animals also contribute towards environmental contamination of parasitic load. Among the adult animals all the periparturient animals were found positive for presence of oocysts in their faeces. Seasonal distribution showed that the rate of infection with intestinal protozoa was highest during monsoon months, which is as per the epidemiological pattern of coccidial disease, because in general hot and humid climate aids to the spread and development of intestinal protozoan diseases. In addition the incidence of infection during monsoon was higher in adults than in the finishers. This trend continued and in summer and winter also the incidence of infection was higher in adults than in the young animals.



Incidence of coccidiocis in piglets

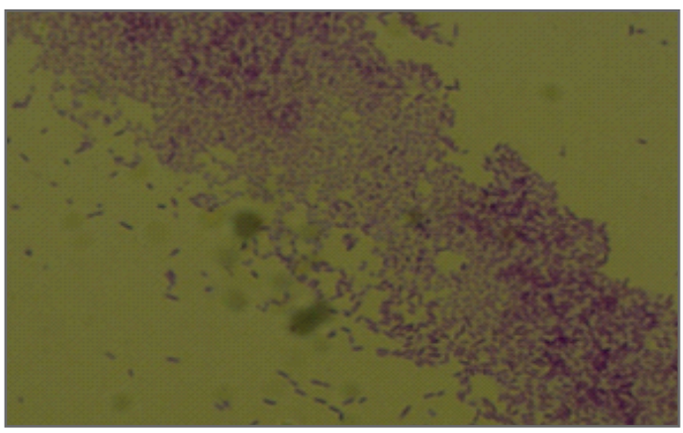
It was observed that the piglets acquired the infection quite early in their life, in some cases as soon as within the first week of their life. Moreover all the periparturient sows examined were positive for the presence of oocysts. For differential diagnosis of various coccidian species involved oocyst sporulation time and micrometry was employed. It was observed that the incidence of Coccidiosis was much higher in field than under farm conditions.

Kinetics of FMD virus serotype specific protective antibody response: In order to assess the specific protective antibody response induced in pigs vaccinated with commercial FMD vaccine intended for use in cattle, a schedule for vaccination in pigs has been devised. Screening of piglets of 8-12 weeks (n=13) of age by 3AB3 NSP ELISA (DIVA) for FMD virus were performed. None of the samples showed any detectable level of anti-NSP antibody response. All the samples subjected to VNT employing serotype O, A and Asia 1 FMD could not find any detectable antibody titres.

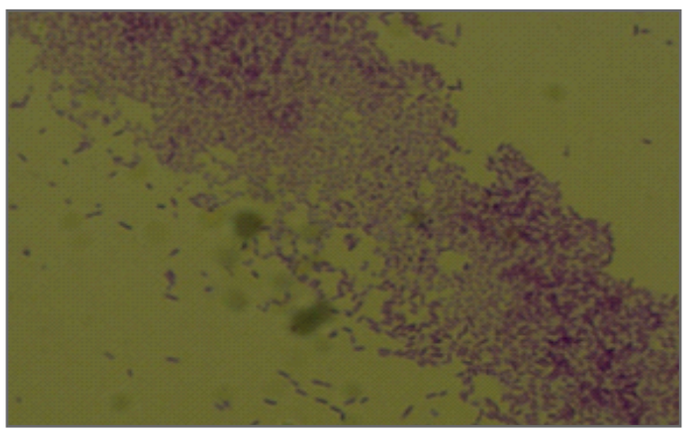
POSTHARVEST PROCESSING AND VALUE ADDITION OF PORK

Biofilm formation and quorum sensing properties of *Yersinia enterocolitica*: Inhibition of biofilm formation, quorum sensing activity and molecular docking study of *Yersinia enterocolitica* against Averrhoa carambola crude extracts has been studied. Extraction of active ingredients from Averrhoa carambola was conducted following standard protocols using methanol as solvent. Selected Y. enterocolitica (ATTC-9610) strain was used for the study. The Biofilm formation of Y. enterocolitica was confirmed by tube adherence method. The Y. enterocolitica was inoculated in Tryptone Soy Broth (TSB) and incubated at 37°C for 24-48 h. The interpretation was recorded based upon the visibility of films linings inside the test tubes as nil, weak, moderate and strong biofilm

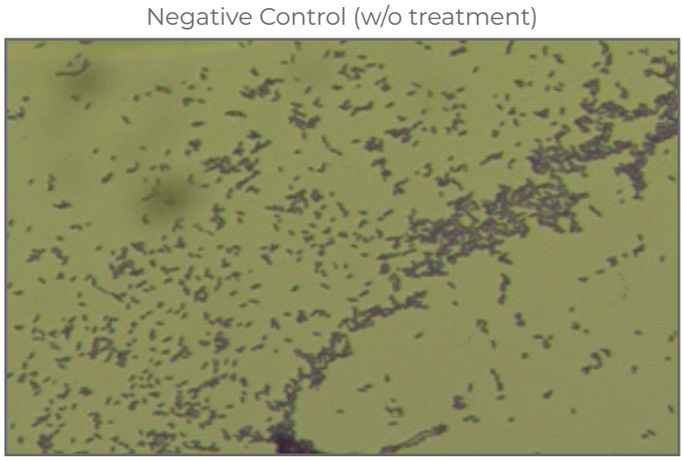
producer. The Biofilm Inhibition activity of Y. enterocolitica was evaluated using crystal violet assay. Each strain was tested in triplicate, where negative control is taken as only tested cell culture. The per cent of inhibition was calculated. In addition, the effect of the crude extract of Averrhoa carambola fruit with Y. enterocolitica biofilm forming bacteria was visualized using light microscopy. The quantification for the inhibition of biofilm of Y. enterocolitica against Averrhoa carambola fruit extract was examined by using 96 well microtiter plate using crystal violet assay and absorbance was measured through UV-Vis spectrophotometer at 620 nm. At varying concentration of (50, 100, 500 and 1000 µg/mL) of Averrhoa carambola fruit extract can inhibit the biofilm formation of Y. enterocolitica and when compared with negative control (untreated without the crude extracts). The maximum efficacy of the Averrhoa carambola crude extract at 1000µg/mL showed 62.72% of biofilm formation was inhibited however at the concentration of 50 µg/mL showed efficiency of 58.99% inhibition of biofilm was observed. Therefore the percentage of biofilm eradicated was decreased with decreasing concentration of crude extracts. The visualization of light microscopy images depicts the untreated slides with the crude extracts have well developed thick and continuous population of biofilm formation. However the effect of crude extract at (1000 µg/mL) concentration reveals that the maximum reduction of biofilm as compared to that of the (50 µg/mL) concentration. Therefore based on the light microscopy analysis, the efficacy of Averrhoa carambola fruit extracts at varying concentration shows the reduction of biofilm-forming planktonic cells against tested strains of Y. enterocolitica.



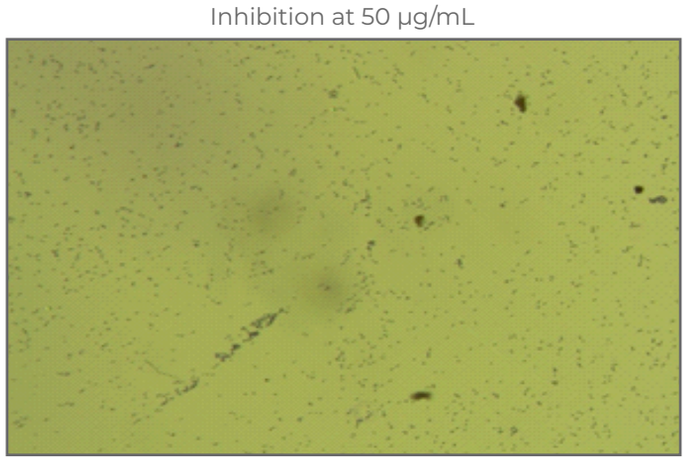
Negative Control (w/o treatment)



Inhibition at 50 µg/mL

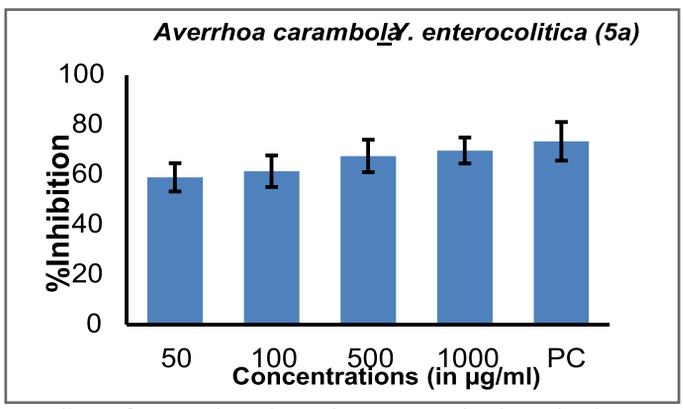


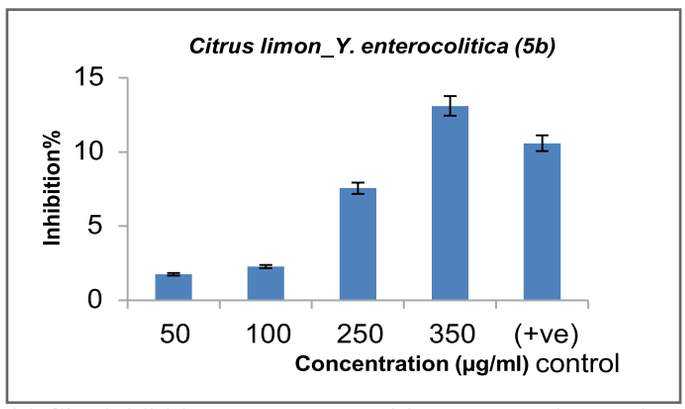
Inhibition at 100 µg/mL



Inhibition at 500 µg/mL

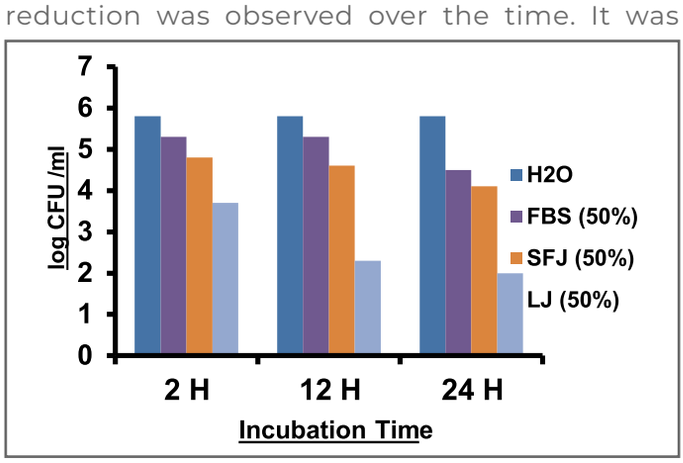
The images above depict the reduction in biofilm formation with increasing concentration of the crude extracts.



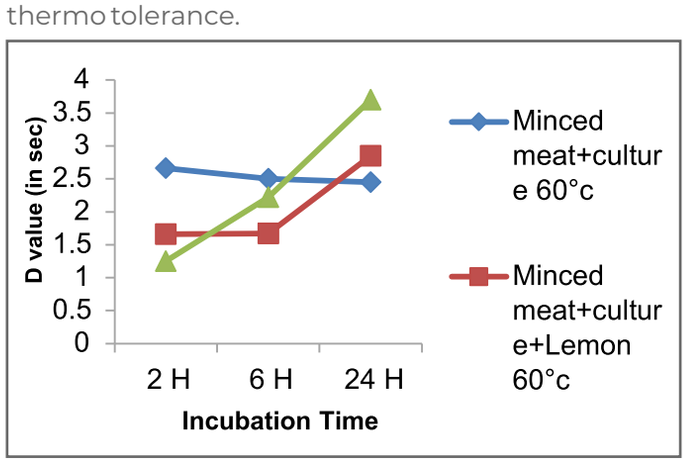


Readings from microtiter plate assay depicts the increase in biofilm inhibition percentage with respect to increasing concentration of crude extractAverrhoa carambola (5a) and citrus tlimon (5b) against Y. enterocolitica.

Behaviour of *Salmonella typhimurim* to different pH and temperatures: The effect of PH on S. typhimurium on meat medium adjusted with various naturally occurring acids and the heat resistance of S. typhimurium at 600c under prolonged exposure to naturally occurring acid stress and subsequent refrigeration was studied. Salmonella typhimurium was grown in tryptic soy broth and then the overnight incubated broth was mixed with 100g of minced meat. Eight (8) %(V/W) of extracted lemon juice and fermented bamboo shoot was added separately and mixed well with meat mixture and then incubated at 40c. Survival of S. Typhimurium in PH adjusted with natural acids was evaluated for 2, 12 and 24 h. S. Typhimurium was found to be acid sensitive and a linear mean reduction was observed over the time. It was indicated that lemon juice was most effective out of all three treatments and log 3.8 reductions was observed within 24 h. Fermented bamboo shoot was least effective compared to lemon and star fruit juice. In both the treatments, D values were observed below the control (without added natural acid) at 2 h. However, there are no significant differences in both the treatments at 2h and 6h. Longer exposure to acid stress for 24 h at 40c, increased the heat resistance of the S. typhimurium, resulting in increased D values compared to control. Whereas it was observed that single stress of natural acids (only PH) was found effective against S. typhimurium, combination of two sub lethal stresses (PH and heating at 600c) induced a cross protection resulting in an increased D value or thermo tolerance.



Total log reduction of S. Typhimurium under acidic stress of lemon and Fermented bambooshoot at 2, 12 and 24h.



Mean D value of S. Typhimurium under combination stress

Established the Quality Control Lab and obtained IS/IEC 17025:2017 Accreditation: The infrastructural development project was sanctioned by Ministry of Food Processing Industries with an outlay of Rs. 365.00 lakhs to set up a state of the art NABL Accredited testing laboratory for pork and pork products at ICAR-NRC on Pig. The project has been completed as on 31-03-2022 after obtaining all the objectives satisfactorily. All the 32 numbers of equipments approved by PAC has been purchased and installed. Also, successfully obtained ISO/IEC 17025:2017 Accreditation for the lab.

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

ICAR-NATIONAL RESEARCH CENTRE ON PIG

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

ICAR-NATIONAL RESEARCH CENTRE ON PIG, RANI, GUWAHATI, KAMRUP, ASSAM, INDIA

in the field of

TESTING

Certificate Number: TC-10429

Issue Date: 17/03/2022 Valid Until: 16/03/2024

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : ICAR-National Research Centre on Pig

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

ISO/IEC 17025: 2017 Accreditation Certificate

Optimized the formulation and processing conditions for value added pork products: The formulation and processing steps were optimized for the following shelf stable pork products using retort technology: Pork with lai, Pork with till, Pork vindaloo, Pork with fermented bamboo shoot and dried chillies. Also, the process for developing the following shelf stable products were standardized and validated: Pork spread- it is a spread on toast. It is like a jelly product and can be served with crackers for an appetizer. It contains onions and spices and has fatty texture and taste; Grilled honey pork- it is a grilled pork product. Both loin chops and bacon are used for the same. Slightly sweet in taste and has smoky note and Pork Kielbasa- Kielbasa is a highly versatile emulsion based sausage. One can consume this product grilled, boiled, smoked or seared.

Extended technical advisory services for piggery value chain improvement in Assam, under the World Bank financed Assam Agribusiness and Rural Transformation Project: Institute is focusing on four thrust areas under this project viz. analysis of feed resources for ration balancing; sero-sampling for JEV to inform targeted measures to decrease mosquito transmitted virus to pigs; support in creation/up-gradation of liquid boar semen processing labs and conducting capacity building programme for master trainers. Regarding capacity building of value chain actors in the project, institute has already conducted 05 training programmes to Veterinary Doctors from 13 districts. The theme of the training programmes was "Master Training (ToT) programme for AHVD staff on Scientific Pig Farming". A total of 115 Veterinarians were trained in these programmes. Similarly, five training programmes for the Pig Bondhus i.e. "Master Training (ToT) programme for local service provider (Pig Bondhu)" were organized and a total of 124 pig bondhus participated in the programme. They were exposed to basics of pig farm management, feeding management, breeding management and the biosecurity measures to be followed to avoid/ reduce the incidence of disease outbreaks in pig farms. Special emphasis was given to artificial insemination in pigs and proper heat detection. Hands-on training sessions were organized on artificial insemination in female pigs using liquid semen samples.

Capacity building for Pig Bondhus under APART programme

Initiated the establishment of STI Hub for Mising and Bodo women of Assam for economic empowerment through technology interventions in the pig value chain: A DST sponsored project of 36 month duration has been initiated with an outlay of Rs. 261 lakhs with the objectives of introducing unique identification cum traceability system for the pigs in the cluster;

developing an IoT based remote meat inspection system for ante-mortem and post-mortem of pig/pork for the first time in India; establishing a "Pig Help Line" system to attend the issues of pig farmers, not only belong to the target group, but also from across the country and to develop and transfer the technologies for processing shelf stable pork products, especially traditional products to the target group. It is envisaged to develop a suitable software to act as the basic platform to document the data pertinent to pig production and management conditions, including GPS identification of premises as well as health management. Also, IoT based remote meat inspection system will be developed and will be placed into operation in the existing pig abattoirs under the control of FPC, with the central database management at ICAR-NRCP. The system will support on-time virtual inspection of slaughter pigs (ante-mortem) and pig carcasses (post mortem) for their suitability for slaughter and subsequent release for human consumption, respectively by Veterinarian. The STI extension Hub will be established in Dhemaji/Lakhimpur Districts on a pilot scale.

Executed consultancy project for Govt. of Manipur: A consultancy project for providing technical support towards establishing 5 numbers of modern pig abattoirs in the state of Manipur has been executed. The support has helped the Govt. of Manipur to obtain Rs.10 crore grant from North Eastern Council under Ministry of DoNER.

Exchange of MoU with Govt. of Manipur to provide technical support in establishing modern pig abattoirs

EXTENSION INTERVENTIONS IN PIG PRODUCTION SYSTEMS

Data base development of small-scale pig producers: As part of the research work, a sampling plan was developed including three districts of Assam i.e., Kamrup, Goalpara and Tamulpur (Tamulpur was part of Baksa District previously). A semi-structured interview schedule was made and personal interview was done with the selected respondents. The respondents were selected from 6 adopted villages of ICAR-NRCP, Guwahati and 6 Non-adopted villages for assessing the impact of extension interventions undertaken by the institute during the previous years. From each village 30 farmers were selected randomly. Thus, a total of 360 farmers were interviewed from 12 villages of Assam. The data on socio economic characteristics of the farmers, knowledge on scientific pig production practices, adoption rate of scientific pig production practices, pig production, farm management activities, marketing aspects and economics of production were collected and tabulated.

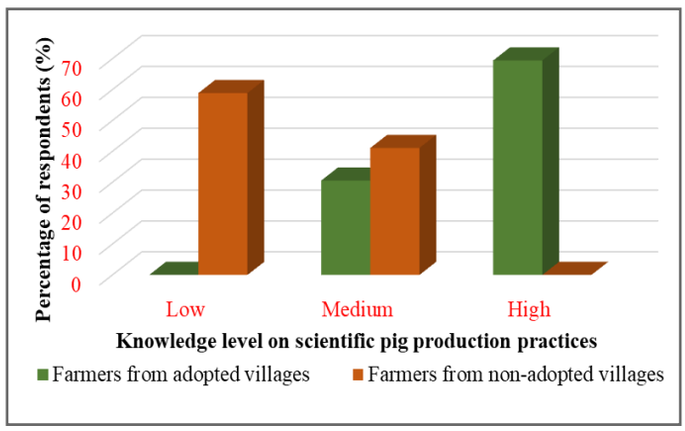
Table : Distribution of respondents from 12 villages of Assam

Sl. No.	Adopted villages	Respondents	Non-adopted villages	Respondents
1	Belguri, Kamrup	30	Ambari, Tamulpur	30
2	Batabari, Kamrup	30	Borkhata, Tamulpur	30
3	Sajjanpara, Kamrup	30	Baghbari, Kamrup	30
4	Sattargaon, Kamrup	30	Bangalikuchi, Kamrup	30
5	Kumarbari, Kamrup	30	Nabagram, Goalpara	30
6	Garilik, Kamrup	30	Thekasu, Goalpara	30
	Total	180		180

Data collection using Open Data Kit (ODK) software installed in tablet

Development and application of knowledge test: A knowledge test was developed by following the standard procedure. After item analysis, 15 items/questions were retained in the final knowledge test. The test developed was used for measuring the knowledge of small scale pig producers on scientific pig production practices. The knowledge scores were computed for each respondent farmer using the knowledge test developed. The knowledge score obtained was further used in the analysis.

Impact assessment of extension interventions of ICAR-NRCP: The data collected from the respondents were analysed using XLSTAT and RStudio softwares. By using the knowledge scores, three categories of knowledge level were formed by Cumulative Square Root Frequency Method. The distribution of respondents from adopted and non-adopted villages in different categories of knowledge level is shown below.



Distribution of respondents based on their knowledge of scientific pig production practices

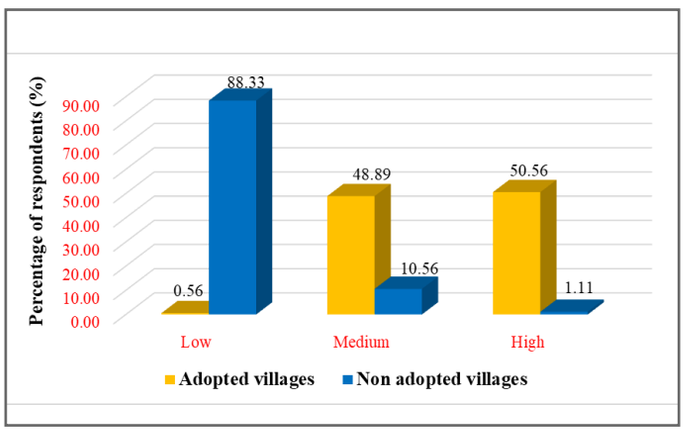
To compare the difference between adopted and non-adopted villages, the non-parametric test for comparing two samples known as Mann-Whitney "U" Test was used. It was observed that the mean score of knowledge about scientific pig production practices of beneficiary farmers of adopted villages and farmers of non-adopted villages were 10.55 ± 0.14 and 3.99 ± 0.14 respectively. The result shows that the knowledge of small scale pig farmers in adopted villages regarding scientific pig production practices was significantly ($p < 0.01$) higher than the farmers from non-adopted villages.

Table: Assessment of impact of extension interventions on knowledge regarding scientific pig production practices

Parameter	(Mean ± SE)
Adopted villages (n=180)	10.55 ± 0.14
Non-adopted villages (n=180)	3.99 ± 0.14
Mann Whitney U Statistics	32243 (P Value <0.0001)

Development and application of adoption index and impact assessment: A composite adoption index was developed following the standard procedure for measuring the adoption rate of scientific pig production practices by the small scale pig producers in Assam. The 72 scientific pig production practices which was selected primarily were reduced to 45 based on expert opinion and relevancy testing. The 45 statements/indicators were grouped under 6 dimensions known as breeding, housing, feeding, management, health care and biosecurity. The weight for each selected

indicator was assigned using Principal Component Analysis (PCA). By PCA, 13 factors having Eigen value>1.00 were selected. The factor loadings of these 13 factors were used for assigning the weights. Based on the adoption index score obtained for each respondent, three categories of adoption level were formed by Cumulative Square Root Frequency Method. The distribution of respondents from adopted and non-adopted villages in different categories of adoption level was analysed. In the adopted villages, about half of the farmers (50.56) falls under high adoption category followed by 48.89 % farmers in medium adoption category. Only 0.56 % of the respondents are belonged to low adoption category. Differently, in non-adopted villages, about 88.33 % of the respondents belonged low adoption category followed by medium (10.56 %) and low (1.11%) categories.



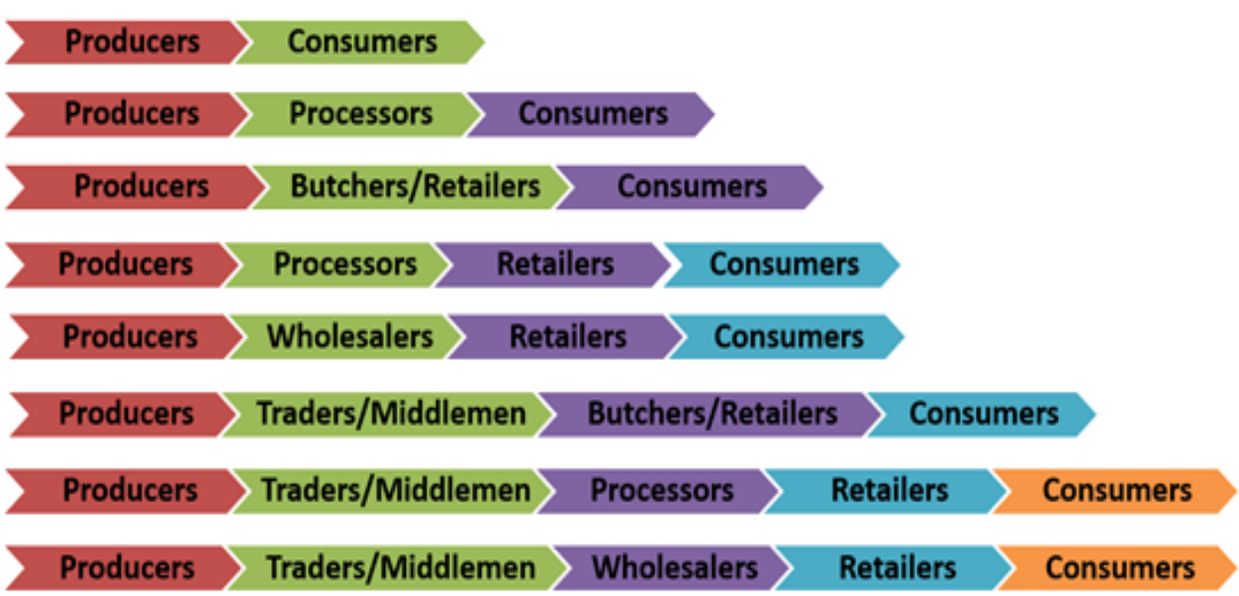
Distribution of respondents based on their adoption of scientific pig production practices

The Mann-Whitney "U" Test was used here also for assessing the difference between adopted and non-adopted villages. It was observed that the mean adoption index by the beneficiary farmers of adopted villages and farmers of non-adopted villages were 0.51 ± 0.01 and 0.13 ± 0.01 respectively. The result shows that the adoption of scientific pig production practices by the small scale pig farmers in adopted villages was significantly ($p < 0.01$) higher than the farmers from non-adopted villages.

Table: Assessment of impact of extension interventions on adoption of scientific pig production practices

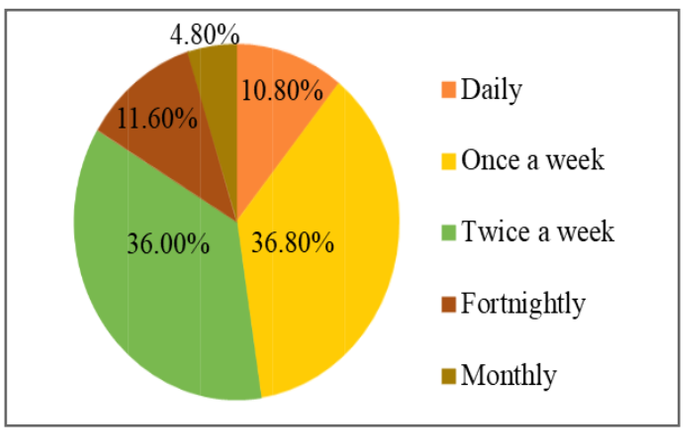
Parameter	(Mean ± SE)
Adopted villages (n=180)	0.51 ± 0.01
Non-adopted villages (n=180)	0.13 ± 0.01
Mann Whitney U Statistics	31849 (P Value <0.0001)

Assessment of pork marketing chains in Assam: For assessing the pork marketing chains in Assam, we created a database of primary data collected from 835 pig producers, 250 pork consumers, 50 sellers, 25 traders/middlemen and 6 processors from 5 districts of Assam. The data collection is continuing as per the sampling plan. As per the data collected, 8 different marketing chains was identified in Assam as shown below.

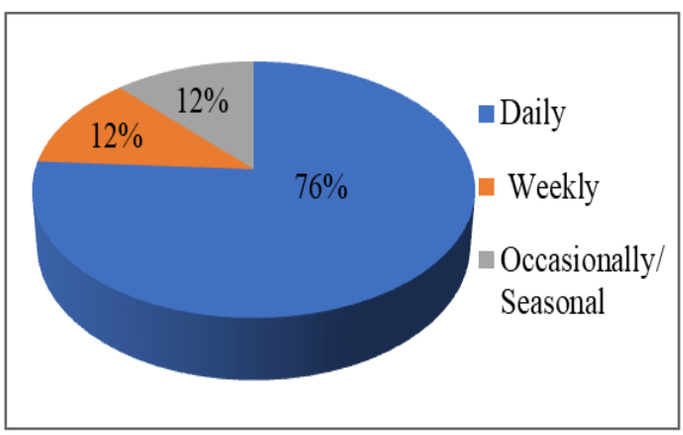


Different pork marketing chains in Assam

For understanding the consumer behaviour, the data collected from 250 pork consumers were analysed and observed that majority of the consumers prefer to have pork once a week (36.8%) or twice a week (36.00%).



Consumption pattern of pork by the consumers (n=250)



Pattern of selling of pork by different sellers

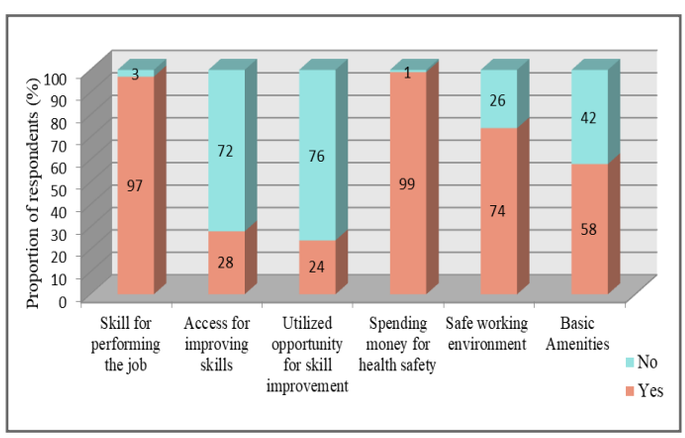
Assessment of tribal women's participation in backyard pig farming: The mean age of the respondents was around 41 years and more than half of the respondents (58%) were in the middle age group (33-47 years). More than half of the respondents were studied below secondary level (56%) and out of them 17 % were had no formal schooling. Majority of them (79%) lived in nuclear families with 2 to 5 members and had only piggery as their occupation (79%). About half of the respondents lived in pucca houses (50%). We find that the integration of piggery with other livestock, crops and poultry were done by few of them (9%), whereas some respondents integrated piggery with only one of these components. In terms of trainings attended on piggery, very few (9%) had got a chance for that while majority (91%) of them never had.The respondents were grouped in three categories according to their pig ownership. We observed that majority of the respondents (84%) had small holdings with 1 to 6 pigs. About 9% of the respondents had large holdings with 10-44 pigs and 7% had medium holdings with 7-9 pigs. We asked the respondents about their expenses and income from piggery and based on the responses, calculated the average annual net income earned by women farmers with different size of holdings. The farmers with large holdings had Rs.63500.00 as net income annually whereas farmers with medium and small holdings had Rs.35200.00 and Rs.24000.00 as annual net income, respectively.

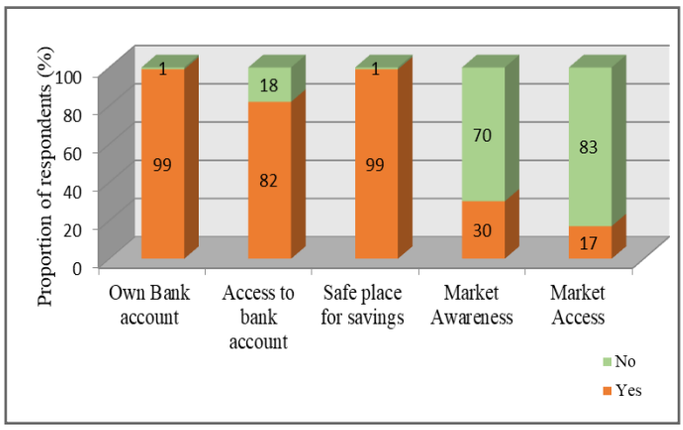
Table : The average net income earned by the tribal women from pig farming

Size of holding (Number of pigs)	Number of farmers	Percentage of farmers	Average Net Income (INR)/Year
Small holding (1to 6 pigs)	274	83.54	24000
Medium holding(7-9pigs)	24	7.32	35200
Large holding (10-44pigs)	30	9.15	63500

The information regarding different social and financial aspects related to pig farming were also obtained from the tribal women farmers. Their perception regarding their skills for present job and access for its improvement was also questioned. The financial security, market awareness and market accessibility were also noted for developing a framework for their capacity building and empowerment.

Access for skill improvement and safe working environment for tribal women





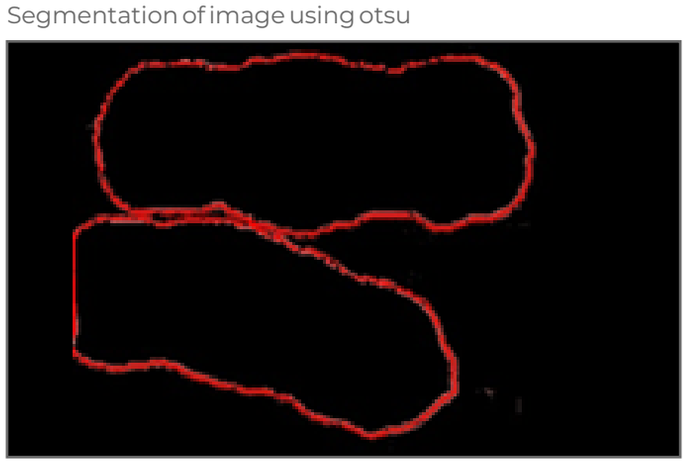
Financial security and market accessibility for tribal women

COMPUTER APPLICATIONS IN PIG PRODUCTION

Image-based growth rate estimation algorithm for pigs: Although growth rate can be estimated directly by weighing the pig on the scale that provides most accurate result, it involves a cumbersome, time-consuming task and it sometimes may cause injury to the handler. Weighing the pig on scale by forcing them to place on scale cause stress to the animals. Besides it also involves direct contact with the animal's body which may be a major cause of transmission of diseases. In this context, image processing technique plays a vital role. Image processing techniques for determining shape, size, area and volume of an object have been increasingly developed in the recent trends. For growth estimation of animals using image processing techniques offer many advantages in comparison to manual or scale estimation technique. In order to avoid direct contact with the animals and to deal with shortage of manpower for growth rate estimation, digital image-based algorithm is one of an effective solution. To estimate the growth rate of different categories of pigs, the top view image data collection (n=10) of live pigs (Large white Yorkshire) from the Institute farm was carried out with the assistance of a DSLR camera. The image data were collected with a gap of 15 days. Individual animals were identified using their ear tag number. The actual weight of each pig was also measured using weighing scale to perform the comparative analysis of actual weight and image based estimated weight. Image segmentation technique were also used for segmenting the pig from the background with some limitations such as lighting condition, uneven distribution of light and low contrast of region of interest and background in the pig farm. Therefore, the graphical user interface was used to extract the contour of pig under the study.

Top View image of Pig from the Institute farm

Segmentation of image using otsu



Segmentation of image using graphical user interface

Out-Reach Programmes

TRIBAL SUB PLAN

A total 22 numbers of pig health and awareness camp cum input distribution was conducted during 2021. Total 342401 kg of pig feed was distributed among 2612 tribal beneficiaries of different villages of Kamrup, Nalbari, Baksa, udalguri and Goalpara district of Assam. Further, 04 trainings were organised for benefitting 68 tribal youths and farmers. In order to uplift the tribal communities in the region, the institute is striving its best to support them by providing improved pig germplasm along with other inputs like compound pig feed, spray machine, umbrella, emergency light, digital thermometer, steel bucket, dustbin etc. under the TSP plan of the institute to the tribal beneficiaries across Assam and Meghalaya. Moreover, the institute has provided 910 pig semen doses for AI to the tribal farmers in Kamrup district. The Institute is constantly monitoring health, growth and management of the pigs in the adopted villages regularly and giving necessary health coverage and AI services as and when required. The following districts viz. Kamrup, Goalpara, Baksa, Kokrajhar, Tamulpur, Udalguri, Morigaon, Cachar, Karbilaong, Tinsukia, Dibrugargh, Dhemaji, Lakhimpur, Golaghat, Sonitpur and Nalbari have been covered under TSP during 2021.

Inauguration of Training under Tribal Sub Plan by Director, ICAR-NRCP

Farmers Field day cum input distribution Programme at Udalguri

Farmers Field day cum input distribution Programme at Rani

Farmers Field day cum input distribution Programme at Kochugaon, Kokrajhar

Awareness programme at Barihat

Farmers Field day cum input distribution Programme at Goreswar

Farmers Field day cum input distribution Programme at Golaghat

Farmers Field day cum input distribution Programme at Cachar

Farmers Field day cum input distribution Programme at Sarthebari, Barpeta

Farmers Field day cum input distribution Programme at Tinsukia

Farmers Field day cum input distribution Programme at Dibrugarh on 15-03-2022

SCHEDULED CAST SUB PLAN

Scheduled caste sub plan activities are being implemented in 12 villages of five districts of Assam Kamrup, Nalbari, Morigaon, Dhemaji & Barpeta covering around 611 beneficiaries. In order to encourage SC farmers for scientific pig production farmers field day has been conducted in different sc villages of Assam and distributed good quality pig breeds (84 nos.) and concentrate pig feed (524 quintals). Also, to create awareness on scientific health care measure and implementation of strict biosecurity measures in the pig firms, pig health camp and awareness program has been conducted and provided necessary inputs like sprayer machine, gumboot, dustbin, emergency light,shovel,spade,rain coat & umbrella to all the sc farmers covered under this program. Further, to give technical knowledge on different interventions in scientific pig farming to the farmers group we have provided two National level training program on Scientific pig production and management and Artificial Insemination in Pigs to total 42 farmers . In order to provide specialized training to the sc beneficiary we have conducted one training program on Hands on training program on basic molecular biology tools and techniques for M.Sc, student of scheduled caste category of total 8 no.

ALL INDIA COORDINATED RESEARCH PROJECT (AICRP) ON PIG

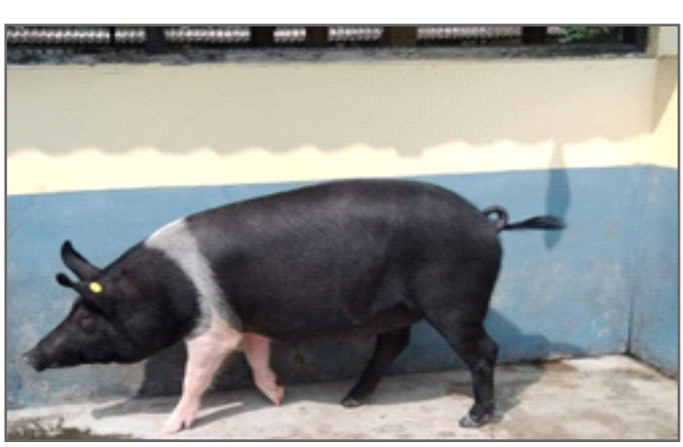
The main objective of AICRP on pig, which launched in IVth Five Year Plan (1970-1971), was to study the performance of pigs in different agro-climatic condition of the country. Subsequently the project was mandated to develop region-specific package of practices including quality germplasm. Few centers are mandated for conservation of indigenous germplasm. Presently the programme is continuing in fifteen different centers across the country. ICAR-National Research Centre on Pig is regularly monitoring the progress of AICRP on Pig project through technical and financial monitoring in consultation with the Council and conduction of review meet. The Annual Review Meeting of "ICAR-All India Co-ordinated Research Project on Pig" and "Mega Seed Project on Pig" held on 16th February, 2021 via virtual platform.

Assam Agricultural University, Khanapara, Guwahati

The ICAR-AICRP & MSP on pig, AAU, Khanapara under the leadership of ICAR-NRC on Pig, Rani has played an important role since its inception for development of pig production in the state and neighboring states through various ways like attending training, awareness program, exhibition, demonstration, distribution of leaflet /booklet. The centre has conducted several training programme and extension activities to popularize piggery in the state of Assam and adjoining states. The ICAR-AICRP & MSP on Pig, AAU Khanapara has played a significant role in developing piggery sector by selling of quality piglets, elite gilts / sows and boars at nominal price to the interested farmers of the state. The center is maintaining HD-K75 crossbred germplasm developed by crossing of Hampshire (75%) and local pig (25%) of Assam. The total herd strength of the HD-K75 crossbred germplasm was 81 at the end of 2020-21 financial year. During 2020-21, total 310 piglets were born, 263 were purchased while 438 piglets were sold and 2156 death occurs at the Centre. The average Litter size at birth and weaning was 7.82 ± 0.51 and 7.48 ± 0.44 respectively.

Kerala Veterinary and Animal Science University, Mannuthy Centre, Kerala

KVASU, Mannuthy Center aims to study the performance of indigenous pigs under optimum management conditions and produce crossbreds by crossing indigenous gilts with exotic boars and assess their performance in respect of their efficiency of feed conversion, production and reproduction. The Centre is maintaining Large White Yorkshire, Desi and Mannuthy White crossbred variety developed by crossing of LWY (75%) with local pig of Kerala. The Centre could impart scientific knowledge to the progressive pig farmers in establishing the piggery units with respect to health care, feeding and breeding management, waste disposal and other problems faced on a day-to-day basis through telephone and by direct personal contact. Mannuthy White is well adapted to humid tropical agro-climatic conditions and suited to low input rearing system of Kerala. The centre has successfully fulfilled the demand of the farmers by supplying 650 desi piglets, 644 fattening piglets (75% crossbreds) and generated a total revenue of Rs 13.92 lakhs during the year 2020-21. Total 168 desi, 20 crossbred 50%, 112 crossbred 75% and 36 LWY was available at the end of 2020-21 financial year. The average Litter size at birth and weaning was 10.26±0.16 and 10.22±0.14 respectively in 75% crossbreds.



HD-K75 Sow

Field unit of AICRP, KVASU

Sri Venkateshwara Veterinary University, Tirupati

The AICRP on Pig at SVVU Center, Tirupati is maintaining Large White Yorkshire pigs and its crosses under optimum managemental conditions. Presently performance of only 75% LWY crossbreds by inter se mating is being studied. so far 23 generations of 75% LWY crossbreds was completed. During the period under report 178 piglets were born, 137 animals were sold and 62 deaths occurred at centre. At the end of 2019-20 total herd strength was 324. The average Litter size at birth and weaning was 8.18±0.15 and 7.6±0.48 respectively in 75% crossbreds.

Field unit of AICRP centre SVVU

ICAR-Central Coastal Agricultural Research Institute, Goa

Goa being tourism hub is one of the highest consumers with more than 50% of its population consuming Pork. The crossbreed pigs developed by ICAR-CCARI, Goa are hugely popular amongst producers and consumers alike. AICRP on pig, Goa centre has attempted to provide fundamental knowledge for scientific management and breeding practices to the pig farmers of the region through different trainings, demonstrations and also by providing improved germplasms for breeding. AICRP on pig Goa centre is attempting to provide trainings and demonstrations and also providing farmers with quality breeding stock. The center is maintaining Agonda Goan (Local), Large White Yorkshire and its crosses. Total herd strength at the end of financial year 2020-21 was 131. During this period total 302 piglets were born and 218 piglets sold to farmers. were

The average litter size at birth and weaning was 8.23±0.871 and 7.62±0.29 of 75% crossbred population.

Field Unit of ICAR-CCARI, Goa

Indian Veterinary Research Institute, Izatnagar, Bareilly

ICAR-IVRI AICRP centre maintains 75% exotic blood line by inter-se mating for which minimum 30 breedable sows are maintained with a sex ratio of 1:3 with 10 sires (2 sires from each 5 unrelated lines). Total herd strength at the end of financial year 2020-21 was 364. During this period total 581 piglets were born and 253 piglets were sold/transferred to farmers. The average litter size at birth and weaning was 8.67±0.24 and 7.62±0.30 of 75% crossbred population.

Crossbred (75 % L x 25 % D) sow with piglets at Unit

Tamilnadu Veterinary and Animal Science University, Kattupakkam

TANUVAS Centre is maintaining inter-se population of TANUVAS KPM Gold (75% crossbred LWY x Desi) pigs. Besides regular training, the center is presently involved for characterizing the local pig population of the state. Total herd strength at the end of financial year 2020-21 was 244. During this period total 464 piglets were born and 550 piglets were sold to farmers. The average litter size at birth and weaning was 8.71 ± 0.78 and 8.25 ± 0.67 of 75% crossbred population.

Success story of AICRP, TANUVAS Centre

College of Veterinary Sciences & Animal Husbandry, CAU, Aizawl, Mizoram

The C.V.Sc & A.H, CAU centre maintains Zovawk to serve as genetic improvement unit. The basic principle of the project is to start a comprehensive study at institutional level to develop a farmer's friendly package of practices creating more assets and better opportunities for cash-starved populace. Total herd strength of Zovawk at the end of financial year 2020-21 was 66. During this period total 45 piglets were born and 35 piglets were sold to farmers while 7 deaths were reported. The average litter size at birth and weaning was 3.76± 0.58 and 3.38± 0.35 of zovawk.

Zovawk Sow with piglets

Nagaland University School of Agricultural Sciences and Rural Development, Medziphema Campus, Nagaland

The AICRP on pig, Nagaland centre is mandated to conserve and subsequent genetic improvement of local pigs of the state (TenyiVo). The centre is also engaged in training on improved pig production. Total herd strength of TenyiVo, and its 75% cross at the end of financial year 2020-21 was 84 and 57 respectively. During this period total 236 piglets were born and 221 piglets were sold to farmers. The average litter size at birth and weaning was 5.71±0.33 and 5.33±0.71 of TenyiVo.

TenyiVo Sow with piglets

ICAR-Central Island Agricultural Research Institute, Port Blair

AICRP on Pig programme of this centre was initiated looking to the high demand of pork and scope of piggery in the region. Under this centre, Nicobari pig are maintained, produced and supplied to farmers. Characterization work for Andaman local pig is initiated by the center. Total herd strength of Nicobari at the end of financial year 2020-21 was 117. During this period total 122 piglets were born from 19 farrowing and 36 piglets were sold to farmers. The average litter size at birth and weaning was 7.17 ± 0.16 and 6.98 ± 0.41 of Nicobari.

Andaman Local pig with Piglets

College of Agricultural, CAU, Imphal, ManipurRani growers at centre

AICRP on Pig at Manipur centre was sanctioned with the main objective of development of region-specific package of practices for improved pig husbandry in the state of Manipur. The center is

mandated to study the various performance characteristics of the Rani breed under Manipur condition. Works on characterization of Indigenous local pigs of Manipur were also initiated during the year. Total herd strength of Rani at the end of financial year 2020-21 was 82. During this period total 232 piglets were born and 236 were sold to farmers. The average litter size at birth and weaning was 8.92±0.33 and 8.58±0.35 of Rani.

Rani growers at centre

ICAR Research Complex for NEH Region, BarapaniFemale Chambil wak

The AICRP on Pig, ICAR Research Complex for NEH region has successfully developed and released Lumsniang crossbred variety of pig which is suitable for hilly terrine of India. Besides Lumsniang the center is also maintaining the indigenous Niang Megha pig and 50% cross of Hampshire and Niangmegha. The center conducted several training, extension activities in farm and farmers' field.

Artificial Insemination (AI) has been carried out regularly at farmers door step to produce the crossbred piglets. Total herd strength of Niangmegha, Lumsniang and 50% cross of Hampshire and Niangmegha at the end of financial year 2020-21 was 48, 107 and 52, respectively. During this period total 502 piglets were born and 331 piglets were sold to farmers. The average litter size at birth and weaning was 9.27 ± 0.15 and 8.37 ± 0.28 of Lumsniang.

Wak Chambil Female with piglets

ICAR-Indian Veterinary Research Institute, eastern Regional Station, Kolkata

ICAR-AICRP on pig in IVRI, Kolkata was established with an idea to develop an elite flock of Ghungroo germplasm through selective breeding, propagate and supply the superior germplasm to cliental which indirectly increase the pork production. Besides maintaining Ghungroo germplasm the center conducted several trainings to the farmers for popularization of the breed. Total herd strength of Ghungroo at the end of financial year 2020-21 was 105. During this period total 276 piglets were born and 210 piglets were sold to farmers. The average litter size at birth and weaning was 8.35±0.25 and 8.05±0.18 of Ghungroo.

Ghungroo piglet at the center

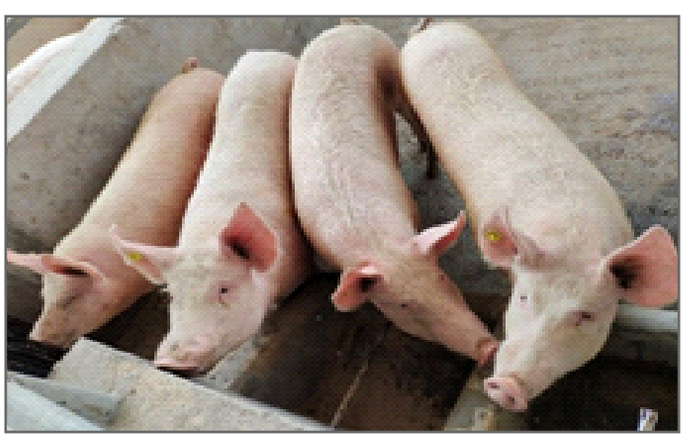
KVK-Goalpara, ICAR-NRC on Pig

The AICRP on pig unit of KVK Goalpara is mandated to conserve Doom pig of Assam and maintain it with selective breeding. The genetic improvement programme of the breed was carried out in the center. As conservation approach, identification of breeding tract, supply of quality germplasm at field and mass-awareness by training and demonstrations were carried out. Total herd strength of Doom pigs at the end of financial year 2020-21 was 43. During this period total 14 piglets were born and 23 were sold. The average litter size at birth and weaning was 5.92±0.21 and 4.90±0.50.

Doom Pig at AICRP on Pig center

Guru Angad Dev Veterinary and Animal Science University, Ludhiana

Looking to the scope and importance of piggery sector in the state of Punjab the Council sanctioned one centre of AICRP on Pig at GADVASU, Ludhiana during 2017. The AICRP on Pig center of GADVASU, Ludhiana is maintaining Large White Yorkshire pigs. The center is engaged in training and demonstration to the farmers of Punjab. Total herd strength at the end of financial year 2020-21 was 34. The average litter size at birth and weaning was 10.3±0.7 and 7. 7±0.7



Grower LWY pigs at centre

Krantisinh Nana Patil College of Veterinary Science, Shirval

Looking to the scope and importance of piggery sector in the state of Maharashtra the Council sanctioned AICRP on Pig center at Krantisinh Nana Patil College of Veterinary Science, Maharashtra Animal and Fishery Sciences University, Shirval during 2017. The center is maintaining Large White Yorkshire pigs. The center has initiated work on characterization and documentation of local pigs of Maharashtra. Total herd strength of LWY and native pigs at the end of financial year 2020-21 was 31 and 13, respectively. During this period total 33 piglets were born and 23 piglets were sold to farmers. The average litter size at birth and weaning was 8.25±1.1 and 6.75±0.87 of LWY, respectively.

Indigenous native pigs of Maharashtra

MEGA-SEED PROJECT ON PIG

Increased population pressure and rapid urbanization has resulted in increased demand for quality pork production. However, the growth and development of piggery sector has been hampered due to various major constraints like non-availability of superior quality seed stock, low-cost feed ingredient, imbalanced ration at reasonable price, unscientific management, lack of financial support and marketing channel, etc. To mitigate the demand of quality pig germplasm among the farmer's field, an attempt was made by launching Mega Seed Project on Pig in 2008 which consists of eight different centres. Under this project improved variety of piglets were produced and distributed to the farmers.

Assam Agricultural University, Khanapara, Guwahati

The center is maintaining HD-K75 and 50% Hampshire crossbred pigs developed under AICRP on Pig unit of this center. These animals are well adapted and acceptable to the farmers of different states of northeastern region. During 2020-21 total 598 piglets were produced and 644 piglets were sold.

Replacement stock of HDK-75 at MSP Centre

Birsa Agricultural University, Ranchi, Jharkhand

The rural people of Jharkhand have widely accepted the piggery sector as remunerative enterprises with great enthusiasm which in turn has provided tremendous employment opportunities to the local people. Mega Seed Project on pig supplying Jharsuk pig variety to the farmers. The center is developing second line breeder for further propagation of the variety. During 2020-21 total 1025 piglets were produced and 862 piglets were sold.

Jharsuk pig

ICAR RC for NEH Centre, Nagaland

Pig is one of the most important livestock which plays an important livestock in improving the socio-economic status of the tribal and weaker section of the society of Nagaland. Mega Seed Project has made an approach to propagate quality pig germplasm at to farmer's field. The center is maintaining and distributing Rani crossbred pig variety to the stake-holders of the state. The center also popularized artificial insemination in pig in the state of Nagaland to enhance the production of piglets from superior breeding stock. During 2020-21 a total of 58 breedable sows of Rani breeds were maintained. Altogether 914 piglets were farrowed and 673 piglets were supplied to 105 beneficiaries including district KVKs and other govt agencies and departments from Nagaland as well as other states. During the reporting year a sum of Rs. 36,38,270/- was generated as revenue under the project.

Healthy litter of piglets farrowed after AI

Kerala Veterinary and Animal Sciences University, Mannuthy Centre, Kerala

The mandate of the centre is producing and supplying Mannuthy White crossbred germplasm developed under AICRP on Pig project. Artificial insemination is being regularly practised to avoid inbreeding depression and proper utilisation of genetic potential of superior males. during the year 2020-21, The centre has successfully fulfilled the demand of 12 farmers by supplying 116 fattening piglets (75% crossbreds) and also generated receipt of Rs. 3.42 lakhs including the sale of culled animals. A total 260 piglets were borne and 126 were sold.

Crossbred pigs at Mega Seed centre of Mannuthy

Animal Resources Development Department, Tripura

The centre was started in 2014 and maintaining Landrace, LWY X Desi crossbred. The center was

actively involved in characterization of local pig of Tripura. During 2019-20 total 608 piglets were produced and 588 piglets were sold.

Landrace, LWY X Desi crossbred

Animal Husbandry and Veterinary Services, Sikkim

Looking to the scope and importance of piggery sector in the state of Sikkim the Mega Seed Project on Pig was sanctioned at Animal Husbandry and Veterinary Services, Govt. of Sikkim. The center is maintaining HD K75 and HD50 crossbred variety. During 2020-21 total 484 piglets were produced and 452 piglets were sold.

Farrowing of HDK75

ICAR-KRISHI VIGYAN KENDRA, GOALPARA

KVK Goalpara carried out different mandated activities through On Farm Testing (OFT) for identifying technologies in terms of location specific sustainable land use system; to organize training to update the extension personnel with emerging advances in agricultural research on regular basis; to organize short term and long term training courses in agriculture and allied vocations for the farmers and rural youths with emphasis on "Learning by doing" for higher production on farms and generating self employment, and organising front line demonstrations (FLDs) on various crops and livestock for large adoption by the farmers. In addition, KVK produces quality technological products (seed, planting material, bio-agents, livestock) and make it available to farmers, organize frontline extension activities, identify and document selected farm innovations and converge with ongoing schemes and programmes within the mandate of KVK. During the reported period from January to December, 2021 the following activities were carried out by the KVK.

Capacity development and training programme: For capacity building of farmers, rural youth and extension functionaries, a total of 72 training programmes were conducted covering 2037 number of participants during the year. The training programmes conducted for farmers and farm women conducted were 33 nos. covering 903 participants; training for rural youth were 21 nos. covering 599 participants; training for extension functionaries were11 nos. covering 135 participants;long duration sponsored trainings were 3 nos covering 67 participants.

Glimpses of trainings conducted

Skill development training on nursery management : A seven days Skill development training on nursery management of horticultural crops was conducted from 12 to 18 December 2021 by KVK Goalpara under the sponsorship of MANAGE Hyderabad. A total of 24 trainees participated in the training programme in which topics ranging from site selection, propagation methods, marketing etc. were discussed by invited resource persons. An exposure visit to a local nursery was also arranged for imparting practical knowledge.

Skill development training on nursery management

Technology Assessment through On Farm Testing (OFT)

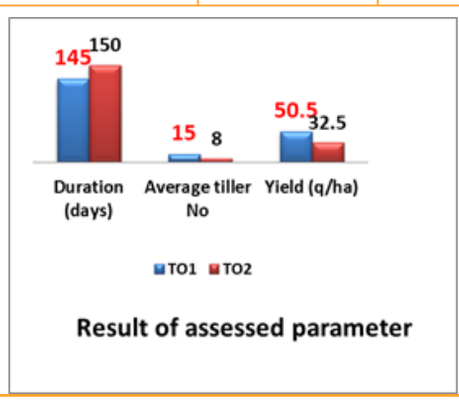
The On farm Testing (OFT) conducted by Krishi Vigyan Kendra Goalpara on different agricultural technologies are as follows:

Performance trial of drought tolerant rice var. CR Dhan 801 and 802: An OFT on performance trial of drought tolerant rice var. CR Dhan 801 and 802 was conducted for assessment to solve the problem of mid crop period moisture stress leading to low yield & crop damage. The trials were conducted in three replication (3 villages) at medium land situation under rainfed condition where mid crop period moisture stress condition prevail due to non-uniform rainfall. ICAR-National Rice Research Institute (NRRI) has developed CR Dhan 801 and CR Dhan 802 possessing submergence as well as drought tolerance ability in the background of mega-variety 'Swarna'. The varieties are reported as resistant to stem borer (both dead heart and white ear), leaf folder, plant hoppers and case worm while moderately resistant to bacterial blight, sheath rot and rice tungro virus.

Technology details

TOI: Var. CR Dhan 801 & 802
TO2: Numoli (check)
Seed Treatment : Mencozeb 2.5 g/kg seed
Spacing : 20cm x 15 cm
Weeding : at Active tillering stage
N:P:K : 60:20:40
Plant Protection: Systemic pesticides

Parameter	TO1	TO2
Duration (Days)	145	150
Average tiller No	15	8
Yield (q/ha)	50.5	32.5
Net Return (Rs)	44,750	27,250
B C ratio	1.70	1.35




Physiological Maturity Stage


Active tillering Stage


Maturity Stage

Assessment for corrective measure of kharif rice spikelet sterility by application of Boron: An OFT on Assessment for corrective measure of kharif rice spikelet sterility by application of boron to solve the problem on Low yield due to severe spikelet sterility of rice. Rice, when grown on a wide range of agro-ecosystem with varying soil pH levels, boron availability, uptake and mobilization become limiting and leads to reduced productivity and poor rice yields. Boron (B) plays a very important role in the cell wall formation, sugar translocation, and reproduction of the rice crop and could play an important role in varying agro-ecosystem.

Technology details
TO1: Application of Boron spray
- Foliar spray of 0.4 ppm boron at flowering stage
- In the form of Boric acid H3BO3@ 2.29 mg/lt water
- Seed treatment : Mencozeb 2.5 g/kg seed
- Spacing : 20cm x 15 cm
- Weeding : at active tillering stage
- N:P:K - 60:20:40, Plant Protection: Systemic insecticide and fungicides

TO2: Local practice (without application)

Parameter	TO1	TO2
Severity of spikelet (nos /sq m)	0.5	3
Yield (q/ha)	49.5	31
Net Return (Rs)	43,000	25,500
B C ratio	1.65	1.42

Foliar spray of 0.4 ppm boron at flowering stage

Severity of spikelet (0.5 /sq m)

Performance trial on stage wise application of N and K in Banana for higher yield: On farm trial on stage wise application of N and K in banana was conducted in three locations of Goalpara district. The objective of the OFT was to assess the increase in yield through split application of nitrogen and potassium against the recommended practice. There was an yield increase of about 28.5 % in split application of N and K as against recommended practice.

Performance trial on stage wise application of N and K in Banana for higher yield

Performance trial of multiple disease resistant Tomato variety ArkaAbhed: On farm trial on multiple disease resistant tomato variety ArkaAbhed was conducted in three locations of one each in Kharmuja, Balijana and Kuchdhowa block of Goalpara district. The OFT was conducted to assess the performance of tomato variety ArkaAbhed in terms of its multiple disease resistant capabilities against non-resistant varieties. The incidence of disease was negligible in ArkaAbhed whereas in variety ArkaSamrat the disease incidence was 14.8 %.

Performance trial of multiple disease resistant Tomato variety ArkaAbhed

Management of Diamond Back Moth and Cabbage Butter Fly with Pheromone Trap: An OFT programme on Management of Diamond Back Moth and Cabbage Butter Fly with Pheromone Trap was taken under plant protection. Technology details TO1: DMB Lure pheromone trap @ 10/bihga TO2 : Farmers practice: Hand picking, neem spray. Source of technology was AAU, Jorhat, 2019. Cabbage Variety: Cabbage Hybrid BC90 (Syngenta) Total number of trial was 8.

Parameter	TO1	TO2
Pest Incidence(%)	27	35
Pest Infestation (%)	5	15
Yield loss (q/ha)	15	34
Yield (q/ha)	220	180
Net return (Rs/ha)	1,76,000	105,000
B: C ratio	2.80	2.1

Management of Diamond Back Moth and Cabbage Butter Fly with Pheromone Trap

Year round Cultivation of Oyster mushroom: An OFT programme under taken under plant protection on year round cultivation of oyster mushroom. Oyster mushroom cultivation is very much popular among women farmers/ SHG members in the Goalpara district of Assam. Several varieties are now available for cultivation of Oyster mushroom in summer season also. Normally oyster mushroom (Pleurotus spp) (10-280C) can be grown during September to April (8 months) of a year. Pleurotus florida is a warm temperature strain. Pleurotus ostreatus can also grow in summer season. Pink oyster mushroom (Pleurotus djamor) (20-300C) grows really fast, producing fruits in as little as 3-4 weeks. They can be cultivate during March to August of a year. Thus year round oyster mushroom can be grown commercially. Technology details TO1: Year round cultivation of Oyster mushroom TO2 : Farmers practice: Winter season cultivation of Oyster mushroom Source: DMR, Solan. Total number of trials: 5

Parameter	TO1	TO2
Yield per bag (kg)	1.55	1.30
Yield (kg/unit)	1560	800
Net return	2,25,000	1,20,000
B: C ratio	3.80	3.0
Farmer's reaction	V good	Good

Year round Cultivation of Oyster mushroom

Assessment of Rani breed of pig: An OFT was conducted to assess the Rani breed of pig in Goalpara district to increase pork production and for profitable pig farming. The Rani breed of pig is introduced to overcome the low productivity of existing pig population in Goalpara district. 06 numbers of piglets (02 male and 04 female) were distributed to farmers under the programme. The programme is in progress.

Distribution of piglets and feeds

Performance trial of fermented banana pseudo-stem feed for Grower Pig: An OFT was conducted on performance trial of banana pseudo-stem feed for grower pig to replace the high cost commercial feed. The ingredients of the feed are Banana pseudo-stem (90%), Molasses (10%) and Probiotics (106 CFU/gm feed). The technology was released by ICAR RC, Barapani, Meghalaya in the year 2018. The programme is in progress.

Flowchart of processing of banana pseudo-stem into fine mesh powder form

Use of engine operated walk behind type paddy transplanter: Transplanting paddy is a time consuming and laborious operation. Traditionally manual transplantation is done and there is shortage of labour during the peak season. Therefore, Engine operated walk behind type paddy transplanter was tested in farmer's field in Goalpara condition. The seedlings were raised in mat nursery. Field capacity of the transplanter was found to be 0.13 ha/hr in comparison to 0.01 ha/hr manually. Transplanting efficiency was recorded 97% with fuel consumption of 7.0 lit/ha.

Use of Engine operated walk behind type paddy transplanter

Assessment of improved turmeric processing technique using steam boiling method: Turmeric (Curcuma longa) is widely cultivated in Goalpara district and its adjacent area of North Garo hills. Farmers gets less profit due to lack of proper processing technology of turmeric. The quality of turmeric powder depends upon the initial quality of rhizomes and on-farm processing of turmeric rhizomes which effects curcumin content, organoleptic characteristics, size and general appearance of the dried turmeric rhizomes. The on farm post harvest processing operations consists of washing, curing, drying, polishing, grading and colouring. Among all, curing, drying and polishing are the important operations of turmeric processing. Curing is a process of cooking the raw rhizomes in hot water or steam water to obtain attractive colour, characteristic aroma, destroy the viability of the fresh rhizomes and obviate the raw odour, reduces the time of drying, ensures an even distribution of colour in the rhizomes and gives a better quality product. Turmeric cured by steam boiling method was found to be the most preferred variant with respect to the sensory quality such as colour, flavour, taste and overall acceptability than in comparison to traditional method of curing. Overall, the product has good sensory attributes and nutritional value than turmeric cured by other method.

Assessment of improved turmeric processing technique using steam boiling method

Preparation of Amla juice and candy: An OFT was conducted on preparation of amla juice and candy to minimize the seasonal loss of Amla due to its perishable nature. Consumption of Amla and its value added products also boost immunity of a person. Amla candy is prepared by blanching amla in sugar syrup and drying. Amla juice is prepared by extracting amla juice and mixing it with water. The result of the programme revealed that organoleptic quality of the products is highly acceptable by the farmers and its also provides more income to the farmers than selling of raw amla in the market. The B.C ratio was 1.67 in case of Amla candy and 3.0 in case of Amla juice.

Preparation of Amla juice and candy

Frontline Demonstration (FLD) and Cluster frontline demonstration (CFLD) Programmes

Popularization of Hybrid Maize 4750 for Silage : India is the largest producer of milk with 187.75 MT production (Basic animal husbandry statistics, 2019). The average yield is about 1600 Kg/animal whereas the world average is about 2700 kg/animal. This is due to shortage in nutritionally balanced ration. However, in Assam during rabi season the fresh fodder is very must lacking. Further, during flood condition it is often observed that some of the livestock's are died due to lack of feed. To overcome this problems a FLD programme on Silage preparation from hybrid maize 4750 was conducted at dairy farmer's field and KVK farm. Further, this variety is high yielding, high test weight, good tolerance against foliar diseases and stay green character.

Technology demonstrated

Maize var. Hybrid Maize 4750

Seed rate : 22.5 kg/ha (3 kg/bigha)

Line sowing : Spacing of 60 cm × 25 cm

Result

Fertilizer NPK : 60:40:40 and FYM 5t/ha

E Y of System (Maize EY): 42.5 q + 16q= 58.5q/ha.
Silage Yield 36 t/ha @ Rs 6000/ tone i.e
216000/ ha. Milk yield increased by 25% .

Demonstration Yield (q/ha)			Yield of local Check	% increase	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C Ratio (GR/GC)
H	L	A						
49.5	34	42.5	29	40.55	42,500	1,28,000	95,500	2.24

Vegetative Stage

Harvesting Stage

Silage preparation

Ready for Packaging

Bagging of Silage

Silage Feeding

Popularization of Sesamum Var. ShT-1 : Sesamum is one of the most important oilseed crops in Goalpara district of Assam next to Rapeseed and mustard. Sesame is a short duration crop, requiring low input of resources and can be grown under rainfed, irrigated, dryland or residual moisture conditions. It grows well on stored soil moisture with minimal irrigation and can produce good yields under high temperature. With the current change in climate and drought conditions, there is a need to grow drought resistant crops, which includes sesame. The farmer of Goalpara district usually grow local variety which are low in yield potential. The sesamum variety ShT-1 is 80-90 days duration crop with yield potential 8-9 q/ha. Further it is marginally resistant to root rot, bacterial blight and mite.

Technology demonstrated

Sesamum var. ShT1

Seed rate - 4 kg/ha

Line sowing - Spacing 15 cm × 15 cm

Fertilizer NPK : 30:20:20 and FYM 5 t/ha

Result

Demonstration Yield (qt/ha)			Yield of local Check	% increase	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C Ratio (GR/GC)
H	L	A						
6	4.5	5.6	3.5	41.6	20,000	39500	19500	1.97

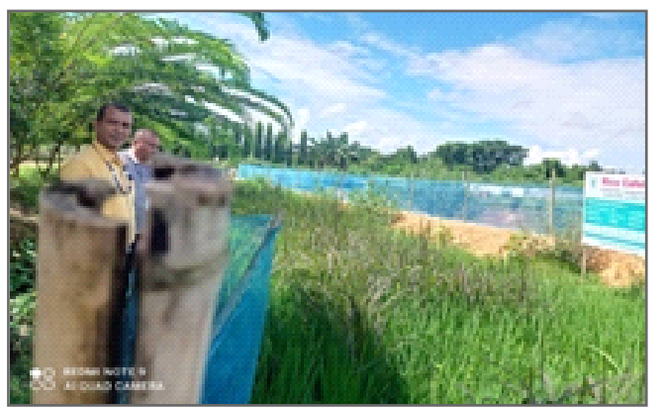

Sesamum Var. ShT-1


Pod formation Stage


Flowering Sage


Threshing

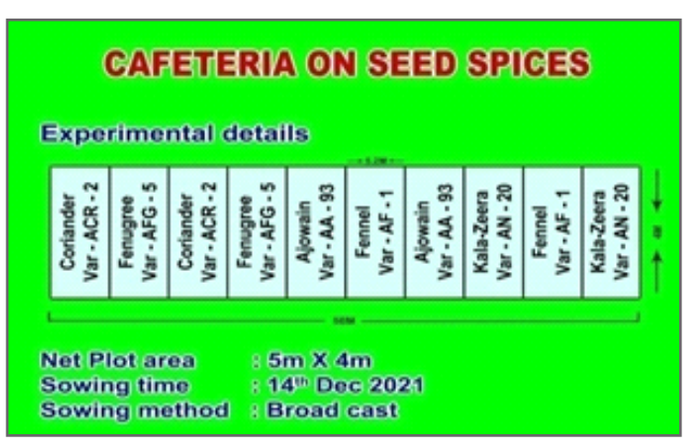
Demonstration on Rice Cafeteria : Rice Varietal Cafeteria- an Innovative Tool for Technology Transfer through Varietal Showcase & Participatory Selection which was conducted in KVK farm with 5 different rice varieties. The demonstration directly visualizes the significant advantages and benefits over existing one which corresponds to 'seeing is believing, leading to secure livelihood and enhanced profitability among visitor of KVK Goalpara.



Result

Variety	No of Tiller	No of panicle	No of grain / panicle	Test wt (g)	Yield (q/ha)
Kalabati	8	7	162	23	25.5
Black Joha	9	8	170	22.5	27
Ranjit Sub 1	16	14	195	23.5	46
Swarna Sub 1	17	16	197	23.5	48.5
Pan Jamuna	12	10	172	23	41.5

Demonstration on Seed Spices: The seed spices are aromatic plant product used for flavouring and imparting aroma to the food and beverages. Out of 20 spices grown in India, the most 5 important spices namely Coriander, Fenugreek, Ajowain, Fennel and Kala-Zera were demonstrated to realized the full potential of varieties per unit area, time and agro-climatic conditions. The varieties which are demonstrated are reported as sustainable yielder under biotic and abiotic stress.



Crop & Variety
Coriander Var. ACR-2
Fenugree Var.AFG-5
Ajowain Var. AA-93
Fennel Var. AF-1
Kala-Zeera Var. AN-20

Demonstration plots of Seed Spices

Technology demonstrated

Rice Var.Swarna Sub 1

Line sowing - Spacing 25 cm × 25 cm

Fertilizer NPK : 60:20:40 and FYM 2 t/ha

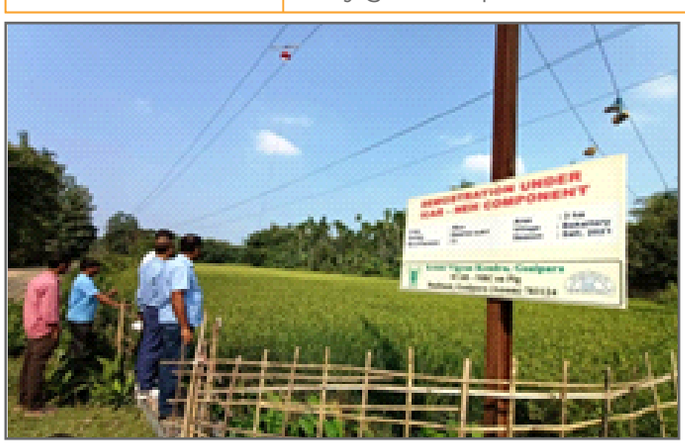
Plant Protection: Systemic Pesticides

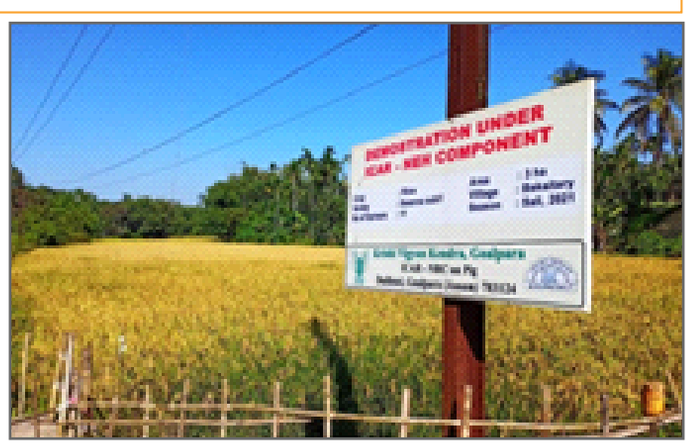
Flowering Stage

Demonstration on Rice Var. Swarna Sub1 : Flash flood or submergence is a common phenomenon in rice growing rainfed lowland areas that seriously affects crop establishment leading to severe yield losses. A few submergence–tolerant rice varieties have been developed by introgression SUB -1 gene into mega rice varieties of South Asia. The introduction of the SUB-1 locus into Swarna (MTU-7029) India's most popular rice variety resulting Swarna-Sub1 (IR05F102) which maintains all the properties of Swarna and acquiring submergence tolerance. It has been shown to withstand floods of up to 17 days. With this advantage a demonstration programme was undertaken on Rice var Swarna Sub 1 at 3 different villages of Goalpara district of Assam.

Result

Variety	No of Tiller	No of panicle	No of grain / panicle	Insect / disease infestation	Yield (q/ha)
Swarna Sub 1	17	16	210	0.5% sqm	49.5
Phulpakri (Local)	8	7	155	3% sqm	27
Farmers feed back	Very good response on var. Swarna Sub1				





Rice Var. Swarna Sub-1 Flowering and Maturity Stage

Cluster Front Line Demonstration on Mustard Var. NRCHB-101: KVK Goalpara conducted Cluster frontline demonstration (FLDs) to demonstrate the production potential of newly released technologies on the farmer's fields at different location in a given farming system and organized farming and extension activities for farmer and extension workers for dissemination of various technologies under National Mission on Oilseed and Oil Palm (NMOOP). A total of 10 hectare area was covered for cluster demonstration on Mustard crops through a total of 25 nos. of demonstrations .

Technology demonstrated

Mustard var.NRCHB 101

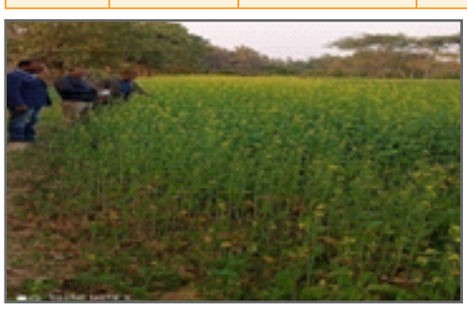
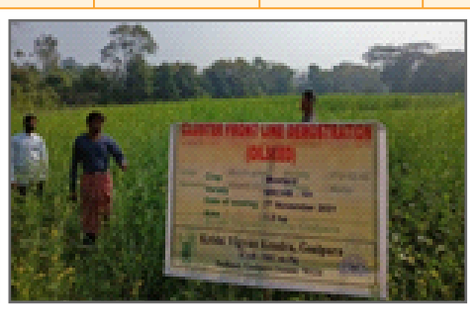
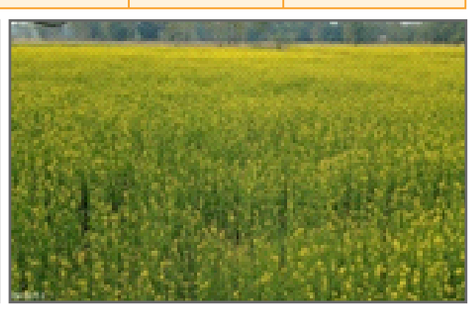
Seed rate - 10 kg/ha

Fertilizer NPK : 80:40:30 and FYM 2 t/ha

Borax : 10 kg/ha

Result

Demonstration Yield (qt/ha)			Yield of local Check	% increase	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C Ratio (GR/GC)
H	L	A						
10	6.90	8.85	5.5	54	27,000	80,200	53,200	1.97

Flowering Stage of NRCHB=101

Cluster Front Line Demonstration on Black gram Var.IPU-2-43: KVK Goalpara conducted Cluster frontline demonstration (FLDs) to demonstrate the production potential of newly released technologies on the farmer's fields at different location in a given farming system and organized farming and extension activities for farmer and extension workers for dissemination of various technologies under National Food Security Mission (NFSM). A total of 20 hectare area was covered for cluster demonstration on Black gram crops through a total of 50 nos. of demonstrations.

Technology demonstrated

Black Gram var. IPU-02-43

Seed rate – 22.5kg/ha

Fertilizer NPK : 10:35:15 and FYM 2 t/ha

Rhizobium cultures & PSB : 50 g/kg seed

Result

Demonstration Yield (qt/ha)			Yield of local Check	% increase	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C Ratio (GR/GC)
H	L	A						
9.25	6.5	8.2	5.5	49	21,000	47,200	26,200	1.80



Harvesing of Black Gram Var IPU2-43

Vegetative Stage Of Black Gram Var IPU2-43

Cluster Front Line Demonstration on SesamumVar.Champaboti : KVK Goalpara conducted Cluster frontline demonstration (FLDs) to demonstrate the production potential of newly released technologies on the farmer's fields at different location in a given farming system and organized farming and extension activities for farmer and extension workers for dissemination of various technologies under National Mission on Oilseed and Oil Palm (NMOOP). A total of 10 hectare area was covered for cluster demonstration on Mustard crops through a total of 25 nos. of demonstrations.

Technology demonstrated

Sesamum var. Champaboti

Seed rate - 4kg/ha

Spacing - 30 cm X 15 cm

Fertilizer NPK : 30:20:20 and FYM 2 t/ha

Result

Demonstration Yield (qt/ha)			Yield of local Check	% increase	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C Ratio (GR/GC)
H	L	A						
6	4.75	5.6	3.5	37.5	18,000	46,000	28,000	1.6

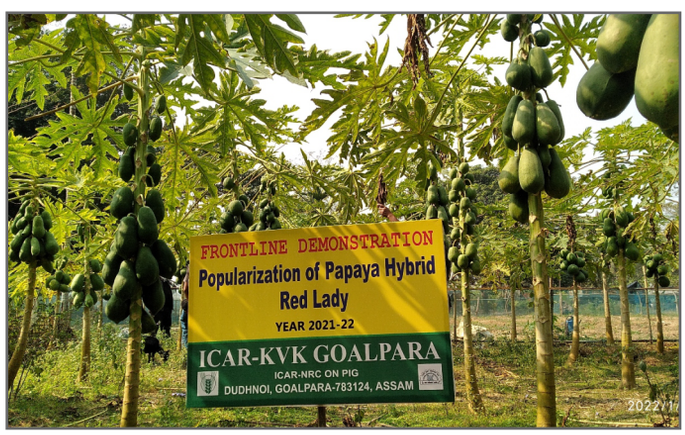
Manual Harvesting of sesamum Var ShT-1

Flowering Stage

Popularization of cabbage cultivation using organic sources of nutrients: Frontline demonstration on popularization of cabbage cultivation using organic sources of nutrients was conducted in two locations each in Matia development blocks and in one location in Kuchdhowa development block of Goalpara district. A total of 75 beneficiaries were covered under the FLD programme. The objective of the FLD programme was to popularize organic cultivation of cabbage among the farmers of the district. The average yield in the demonstration plot was found to be 405 quintals per hectare. A benefit cost ratio 3.6 was recorded in the Frontline demonstration plots.

A view of cabbage crop in FLD plot

Introduction of high density planting of papaya for higher yield: Frontline demonstration of high density planting of papaya for higher yield was conducted in three locations of Goalpara district. A total of 60 beneficiaries were covered under the programme. The average yield recorded per plant was 30 kg. The average yield recorded in the programme was around 50 tons per hectare. The benefit cost ratio recorded was 8.



Introduction of high density planting of papaya for higher yield

Extension of shelf life and keeping quality of gerbera with pulsing: Gerbera (Gerbera jamesonii L.) is an important ornamental plant with beautiful colourful flowers used as cut, pot and garden flowers. It belongs to the Asteraceae family, originating in Southern Africa and Asia. Vase life is often used as an indicator of postharvest longevity in cut flowers, and is determined by the number of days from harvest until flower senescence. During the year, 2021-22 a FLD on extension of shelf life and keeping quality of gerbera with pulsing treatment was carried out in 2 villages namely Damra under Dudhnoi block and Patpara under Rangjuli block. The source of technology is AAU, Jorhat, 2015. In this technology, the harvested gerbera flower stalks were dipped in AgNO3 1000ppm for 10 minutes as pulsing treatment followed by putting them in holding solution of 4% sucrose. The result shows that the treatment in the flowers increased their shelf life to 07 days whereas it was usually only 02 days in case of untreated ones. The B: C ratio calculated was 3.5 in case of treated ones and 2.0 in case of local check. The farmers are happy with the result of enhancement of shelf life of the flowers and have shown interest to follow the technology.

Cultivation Practices of milky mushroom: Milky Mushroom can be grown in the temperature range of 250 - 400C. However, for best yields, 250 - 350C is necessary. Hence, this mushroom can be cultivated from the month of March to October in Assam. Technology details Milky mushroom (Calocybe indica) spawn Substrate: rice straw Casing material: pasteurized soil (75%) + sand (25%). Source of technology ICAR-DMR, Solan and Bodoland University. Number of demonstration: 05. Number of farmers :05.

Results

Parameter	Data
Yield per bag (kg)	1.20
Total yield (kg)	800
Net return (Rs/unit)	50000
B: C ratio	3:1
Market demand	High
Farmer's reaction	V good

Cultivation Practices of milky mushroom

Organic Management of Late blight in Tomato: Late blight of tomato is a major disease problem in tomato cultivation. Farmers applied different chemical fungicides for management of the disease. A FLD programme on Organic Management of Late blight in Tomato taken up under farmer's fields for the year 2021-22.Technology details Application of Copper oxychloride (COC) @0.25% Source of technology: AAU, Jorhat. Variety: Emerald (F1 hybrid). Total number of trials :5. Total area under the programme is 1 ha.

Organic Management of Late blight in Tomato

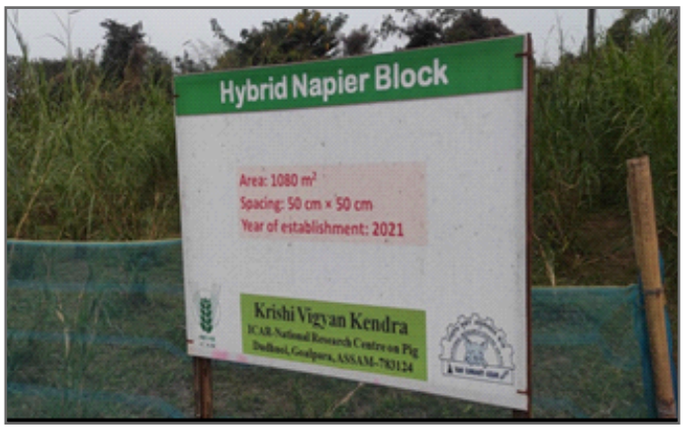
Popularizing green fodder cultivation (Hybrid Napier) : A demonstration on Hybrid Napier grass (Var. CO3) as green fodder is conducted. Hybrid Napier produces larger and softer leaves. They grow best in deep, well drained loams with a pH of 4.5-8.2 (mean 6.2).

Economic parameters:

- Demonstration : 57 q/bigha
- Gross cost :7,800/-
- Gross return :17,100/-
- Net Return :9300/-
- % change in the parameter :100

Remarks: Feeding hybrid Napier fodder during scarcity period maintained milk production level optimum.

BC ratio: 2.19



Hybrid Napier demonstration plot

Use of Tractor operated Multicrop Thresher: Threshing of Paddy is a time consuming and labourious job. Cost involvement is also high and there is shortage of hired labourer during peak harvesting season. Multicrop thresher has been demonstrated in farmer's field for awareness and popularization of mechanised threshing in Goalpara condition. Threshing capacity recorded was 0.8 Ton/hr with threshing efficiency of 98%. Winnowing efficiency was recorded 100%. Breakage of grains was nil at 1200 RPM. Threshing capacity of 3 pairs was 0.04 Ton/hr/pair. The technology was readily accepted by the farmers.

Use of Tractor operated Multicrop Thresher

Polythene Mulching in Pineapple: Mulching of Pineapple is very effective in soil moisture conservation, weed control and thereby enhancing production and productivity. 50ᴍ black polythene is a suitable material for mulching Pineapple crop. Therefore front line demonstration on use of 50ᴍ black polythene is conducted to demonstrate performance of the technology in farmer's field in Goalpara condition. The farmers are provided hands on experience on plastic mulching for cultivation of Pineapple. The programme is in progress.

Polythene Mulching in Pineapple

Nutrition garden: Nutrition Garden established at different Anganwadi centres, schools and household with an objective to minimize micro nutrient deficiency prevailed in the women and children. Seasonal fruits and vegetables with organic manure cultivated in Nutrition Garden for wholesome nutrition, which helped in improving the quality of midday meals scheme and further curtail the vegetables shortage required for preparation of meals at schools. Bio-fortified and improved variety of fruits and vegetables has incorporated in the kitchen garden along with nutritional knowledge to improve nutritional status and attainment of food security at domestic level as well. Bio fortified crop varieties are introduced in Nutrition Garden by considering the fact that these varieties are the most sustainable and cost-effective approach where the nutrients reach the target group in natural form. Maize Pusa QPM-9 improved variety has grown in Nutrition Garden along with other vegetable crops. It has good yield and rich in high pro-vitamin -A (8.15 ppm), lysine (2.67%) and tryptophan (0.7.4%). Improved varieties of vegetables were also cultivated in the nutrition Garden.

Nutrition garden

Solar Tunnel Dryer: Open-sun drying is the most common method used to preserve agricultural produces in the world and also in India. However, it is labor intensive, takes long time and produces low quality products. Solar-drying technology offers an alternative source which can process the vegetables, fruits, spices, herbs etc. in clean, hygienic and sanitary conditions and maintain standards with zero energy costs. Solar tunnel type dryers are best suited for meeting these requirements. In order to demonstrate the drying potential of this type of dryer, a performance analysis was conducted for red chilli, turmeric, ginger, amla etc. and the following conclusions are made from the experiments. The solar dryer reduced the moisture content of red chilli from 79% (w.b.) to about 10% (w.b.) in 55 h compared to 124 h taken by open-sun drying by saving 56% of drying time. The turmeric, ginger, amla was also dried in the dryer from an initial moisture content of 79% to a final moisture content of 10% in 55 h compared to 124 h required in open-sun drying. The average thermal efficiency of the dryer for drying was found to be 16.25%. The overall acceptability was very good in terms of colour, texture, taste and shelf life of all the products.

Solar Tunnel Dryer

Improved sickle for drudgery reduction during paddy harvesting: An FLD was conducted on Improved sickle for drudgery reduction during paddy harvesting. The Sickle was brought from ICAR - Central Institute of Agricultural Engineering, Bhopal. The results of the demonstration were as follows: Special shape of handle gives protection to fingers and palm from getting rubbed to soil; Low physiological pressure due to less pushing force with improved sickle; Increase in output by 33 %; Average heart rate (beats/min) is 112 as compared to 109 with Conventional Sickle; and Field capacity (ha/h) is 0.016 as compared to 0.012 with Conventional Sickle.

Fig. Demonstration on Improved Sickle

KVK Farm Activities

A number of demonstration units have been established at KVK Goalpara farm during the reported period viz. protected cultivation unit, bee keeping unit, vemicompost unit, solar based sprinkler irrigation, demonstration of field and horticultural crops, nutrition garden, bamboorium, etc. Production of seed and planting materials is an important activity of KVK Goalpara. During the reported period, 15 Quintals of Paddy (Ranjit sub-1), 10 Quintals of Rapeseed (Uttara) were produced in farmer's field. 5500 numbers of Vegetable and Avenue tree seedlings were produced in KVK Farm whereas 1,45,000 numbers of Vegetable, Fruit and Spice seedlings were produced in farmer's field.

KVK Farm

Other programmes implemented by KVK

Gramin Krishi Mausam Sewa/DAMU Programme: The following activities have been carried out: Preparation of agromet advisory bulletin and dissemination is the main objective of Gramin Krishi Mausam Sewa (GKMS). The AAS bulletins are being prepared biweekly and were being disseminated through whatsapp as well as via DSS portal both English as well as in local languages (Assamese). All total, 104 district level and 832 numbers of block level bulletins were being prepared throughout the year; Data record keeping of Automatic weather

Automatic Weather station

Bulletins

station is the another objective. Daily weather data were being collected, analyze and maintained data both in hard copy as well as in soft copy format; and Information regarding extreme weather events was also being disseminated among the farmers in advance.

CELEBRATION OF IMPORTANT EVENTS

National Campaign on Poshan Abhiyan and Tree Plantation: To celebrate Poshan Vatika Maha Abhiyan & Tree Plantation and as curtain raiser of the "International Year of Millets 2023", KVK Goalpara organised a day long programme on 17th September, 2021 where 110 numbers of participants were present comprising 56 nos. of farmers and 37 nos. of adolescent girls. A seed distribution programme was held where all the paricipants were provided seed packets provided by IFFCO. All the participants were also provided seedlings of Amla, Guava and Assam Lemon. Millet based food products were distributed among adolescent girls.

International Women's Day: International Women's day is organised by KVK Goalpara at the Training Hall of KVK Goalpara. In view of this years theme "Empowerment women farmers with skill and knowledge", a training programme was organised where 27 numbers of women from different parts of Goalpara district participated. The women farmers visited the Exhibition Hall of KVK Goalpara where many agriculture models, implements, value added products, agricultural implements and posters were displayed.

Awareness programme on Climate Resilient Agriculture Technologies & Farmer's Scientist Interaction: An awareness programme on Climate Resilient Agriculture Technologies was organised by KVK Goalpara on the occasion of Honourable PMs address to farmers on Climate Resilient Agriculture Technologies on 28th September 2021 at Committee Hall of KVK Goalpara. In this regard, a Farmer's Scientist Interaction was also organised. 114 numbers of farmers and officials participated in the programme. The meeting was chaired by Mr. Jadab Swargiary, MLA, 36th Dudhnoi LAC who speak on the effect of global warming and how we human race have to work together to overcome it.

Natural Farming (Zero Budget Natural Farming): A programme on Natural Farming (Zero Budget Natural Farming) cum Farmers Scientist interaction Programme was organised by KVK Goalpara on the occasion of Hon'ble Prime Minister Shri Narendra Modiji's Address to farmers on Zero Budget Natural Farming on 16th December 2021 at Committee Hall of KVK Goalpara. A total of 123 members participated in the programme. In this regard, a Farmer's Scientist Interaction was also organised where all the queries of farmers were answered.

Visit of Mrs. Meenakshi Das Nath, ACS, Deputy Commissioner, Goalpara to KVK Goalpara: Deputy Commissioner of Goalpara district of Assam Mrs. Meenakshi Das Nath, ACS visited Krishi Vigyan Kendra Goalpara on 23rd December 2021. She attended a series of programme at KVK Goalpara. She inaugurated the newly established Automatic Weather Station (AWS) at KVK Goalpara farm for delivering agro-met services to farming community of Goalpara district. She visited the Experimental cum Demonstration Plots (Spice cafeteria, Bee keeping unit, Vermicompost unit, Assam Lemon Block with pitcher drip irrigation and mulching, experimental plot on Horticultural crops, Nutrition garden, Natural farming plot, etc. Honorable DC Madam also launched Tractor operated Seed drill for sowing of seeds for first time in Goalpara district in the KVK experimental farm.

Extension Activities carried out by KVK: A number of extension activities were carried out for dissemination of agricultural technologies and information by the KVK during this period which is presented in table 1.

Table : Extension activities carried out by KVK

Sl. No.	Activity	Nos.
1.	Field Visits	315
2.	Advisory Services	486
3.	Celebration of Important Days	12
4.	Exposure Visits	2
5.	Farmer's Visit to KVK	1273
6.	Field day	5
7.	Awareness camp	14
8.	Newspaper Coverage	11
9.	Electronic Media	10
10.	TV Programme	06
11.	Seed distribution programmes	06
12.	PRA	04

PRA at Dairong Village

Parthenium
Awareness programme

Seed distribution
under NEH component

INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)

During 2021-2022, Institute Technology Management Unit, ICAR-National Research Centre on Pig has taken several innovative steps for the technologies developed by the Institute and providing that information to pig stakeholders for economically sustainable pig husbandry. In this connection Institute Technology Management Unit (ITMU) which is funded by the National Agriculture Innovation Fund has also taken many forward steps for transfer of technology and commercialization of different pork products, diagnostic kits, low-cost feed formulation etc. as well as provide consultancy, contract research and contract services in piggery sector of India. The Centre has trained numbers of Pig farmers, stakeholders and pork processors for scientific pig rearing and value addition of pork and pork products. These efforts were intended to nurture and support unemployed youth who would be future piggery entrepreneur and thereby boosts the economy of the sector. ICAR-National Research Centre on Pig also taking initiative in making hygienic pork and pork products with good taste and flavour to popularize supply of "Clean Pork" which is also help in get rid of zoonotic diseases that may arise from pork and pork product. With the continuation of its effort to develop and transfer of technologies, institute has applied five Patents, ten Copyrights and two Designs. During 2021-2022 institute has developed three nos. of technologies and signed thirteen MoUs with different entrepreneurs, stallholders and organization to commercialise and transfer these technologies as well as for various services like consultancy, contract research and contract services. The newly developed technologies under different aspects will further strengthen the intellectual property management and transfer the regime of ICAR and make a significant contribution to the upliftment of the economic status of pig farmers.

Institute Technology Management Committee

Chairman: Director, ICAR-NRC on Pig

Member: Dr. Santanu Banik, Principal Scientist

Dr. N.H. Mohan

Dr. Keshab Barman, Principal Scientist

Dr. R. Thomas, Sr. Scientist

Mr. P. Nayak, AFAO/AO

Mr. Uttam Prakash, AAO

External Member: Dr.B.K Bhattacharjya, Pr. Scientist &Head, CIFRI Regional Station, Guwahati

Member Secretary: Dr. Pranab J. Das, Pr. Scientist

IPRs	Name of Institute	Application/ Registration No.	Name of Innovation/ Technology/ Product/ Variety	Date of Filing/Registration	Application Granted/ Registered
Patent	ICAR-NRCP	201831043234	PIG RESTRAINING TOOL	16.11.2018	FER completed 13.04.2021
	ICAR-NRCP	201831033038	A PORTABLE FREE STANDING SMALL-ANIMAL RESTRAINING TOOL	03.09.2018	FER completed on 04.06.2021
	ICAR-NRCP	202011004699	NRCP-Nucleic acid based diagnosis of porcine reproductive and respiratory syndrome (PRRS) virus infection in pigs	03.02.2020	Publication Date: 27.08.2021
	ICAR-NRCP	202011052348	Antimicrobial activity of piggery waste medicinal maggots	10.12.2020	Complete Specification 21.12.2021

	ICAR-NRCP	202211001562	Process for preparation of a spray for surface decontamination of pork carcasses using fermented bamboo shoot extract and spray thereof	19.07.2021	Complete Specification filed on 11/01/2022
Copyrights	ICAR-NRCP	Literary work	AI in Pig	23.10.2021	Processed
	ICAR-NRCP	Literary work	Pig Production and Management	23.10.2021	Processed
	ICAR-NRCP	Literary work	Scientific Pig Production Practice (Assamese)	23.10.2021	Processed
	ICAR-NRCP	Cinematographic work	Scientific interventions for upscaling rural piggery (Assamese)	23.10.2021	Processed
	ICAR-NRCP	Cinematographic work	Scientific interventions for upscaling rural (Hindi)	23.10.2021	Processed
	ICAR-NRCP	Cinematographic work	Scientific interventions for upscaling rural (English)	23.10.2021	Processed
	ICAR-NRCP	Literary work	Scientific Pig Production and Management	04.04.2022	Processed
	ICAR-NRCP	Cinematographic work	Biosecurity in scientific pig production (Assamese)	04.04.2022	Processed
	ICAR-NRCP	Cinematographic work	Biosecurity in scientific pig production (Hindi)	04.04.2022	Processed
	ICAR-NRCP	Cinematographic work	Biosecurity in scientific pig production (English)	04.04.2022	Processed
Design	ICAR-NRCP	360850-001	Boar semen storage cabinet	28.02.2022	CBR N0. 214886 16.04.2022
	ICAR-NRCP	360850-002	Boar semen storage and transportation box	28.02.2022	CBR N0. 214886 16.04.2022

New technology endorsed for commercialization

Sl. No.	Institute	Name of Technology	IP Protection (Yes/ No)*	Endorsement Date for Communication	Price for commercialization
1	ICAR-NRCP	Nucleo Fast Viral DNA isolation Kits	No	13.01.2022	₹400000/
2	ICAR-NRCP	Multiplex CSE, JE, 7PRRS Assay Kit	No	28.02.2022	₹400000/

Consultancy, Contract Research and Contract Service

Sl. No.	Name of Service	Type of Service	Personnel involved	Name of clients	Total Revenue earned
1	Testing of Nirmay efficacy in crossbred pigs	Contract Service	Dr. K. Barman,	Mr. Arvind Soman, Lilac Organics, Maharashtra	74,500.00
2	Development/standardization/ refinement of the formulations for the selected pork cuisines [viz. pork with till; pork with lai; pork with muska tenga; pork with fermented bamboo shoot and dried chillies; pork vindaloo; pork chilli; pork pura with lemongrass; pork with dry jute leaf], to make them amenable for retort processing with good sensory attributes.	Contract Research	Dr. R. Thomas & Dr. V.K. Gupta	M/s Hillygreens Agro, Amingaon, Guwahati	73,160.00
3	Technical assistance in preparation of detailed project reports (DPR) towards establishment of five slaughter houses in different district of Manipur.	Consultancy	Dr. R. Thomas & Dr. V.K. Gupta	dept. of animal husbandry service, govt. of manipur	2,72,580.00
4	Exchange of Resources	Co-operation in Education and R&D activities		IIT, Guwahati	-

Commercialization of Technologies (MoU/MoA signed)

Sl. No.	Name	Location of Business Enterprise	Areas specific for Institutional Support	Technology Transfer fees	Date of MoU/MoA Signing
1	Emergent Dream Works Infra Developers	Serillingampally, Hyderabad	I. Technology for establishing commercial pig breeding farm	25,000	06.01.2021
			II. Technology for establishing a micro Pig Abattoir.	10,000	
			III. Technology for establishing Processing of common value added pork products	10,000	
2	Directorate of Animal Resources Development Department	Agartala, Tripura	I. Technology for establishing a micro Pig Abattoir	10,000	26.03.2021
3	Majo Francis. A	Thissur, Kerala	I. Technology Establishing Micro Pig Abattoir	10,000	06.07.2021
4	Hester Bio-sciences Ltd	Ahmedabad, Gujarat,	I. Technology Transfer of Pigmin Technology	1,89,000	03.08.2021

Commercialization of Technologies (MoU/MoA signed)

5	Arthur Foods Company Pvt. Ltd	Bangalore, Karnataka	I. Quality testing of pork products	10,000	06.09.2021
			II. Establishing a pork processing unit	25,000	
6	Murali Jayaram Reddy	Bangalore, Karnataka	I. Establishing micro pig abattoir	10,000	
			II. Technology for establishing pork processing unit	25,000	06.09.2021
			III. Establishing a small feed mill	25,000	
7	Rayan Firms LLP	Ulubari Guwahati, Assam	I. Technology for establishing commercial pig breeding farm	25,000	08.02.2022
			II. Technology for establishing Artificial Insemination support		
8	Animal Resources Development Department (ARDD)	Agartala, Tripura	I. Technology Transfer for Chilled Boar Semen Processing Centre	25,000	08.02.2022
9	Aqgromalin Farmtech Pvt. Limited	Chennai, Tamil Nadu	I. Knowledge Partner	25,000	06.04.2022

Capacity Building in IP Management

Sl. No.	Name of Programme	Organized By	Days of Programme	Participant
1	Exhibition Show in Rani Guwahati to showcase institute value added product tand other technologies	Kisan Manch	7th Oct. 2021	Dr. P.J.Das Dr. Sunil Kumar
2	Exhibition Show and awareness campaign at Jirang, Meghalaya during the SHG Mela &Health Camp	Govt. of Meghalaya	5th Nov. 2021	Dr. K. Barman Dr. P.J.Das Dr. S.R. Pegu Dr. M. Madhavan
3	National Dialogue on “Innovative Food for Hospitality Industry” through video conferencing.	IP& TM unit ICAR, under the Chairmanship of Secretary (DARE) & Director General (ICAR)	22nd June, 2021	Dr.P.J.Das
4	Review and sensitization workshop of ZTMUs/ITMUs/PMEs under NAIF scheme. (Virtual platform)	IP&TM unit, Indian Council of Agricultural Research	5th -11th October 2021.	Dr. P.J.Das
5	Webinar on “How to write claims in a patent application?”	Institute technology Management Unit, ICAR-National dairy Research institute.	1st December 202	Dr. P.J.Das

Training/workshop/Seminar etc. Organized

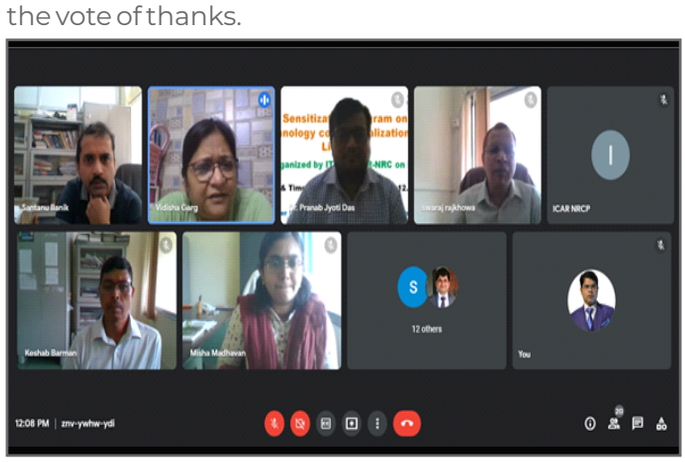
Sl. No.	Name of Programme	Days of Programme	Participants (No.)	Participant category *
1	Workshop on Sensitization Programme on Technology Commercialization and Licensing	5th July 2021	25	Scientist and Research staff
2	Covid-19 awareness programme and input distribution for hygienic slaughter practices among the pig butchers of Rani and adjoin areas	28th March 2021	100	Stakeholders

Covid-19 awareness programme and input distribution for hygienic slaughter practices among the pig butchers of Rani and adjoin areas

A COVID awareness programme and input distribution for tribal pig butchers were conducted in Rani and adjoining areas on 28th March 2022. A total of 13 pig butchers were covered in this programme and were educated about hygienic slaughter practices and their importance in public health. Pig butchers were also educated about COVID-19 for its prevention. Each tribal pig butcher was given one dustbin, charge light and sprayer machine as well as a COVID-19 kit which contains an apron, a hand sanitiser, one small towel and 5 masks. The programme was successfully conducted and pig butchers were very responsive to the awareness programme.

Sensitization Programme on Technology Commercialization and Licensing

An Online Sensitization Programme on Technology Commercialization and Licensing was conducted on 5th July 2021 from 11.00 AM -12.30 PM on the virtual mode by the Institute Technology Management Unit (ITMU) of ICAR-National Research Scientist on Pig, Rani Guwahati. Senior advocate Ms. Bidisha Garg from ICAR empanelled law firm of Anand & Anand, New Delhi gave a detailed presentation on the different issues related to Intellectual Property Rights and their implementation in India. In her talk, she has lucidly described the overview of patent, development of Patent, criteria of patent, the novelty of Patent etc. After the presentation by the speaker, an interactive session was conducted between the speaker and the scientific staff of the institute. All the scientific staff of the Institute actively participated in the programme and it was concluded after delivering the vote of thanks.



Sensitization Programme on Technology Commercialization and Licensing

AGRI-BUSINESS INCUBATION (ABI) CENTRE

ICAR-National Research Centre on Pig, through its Agri-Business Incubation Centre, focuses on finding new ways of doing business in commercial piggery; allied service sectors and value addition in pork by finding doors to unexplored markets.

ABI Advisory Committee

Chairman: Dr. Vivek Kumar Gupta, Director

Members: Dr. S. Banik, Principal Scientist
Dr. K. Barman, Principal Scientist
Dr. N.H. Mohan, Principal Scientist
Dr. P.J. Das, Principal Scientist
Dr. Alpana Das, SIC, CPCRI Regional Station Finance and Accounts Officer
Shri. Uttam Prakash, AAO
Dr. R. Thomas, Senior Scientist and Member Secretary

Induction of ABI Entrepreneurs

ABI centre of ICAR-National Research Centre on Pig is intended to help and promote piggery based enterprises by developing agi-business incubator networks in North East region and other parts of India to create a value chain in commercial piggery sector. ICAR-National Research centre on Pig inducted 09 numbers of Entrepreneurs/Start ups under ABI during 2021 to 2022; who sought for the possible support from ABI centre for streamlining their business prospectives. A total of fifteen numbers of technology transfer agreements has been signed with the entrepreneurs. The technology transfer agreement focuses on incubation and business development programme including entrepreneurship skill development activities in the areas of commercial piggery, allied service sectors and value addition in pork.

Support extended to the Incubatees

ABI centre of ICAR-National Research Centre on Pig through its mentorship connects to guide the entrepreneurs in the right direction for a better resolution and to become more agile, lean and mature as a start up company. The ABI unit also provided a more structured way to the start ups by extending the support by commercializing institute's technologies and infrastructure facility to its entrepreneurs, which has opened up new entry points in the piggery value chains for the start ups, which in turn help them to access the new potential markets. The ABI unit of ICAR-National Research Centre on Pig also extended its valuable support to its entrepreneurs in processing value added pork products and quality control. The ABI Unit is also helping the entrepreneurs by providing them pro-active and value added business support in terms of technical consultancy and mentor connections, guidance and trainings to develop modern technology based business ideas and models in business domains in order to scale their start-ups effectively.

The list of ABI supported entrepreneurs/startups are mentioned below:

Sl. No.	Name	Location of Business Enterprise	Status of the Incubatee
1	Arohan Foods Pvt Ltd	ZN Road, Geetanagar, Guwahati, Assam	Graduated
2	Amora Foods Pvt Ltd	Lokhra Road, Guwahati, Assam	Graduated
3	Sayuri Farms	Betkuchi, Lokhra, Guwahati, Assam	Graduated
4	Symbiotic Foods Pvt Ltd	Sonitpur, Assam	Early Stage
5	Borluit Farms	Dispur, Guwahati, Assam	Early Stage
6	G.N Nagesh	Bangalore, Karnataka	Graduated
7	Paras Farm	Ranchi, Jharkhand	Early Stage
8	RubulDeka	Dibrugarh, Assam	Early Stage
9	Emergent Dream Works Infra Developers	Serillingampally, Hyderabad	Graduated
10	Directorate of Animal Resources Development Department	Agartala, Tripura	Early Stage
11	Majo Francis	Thrissur, Kerala	Early Stage
12	MuraliJayaram Reddy	Bangalore, Karnataka	Early Stage
13	Arthur Foods Pvt. Ltd	Bangalore, Karnataka	Early Stage
14	Hester Bioscience	Ahmedabad, Gujarat	Early Stage
15	Ryans Farms	Sonapur, Guwahati	Early Stage

A session in Entrepreneurship Development Programme is in progress

Exchange of MoU between ICAR-NRCP an dM/s Ryan Farms Pvt. Ltd

Exchange of MoU between ICAR-NRCP and IIT, Guwahati

Swachh Bharat Mission

The ICAR-NRC on Pig, Rani organized swachhta campaign, cleanliness drive and awarnwess programme through out the year on regular basis. Other than the regular swachhta programme, the ICAR-National Research Centre on Pig, Rani organized a Special Swachhta Campaign from 02nd October, 2021 to 31st October, 2021. The programme was initiated with the address of Dr. V.K. Gupta, Director, ICAR-NRC on Pig, Rani. He briefly introduced the importance of 2nd October concerning the Swachhta and the celebration of Azadi ka Amrit Mahotsav. In that Special Swachhta Campaign, four off-campus special outdoor campaigns were carried out involving institute staff and villagers. The first outdoor campaign was Swachhta awareness programme at the Rani Monday market on 04-10-2021 involving local market buyers and sellers. The second outdoor programme was carried out on "Waste to Wealth" on 12-10-2021 at Barbakra village Mandir field involving 70 villagers from the nearby villages (Barbakra, Nampara and Jayantipur). The third outdoor programme was conducted from 21-10-2021 to 23-2021 at Rani High School involving more than 100 students in a Workshop on swachhta awareness, elocution competition on Swachh Bharat and swachhta abhiyan in school. The fourth outdoor campaign was held on 27-10-21 by cleaning roadside bushes between the institute and Rani to destroy insect breeding places. All the officers/officials, contractual staff, RA and SRF of - National Research Centre on Pig, Rani actively participated in this programme and made the event successful. The approved logo for Bharat Ka Amrit Mahotsav is also displayed prominently in this Special Swachhta Campaign Banner.

Sl. No.	Week	Date	Program	Person responsible
1	Week I	2nd October	Cleaning of the institute gate premises	Mr. Uttam Prakash
		3rd October	Cleaing of garden	Dr. Jaya
		4th October	Swachhta Awareness in local market	Dr. Gagan Bhuiyna
		5th October	Cleaning of Institute library	Dr. Rafiqul Islam
		6th October	Cleaning of office chambers	Scientist I/C
		7th October	Cleaning of Auditorium	Dr. Souvik Paul
		8th October	Cleaning of Laboratiories	Scientist I/C
2	Week II	9th October,2021 - 16th October 2021	Sanitation of the institute building, Cleanliness Drive	Dr. Juwar Doley, I/C Estate section
3	Week III	17th October	Awareness in Rani market meat shops	Dr. Rajiv Das
		18th October	Awareness in Mayrapur market	Dr. Gagan Bhuiyna
		19th October	Awareness in Jayathipur market	Dr. Nitin Attupuram
		20th October	Workshop on Swachhta awareness with farm staff	Dr. Kalyan De
		21th October	Workshop on swachhta awareness with students	Dr. Jayachitra Dr. Misha Madhavan
		22nd October	Swachhta abhiyan at nearby school	Dr. Sunil Kumar
		23rd October	Elocution competition by students on topics related to swachhta abhiyaan	Dr. Satish Kumar
4	Week IV	24 October, 2021-31st October, 2021	Sanitation & Cleanliness Drive at farm premises and including cleaning roadside bushes outside campus	Dr. Rajib Das, Dr. Gagan Bhuiyna


Swachhta Awareness in Rani Monday market




Cleaning of institute building and laboratories


Cleaning of laboratories

"Waste to Wealth" programme in Barbakra village Mandir field

Swachhta Abhiyan at Rani High School


Off-campus roadside cleaning

Campus cleaning drive

ICAR-National Research Centre on Pig, Rani, Assam celebrated and organized Swachhta Pakhwada during 16th–31st December 2021. During the Swachhta Pakhwada different cleanliness drive, awareness campaign, workshop, essay writing competition, curb the use of single-use plastic and discouraged the use of plastic, promotion of organic kitchen gardening and use of social media for swachhta promotion was done to make swachhta "everyones' business". The programmes were conducted focusing on "Hygiene and sanitation" particularly keeping in mind the ongoing COVID-19. On this occasion, the banner on Swachhta Pakhwada was displayed in different prominent places like the main gate of the institute, institute main building, nearby market places, schools and in Honorable Prime Ministers' address on "Natural farming" at the ICAR-NRC on Pig on 16th December 2021. To make the event successful, all the staffs were actively participated and celebrated Swachhta Pakwada from 16th-31st December 2021. The programme was initiated by taking Swachhta Pledge by all the staff of the institute; given by Dr. V.K. Gupta, Director, ICAR-NRC on Pig, Rani at the front gate of the institute main building on the 16th December 2021. On that starting programm; Dr. Kalyan De, Scientist & I/C Swachh Bharat Abhiyan; briefly described the programmes and events the institute going to organize during this Swachhta Pakhwada to celebrate the event.

Date	Activities	Person responsible
16.12.2021	Display of banner at prominent places, taking Swachhata pledge, Stocktaking & briefing of the activities to be organized during the Pakhwada.	Dr. Seema R. Pegu
17.12.2021	Basic maintenance: Stocktaking on digitization of office records/ e-office implementation. Review of progress on weeding out old records, disposing of old and obsolete furniture, junk materials and whitewashing/painting.	Mr. Uttam Prakash
18.12.2021	Cleanliness drive including cleaning of offices, corridors and premises.	Dr. Juwar Doley
19.12.2021	Cleanliness and sanitation drive within campuses and surroundings including residential colonies, common market places.	Dr. Kalyan De
20.12.2021	Promoting clean & green technologies and organic farming practices in kitchen gardens of residential colonies and at least one nearby village	Dr. Sunil Kumar
21.12.2021	Essay competitions for school children	Dr. Jaya
22.12.2021	Awareness on Swachhta and waste management & other activities including utilization of organic wastes/ generation of wealth from waste, polythene free status among school children.	Dr. Gagan Bhuyan
23.12.2021	Celebration of Special Day- Kisan Diwas (Farmer's Day)-23 December inviting farmers.	Dr. K. Barman
24.12.2021	Swachhta Awareness at local level (organizing Sanitation Campaigns involving and with the help of the farmers, farm women and village youth in new villages not adopted under any scheme by Institutes/ establishments.	Dr. Rajib Das
25.12.2021	Cleaning of public places, community market places and/or nearby tourist/selected spots.	Mr. Rana Kakoti
26.12.2021	Awareness on recycling of wastewater, water harvesting for agriculture/ horticulture application/kitchen gardens in residential colonies	Dr. Souvik Paul
27.12.2021	Demonstrations on safe disposal of all kinds of farm wastes.	Dr. Nitin Attupuram
28.12.2021	Cleanliness drive in farm complex	Dr. Nitin Attupuram
29.12.2021	Visits of community waste disposal sites/ compost pits, cleaning and creating awareness on treatment & safe disposal of bio-degradable/ non-bio-degradable wastes.	Dr. Satish Kumar
30.12.2021	Publicity through website and social media platforms.	Dr. Jayachitra Devi
31.12.2021	Report preparation and submission	Dr. Kalyan De

The farm-worker and the employee residing inside the campus started organic kitchen gardens utilizing the wastewater and pig dung from the farm to promote clean and green technologies and organic farming practices in kitchen gardens on 20th December 2021. They initiated to cultivate tomato, brinjal, chili, cauliflower, kohlrabi, spinach to meet their household requirements for a season. The cultivation was without any use of chemical fertilizer and pesticides. In the Nargaon Mairapur ME School, Village- Nargoan, at Rani; an essay writing competition was organized among the students on 21st December 2021 at 11:00 am on the occasion of Swachhta Pakhwada. The school is located almost 3 km away from the institute. A total of 25 students participated in the essay writing completion and wrote their views on the topic of "Swachh Bharat". On 22nd December 2021, a painting competition has been organized by our institute at Nargaon Mairapur ME School, Village- Nargoan, PO- Rani; to encourage and aware of the students about Swachhta. The students of the Nargaon Mairapur ME School School positively took part in this competition and created paintings on swachhta. A total of 28 students participated in the competition.

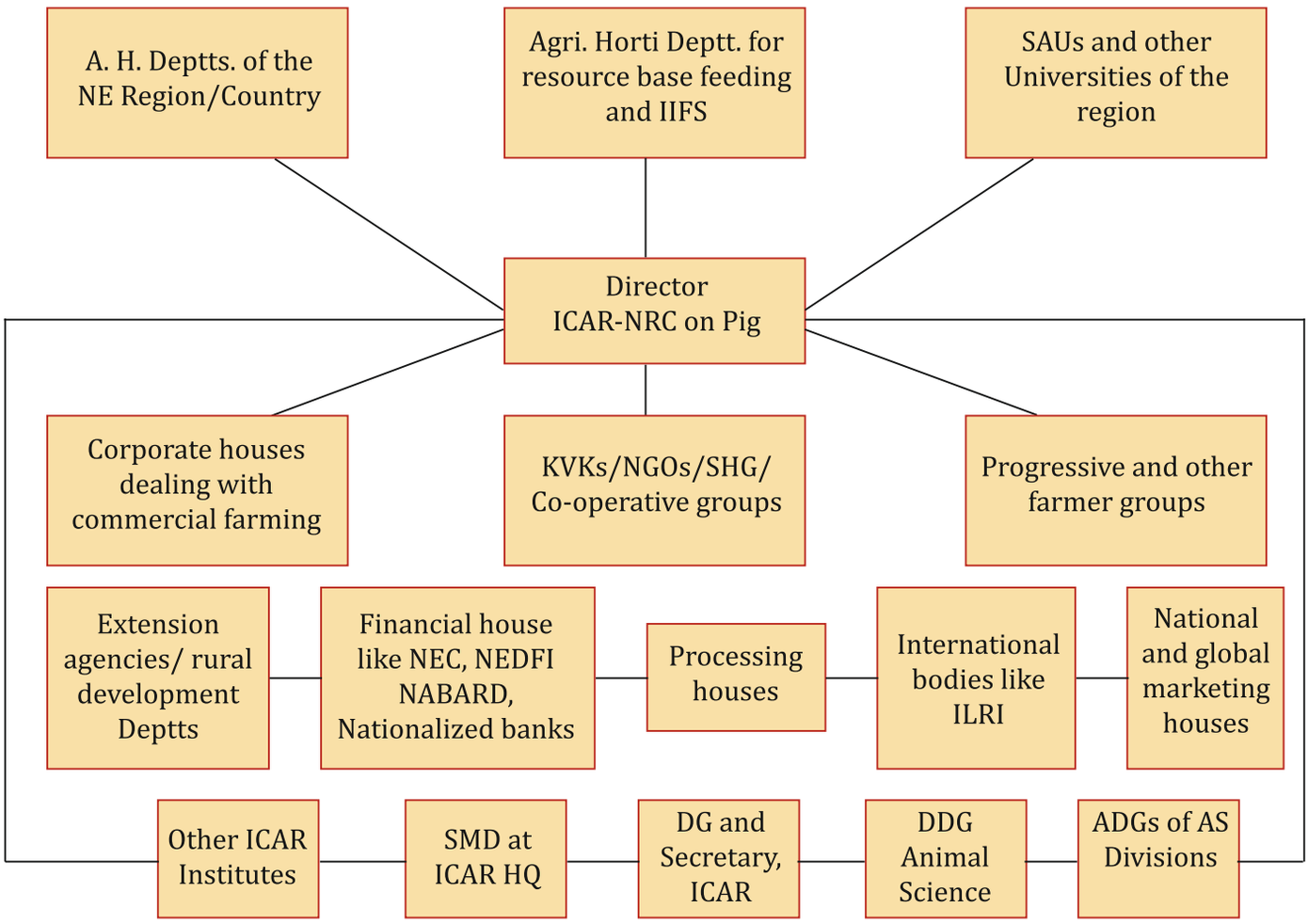
Drawing competition for school kids on 'Swatchata' theme

The Kisan Diwas (Farmers' Day) was celebrated on 23rd December in the ICAR-National Research Centre on Pig, Rani. On this occasion, farmers were invited and interacted from 8 villages of Mataikhar, Garopara, Umchuru, Tangonpara, Garilik, Rajapara, Bagan and Mairapur. To mark the event, water motor pumps-1hp were distributed among 28 farmers under the Tribal Sub plan Project and maize seeds were distributed among 10 farmers under the Maize project. During the interaction, the farmers elaborated their improvement in livelihood earning through pig rearing, they stressed that the institute help in terms of providing all possible scientific knowledge and inputs to achieve success in this process.

On 24th December 2021, to promote the Swachhta among the school children, a workshop has been organized at Nargaon Mairapur ME School, Village- Nargoan, at Rani. In this workshop, the teachers and students of the school participated actively and they were encouraged to keep their surroundings, school, playground and classroom clean. Almost 53 students and 7 teachers participated in that workshop. On 25th December 2021, the swachhta awareness campaign was conducted at the shops in the local Mairapur market. The shop keepers were advised to keep their shop premises clean. They were further suggested to stop using plastic and keep a dustbin in their shops for disposing of the wastes, papers and wrappers. As a part of Swachhta Pakhwada, a cleanliness drive was organized at the Pig farm complex, ICAR-NRC on Pig. Scientists, farm managers and farm workers participated to clean the farm premises on 27th December 2021 and cleaned the farm complex thoroughly. Mainly the cleanliness drive focused on cleaning bushes and shrubs around the farm.

A campaign on-farm biosecurity was conducted among the farmworkers on 29th December 2021. On this event, all the pens were cleaned thoroughly. Bleaching powder was spread on the entrance of the farm gate and in the pigpen. The bleaching powder foot-dip was also prepared with spreading bleaching powder on the gunny bag at the entrance of the farm. The foot bath with potassium permanganate was also prepared and used. The footbath with 0.1% formalin was also kept with a tray as biosecurity measures against African swine fever. The viricidal was also sprayed inside the pen of the pig. The biosecurity awareness among the farm-worker also empowers the biosecurity of their farm to prevent different diseases which were maintained by their family members.

Linkage and Collaboration of ICAR-NRC on Pig



Research Advisory Committee Meeting (RAC)

The 15th meeting of RAC was held on 28th August, 2021 on virtual mode. It was attended by the following members:-

Chairman

Dr. N. Balaraman, Former Vice Chancellor, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Chennai

Members

Dr. John Abraham, Former Director, Centre for Excellence in Meat Processing, KAU, Mannuthy, Kerala & Member, RAC

Dr. R.N. Goswami, Former Dean, CVSc, Khanapara & Member RAC

Dr. Jancy Gupta, Former Head, Dairy Extension Division, NDRI, Karnal & Member, RAC

Dr. R. C. Upadhay Former Head, DCP Division, ICAR-NDRI-Karnal & Member, RAC

Dr. C. Rajkhowa, Former Director, ICAR-NRC on Mithun, Nagaland & Member, RAC

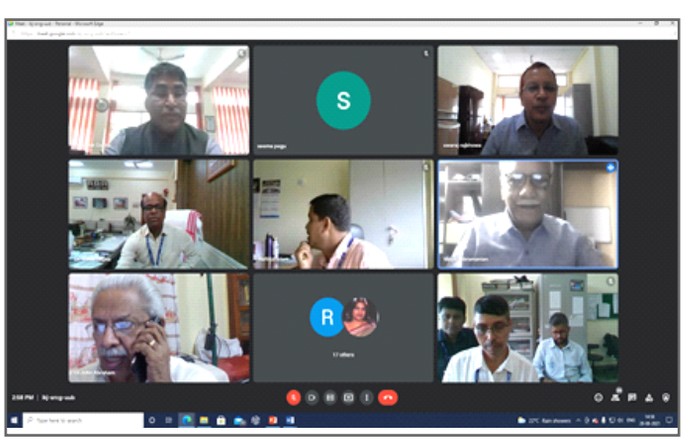
Dr. A.K. Tyagi, ADG, AN & P, ICAR, New Delhi - Member RAC

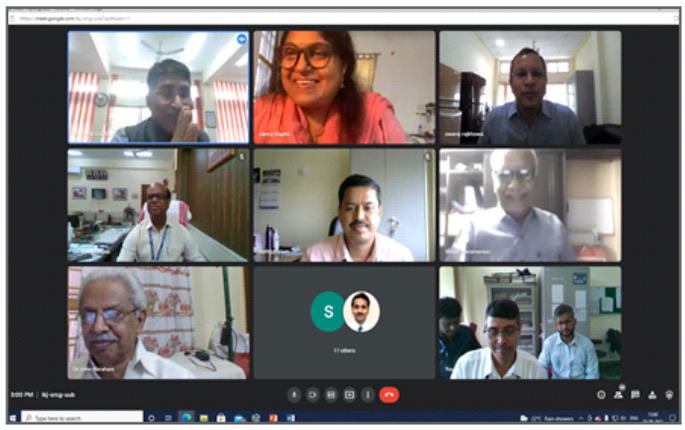
Dr. V.K. Gupta, Director, ICAR-NRC on Pig – Member RAC

Dr. Dhaneswar Deka, Nominated member by Ho'ble AM in the IMC of the Institute & Member, RAC

Sh. Prema Dutta, Nominated member by Ho'ble AM in the IMC of the Institute & Member, RAC

Dr. Keshab Barman, Principal Scientist and I/C PME- Member Secretary





The major recommendations of the XVth RAC were as follows: Genomic selection is very important and work shall be conducted in the area. DNA sample collection from high and low litter shall be done. In this regard, proposal for external funding on studies on SNP chips, genome wide association study (GWAS) and whole genome sequencing (WGS) is desirable. Simple selection indices shall be developed; metagenomics in pigs in relation to digestion of nutrients especially lignocelluloses shall be undertaken; work on metagenomics in bacteria and antimicrobial resistance for identification of resistance genes in pig genome should be conducted; institute scientists should be involved in conducting structured surveillance programme on emerging swine diseases to prevent further occurrence in collaboration with State Govt., KVKs as well as National institutes; surveillance programme with states shall be undertaken and a coloured atlas should be developed; work on indigenous technologies for processing and preserving pig products need to be documented. Further the processing of these products need to be validated and subsequent refinement for safe use of the consumers; work on market and value chain should be conducted; work on carcass microbiology, as mentioned in FSSAI standards, using ATCC positive standards should be done and NABL accreditation shall be taken for food testing.

Institute Research Committee (IRC) Meeting

The XVth Annual Institute Research Committee meeting of ICAR-NRC on Pig was held on 29th, 30th September, 1st and 6th October, 2021 in the Committee room of ICAR-NRC on Pig under the chairmanship of Dr. V.K. Gupta, Director, ICAR-NRC on Pig, Rani. The Chairman emphasized that the scientists should be critical in undertaking basic

and applied research and mentioned that the new projects must comply with the Institute mandate. He also mentioned that the scientists should make extra efforts to publish quality papers in the research journals with high impact factor. During the meeting, the outcome of completed projects, progress of ongoing Institute projects and the technical programmes of new project proposals were presented by the PIs and thoroughly reviewed.s

Institute Management Committee (IMC) meeting

Institute Management Committee Meeting (19th meeting) of the Institute was held on 07.03.2022 through Virtual Mode. Following Members attended the meeting:

Chairman

1. Dr. Vivek Kumar Gupta, Director, ICAR-NRC on Pig, Guwahati.

Members

1. Dr. Amrish Tyagi, ADG (ANP), ICAR Hqrs., New Delhi.

2. Dr. Arnab Sen, Pr. Scientist, ICAR RC for NEH Region Umiam, Meghalaya.

3. Dr. B.K Bhattacharyya, Pr. Scientist & Head, CIFRI Regional Station, Guwahati.

4. Dr. Shymal Naskar, Pr. Scientist IVRI, ERS Kolkata.

5. Dr. B.C Das, Pr. Scientist, ICAR-NRC on Pig, Guwahati.

6. Dr. Vijay Paul, Pr. Scientist & I/C FAO, ICAR-NRC on Yak, Dirang, Arunachal Pradesh.

7. Mr. Uttam Prakash, Assistant Administrative Officer, ICAR-NRC on Pig, Guwahati.

The main agenda for the discussion were related to Infrastructure development and expenditure under the Capital head items i.e. Construction work items, purchase of Equipments, Furniture, IT, Library and Livestock as per the items proposed in the EFC. Further, it was also discussed to change the name of Guest House to Luit Bhawan and Farmer Hostel to Anubrata Bhawan and to adopt the developed insignia of ICAR-NRC on Pig, Guwahati. All the agendas were agreed and approved by the IMC.

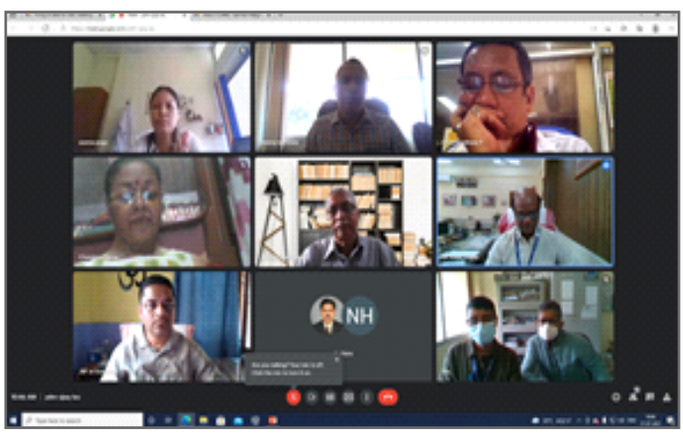
Institute Animal Ethics Committee (IAEC) Meeting

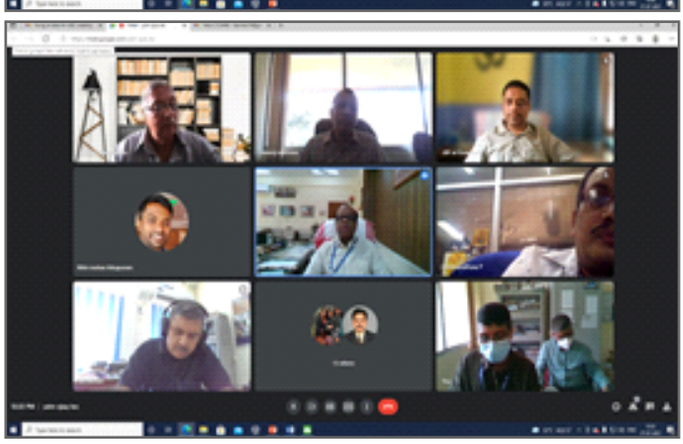
The Institute Animal Ethics Committee Meeting was held on 27th July, 2021 on virtual mode under the chairmanship of Dr. V.K. Gupta, Director, ICAR-NRC on Pig, Guwahati, Assam. It was attended by the following members:

- Dr. Vivek Kumar Gupta, Director ICAR-NRC on Pig, Guwahati & Chairman, IAEC
- Dr. Apurba Chakraborty, Ex Director of Research (Vety), AAU, Khanapara & Main Nominated member by CPCSEA, New Delhi
- Dr. P. Chtopadhya), Scientist, Defence Research & Development Organization, Ministry of Defence, Solmara Cantt, Tezpur and Link nominated member, by CPCSEA, New Delhi
- Dr. Chandana Choudhury Barua Professor, Department of Pharmacology, College of Veterinary Sciences, Khanapara, Scientist from outside the Institute nominated by CPCSEA, New Delhi
- Dr. Sashanka Sekhar Dutta, Socially Aware Member, 4-Kanaklata Path, Survey, Beltola, Guwahati and Socially Aware Nominated by CPCSEA, New Delhi
- Dr. S. Rajkhowa, Pr. Scientist, Veterinary Medicine, ICAR-NRC on Pig and member

Scientist from different discipline nominated by CPCSEA, New Delhi

- Dr. Rafiqul Islam, Principal Scientist & I/C Animal House Facility & Member IAEC
- Dr. Rajib Kumar Das, Member Veterinarian
- Dr. Keshab Barman, Scientist from different discipline & Member secretary nominated by CPCSEA, New Delhi



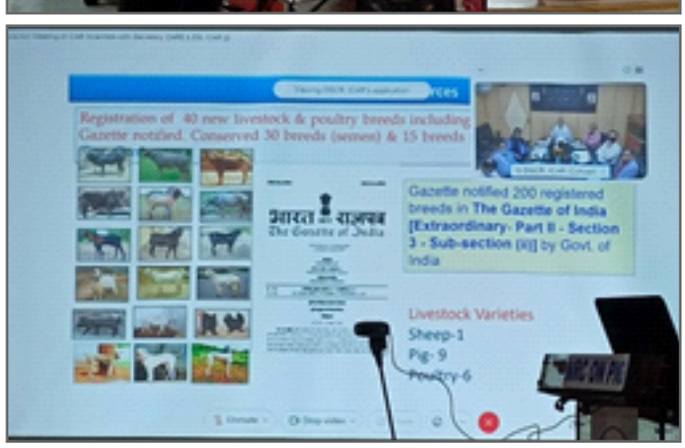


Inspection of Animal House Facility by CPCSEA, New Delhi

Animal House Facility was inspected by Dr. Apurba Chakraborty, Ex Director of Research (Vety), AAU, Khanapara & Main Nominated member of CPCSEA, New Delhi on 10th November 2021. Few photos of the same is given below:

Interaction programme of DG, ICAR and Scientist of ICAR

An interaction programme of Secretary, DARE & DG, ICAR with Scientist of ICAR was held on 28.10.2021 from 10.00 a.m. onwards through virtual mode under the chairmanship of Dr. V. K. Gupta, Director, ICAR-National Research Centre on Pig. All the scientist of ICAR-NRC on Pig attended the programme from committee room of the Institute. Several issues were discussed in this interaction programme.



Interaction programme with DG, ICAR and Young Scientist

An interaction programme of Secretary, DARE & DG, ICAR with Young Scientist was held on 8.12.2021 from 11.00 a.m. onwards through virtual mode. Ten young scientist of ICAR-National Research Centre on Pig has attended the interactive programme under the under the chairmanship of Dr. V. K. Gupta, Director, ICAR-National Research Centre on Pig and supervision of Dr. Bikash Chandra Das, Principal Scientist in the committee room of the Institute. Several young scientists from different ICAR Institute(s) have given suggestions for bringing about the improvement of the organisation and the problem(s) faced by them. The young scientist(s) of ICAR-NRC on Pig also took part in the interaction programme.

Visit and Interaction programme with Hon'ble Secretary, DARE and DG, ICAR

Dr. Trilochan Mohapatra, Secretary (DARE) & Director General (ICAR) visited ICAR- National Research Centre on Pig and interacted with the scientists of the institute on 05th October, 2021,. He discussed with the scientists on “How do we become self-sufficient in pork production?” He also emphasized different actionable points like identification of best traits of different breeds, creation of comprehensive data base of all breeds, conservation of different breeds in field, mapping of pig population, awareness programs in field and preparation of digital libraries.

Interaction programme with Hon'ble ADG (AN&P), Dr. AK Tyagi

On 28th August, 2021, Dr Amrish Kumar Tyagi, Assistant Director General (Animal Nutrition and Physiology) visited ICAR- National Research Centre on Pig and interacted with the scientists of the institute. He first asked the scientific staff to brief about the ongoing research activities in the institute. Later a scientific discussion was carried out regarding how to improve the piggery sector in India. He appreciated the scientists of the institute for their achievements.

Interaction meeting of Dr. Suresh Hannappagol, Former Animal Husbandry Commissioner, Govt. of India

On 28th October, 2021, Dr. Suresh Hannappagol, Former Animal Husbandry Commissioner, GOI and VC, KVAFSU, Bidar, Karnataka visited ICAR- National Research Centre on Pig and interacted with the scientists of the institute. He shared his vast experience of working in the animal husbandry sector and asked the scientists of ICAR-NRC on Pig about their ongoing research projects. He briefed about the zone wise piggery development advisories and disease forecasting using artificial intelligence. He also suggested to undertake a diploma course to school dropouts on pig production and value addition by signing MoU with universities.

Celebrations

Institute Foundation Day

ICAR-National Research Centre on Pig, Rani has celebrated 20th Foundation Day of the Institute on 4th September 2021. Dr K.M. Bujarbaruah, Former DDG (AS), ICAR and Former Vice Chancellor, Assam Agriculture University and Dr Dilip Kumar Sarma, Former Director, ICAR-NRC on Pig, Department of Veterinary Microbiology, College of Veterinary Science, AAU, Khanapara, Guwahati, Assam graced the occasion as chief guest and guest of honour of the programme. Dr Bujarbaruah has enlightened the participants with the foundation day lecture. Dr Dilip Kumar Sarma has emphasised on the diseases of the pigs especially African Swine Fever. Dr. V. K. Gupta, Director of the institute addressed the gathering and explained about the ongoing institute activities and future plan of work. Sports events and cultural events were organized for the institute staff and their family members on this occasion.

Republic Day

ICAR-National Research Centre on Pig celebrated 72nd Republic Day on the 26th January 2021. The celebration was started with flag hosting by the Director followed by National Anthem. In his speech the Director, NRC-Pig emphasized the vibrancy of the Indian democracy and unity among us in spite of the diversity in the country. He also highlighted about the core values outlined in the preamble of the constitution - Justice, Liberty, Equality, and Fraternity. Parade by the security persons of the institute was also held during the celebration.

Vigilance Awareness Week

Vigilance Awareness Week-2021 was observed in ICAR-National research Centre on Pig, Rani, Guwahati, Assam from 26.10.2021 to 02.11.2021. During the Vigilance Awareness Week-2021 a number of activities were organized starting from pledge taking ceremony to conducting of competitions, workshop, public display of banner etc.

World Veterinary Day

The instituted celebrated World Veterinary Day on 24th April,2021. On this occasion, Dr. V.K. Gupta, Director NRC on Pig addressed the gathering with his wisdom and congratulates all the veterinarians of the institute for constant support and contribution for the animal safety, environment, ensure the availability of necessary natural resources to raise livestock. Dr. Ajay Kumar Yadav, Scientist, has delivered a lecture on the topic 'Veterinarian response to the COVID-19 crisis'. All the scientists of the institute expressed their views on this matter and shared their experience and feeling of being a veterinarian.

International Women's day

International women's day was celebrated at ICAR-National Research Centre on Pig, Guwahati, Assam on 08.03.2021. A workshop on “Strengthening the role of farm women in pork value chain in North East India for Sustainable Livelihood” was organized to mark the occasion. The event was attended by 140 persons including 80 women farmers and entrepreneurs. Dr. V. K. Gupta, Director, ICAR-NRCP, extended warm regards to all participants and emphasized the role of promoting gender equality and women empowerment through agri-business in general and pig husbandry in specific.

World Environment Day

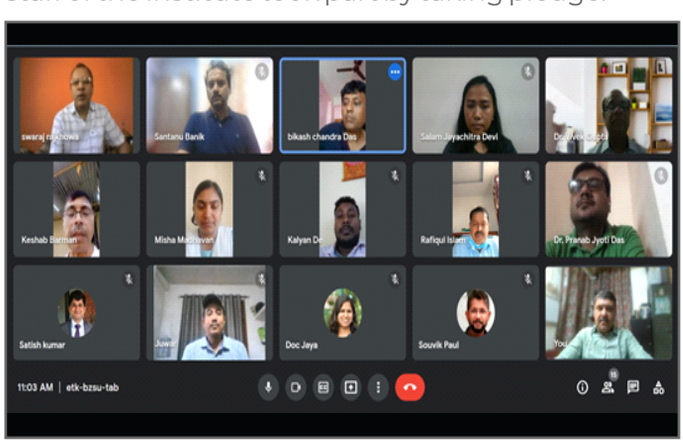
The World Environment Day was celebrated at ICAR -NRC on Pig, Rani on 5th June, 2021. The theme of this year celebration was “Ecosystem Restoration". A plantation drive was carried out in the campus by the institute staff following COVID 19 protocols. On this occasion Dr. V. K. Gupta, Director of the Institute spoke about the damages happening nowadays to the ecosystem and emphasised the role of plants in its restoration.

International Yoga Day

ICAR- National Research Centre on Pig, Guwahati celebrated International Day of Yoga on 21st June 2021. The theme of celebration was 'Be With Yoga, Be at Home'. Entire family and staff of the institute have enthusiastically practiced pranayama and asana of yoga, while adhering to the COVID protocols. The institute took an initiative to distribute yoga attire to promote practice of yoga for the holistic health of staff members.

National Unity Day

The ICAR-National Research Centre on Pig, Rani, Guwahati celebrated the National Unity Day (also known as Rashtriya Ekta Diwas) through virtual mode on 31st October 2021 for annual commemoration of the birthday of Sardar Vallabhbhai Patel. On this occasion, all the scientific staff of the Institute took part by taking pledge.



Constitution Day

The ICAR-National Research Centre on Pig, Rani, Guwahati celebrated the constitution day in the auditorium of the institute on 26th November 2021 to commemorate the adoption of the Constitution of India. All the staff of the Institute has taken part in this occasion. The occasion marked the delivery of lecture by the Director of the Institute followed by pledge taking.

World Zoonoses Day

The institute celebrated world zoonoses day on 6th July, 2021. On this occasion, an awareness programme was conducted for the farm workers regarding the zoonoses diseases.

Azadi Ka Amrut Mahotsav

ICAR- NRC on Pig organized a series of lectures as a part of the 'Azadi Ka Amrit Mahotsav' commemorating India's 75 years of independence. A session on “Emerging and re-emerging viral diseases of pigs” was delivered by Prof. Dilip Kumar Sarma, an eminent virologist and former director, ICAR-NRC on Pig on 10th September 2021. Dr V.K. Gupta, Director, ICAR- NRC on Pig, delivered a lecture on “Animal vaccines: Issues in R&D” on the 29th of October, 2021. The history and evolution of vaccine development and its present significance to the COVID pandemic were elaborated during the session. A talk on “Role of stem cells in Pig production: Current scenario” by Dr B.C. Das, Principal Scientist and Head of Division, Animal Physiology, ICAR-NRC on Pig was organized on 30th of October, 2021. The concept, classification, prospects and evolving techniques in stem cell biology were discussed in the session. Lecture on “Anti-Microbial Resistance (AMR): future implications” by Dr Swaraj Rajkhowa, Principal Scientist and Head of Division, Animal Health, ICAR-NRC on Pig highlighted our current understanding and emergence of antimicrobial resistance while discussing its global significance. The topic "Prebiotics and Probiotics: impact on pig health” was comprehensively delivered by Dr Keshab Barman, Principal Scientist and Head of Division,

Animal Nutrition, ICAR-NRC on Pig on 12th of November 2021. A session on “Future of cross-breeding in pigs” by Dr. Santanu Banik, Principal Scientist and Head of Division Animal Genetics and Breeding, ICAR-NRC on Pig, was organized on 20th November 2021. The interactive session focused on the significance of crossbred pig breeds in the Indian scenario while emphasizing the need for conservation of indigenous germplasm in its home tracts.

राजभाषा प्रकोष्ठ, भा.कृ.अनु.प.-राष्ट्रीय शूकर अनुसंधान केंद्र

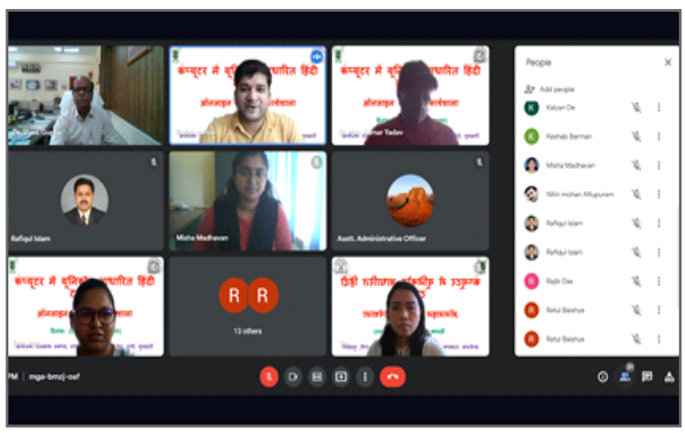
राष्ट्रीय शूकर अनुसंधान केंद्र, गुवाहाटी में राजभाषा के कार्यान्वयन के लिए निम्नलिखित राजभाषा कार्यान्वयन समिति कार्यरत है।

क्रम. सं.	समिति	नाम
1.	अध्यक्ष	डॉ. विवेक कुमार गुप्ता, निदेशक, राष्ट्रीय शूकर अनुसंधान केंद्र
2.	सदस्य	डॉ. प्रणव ज्योति दास, प्रधान वैज्ञानिक
3.	सदस्य	डॉ सौविक पॉल, वैज्ञानिक
4.	सदस्य	डॉ. मिषा माधवन, वैज्ञानिक
5.	सदस्य	डॉ. सलाम जयचित्रा देवी, वैज्ञानिक
6.	सदस्य	श्री उत्तम प्रकाश, सहायक प्रशासनिक अधिकारी
7.	सदस्य सचिव	डॉ. सतीश कुमार, वैज्ञानिक एवं प्रभारी, हिन्दी प्रकोष्ठ

राजभाषा कार्यान्वयन समिति की बैठक कार्यालय में प्रत्येक तिमाही को होती है। समिति हिंदी के प्रचार व प्रसार के लिए सुझाव देती है एवं विगत तिमाही की प्रगति रिपोर्ट की समीक्षा करती है। कार्यालय उपयुक्त समय पर राजभाषा विभाग को तिमाही रिपोर्ट प्रस्तुत करता है। इस वर्ष राजभाषा कार्यान्वयन समिति की चार बैठक का आयोजन किया गया जिसकी अध्यक्षता निदेशक, डॉ वी के गुप्ता जी ने की। बैठक का कार्यवृत्त एवं कार्यवाही परिषद को सूचना के लिए भेजा गया। इसके अलावा संस्थान, गुवाहाटी नगर राजभाषा कार्यान्वयन समिति का सदस्य है एवं संस्थान ने नगर राजभाषा कार्यान्वयन समिति की सभी बैठकों में भाग लिया। राजभाषा विभाग के निर्देशानुसार वार्षिक कार्यक्रमों, राजभाषा अधिनियमों एवं अन्य सभी आदेशों/अनुदेशों का अनुपालन कार्यालय द्वारा सफलतापूर्वक किया गया।

राजभाषा कार्यशाला का आयोजन

हिन्दी प्रकोष्ठ, राष्ट्रीय शूकर अनुसंधान केंद्र, गुवाहाटी द्वारा दिनांक २९.०६.२०२१ को कंप्यूटर में यूनिकोड आधारित हिंदी टाइपिंग विषय पर ऑनलाइन राजभाषा कार्यशाला का आयोजन किया गया। इस कार्यशाला का उद्घाटन निदेशक महोदय के सम्बोधन से हुआ। उन्होंने राजभाषा के विकास के लिए डिजिटल उपायों के प्रयोग पर बल दिया। इस कार्यशाला में संस्थान से २५ वैज्ञानिकों एवं कर्मचारियों ने अपनी सहभागिता प्रदान की। कार्यशाला में प्रभारी, राजभाषा प्रकोष्ठ डॉ सतीश कुमार ने कंप्युटर के विभिन्न ऑपरेटिंग सिस्टम में हिन्दी टायपिंग करने के लिए जरूरी सॉफ्टवेयर के बारे में जानकारी दी एवं उन्हे इंस्टॉल करने की विधि का प्रदर्शन भी किया। बाद में उन्होंने युनिकोड का इस्तेमाल कर सरल तरीके से हिन्दी टायपिंग करने की जानकारी दी एवं हिन्दी में टायपिंग कर सभी प्रतिभागियों को दिखाया एवं किसी भी प्रकार के समस्याओं का निराकरण किया। इस कार्यशाला के दौरान ई-ऑफिस में हिन्दी में किस तरह से कार्य किया जाए एवं फाइल में टिप्पणी हिन्दी में कैसे करें, इसकी भी जानकारी दी गई। अंत में निदेशक महोदय ने इस कार्यशाला के महत्व को उजागर करते हुए कार्यशाला के आयोजन समिति को बधाई दिया एवं भविष्य में इस तरह के और भी कार्यशाला के आयोजन करने के लिए प्रोत्साहित किया। कार्यशाला का समापन प्रभारी, राजभाषा प्रकोष्ठ, डॉ सतीश कुमार के धन्यवाद ज्ञापन के साथ हुआ।



भा.कृ.अनु.प.-राष्ट्रीय शूकर अनुसंधान केंद्र में राजभाषा कार्यान्वयन का निरीक्षण

उप निदेशक एवं कार्यालय प्रमुख, क्षेत्रीय कार्यान्वयन कार्यालय (पूर्वोत्तर), गुवाहाटी के श्री बदरी यादव द्वारा दिनांक ३० अगस्त, २०२१ दिन सोमवार को संस्थान के राजभाषा कार्यान्वयन का निरीक्षण किया गया। इस अवसर पर उन्होंने संस्थान के विभिन्न अनुभागों का निरीक्षण किया एवं राजभाषा के कामकाज की समीक्षा की। राजभाषा प्रकोष्ठ के प्रभारी डॉ सतीश कुमार एवं सहायक प्रशासनिक अधिकारी, श्री उत्तम प्रकाश ने संस्थान के द्वारा राजभाषा के प्रचार के लिए किए जा रहे कार्य की जानकारी दी एवं हिन्दी के कामकाज की प्रगति से अवगत कराया। निरीक्षण के दौरान पुस्तकालय, निदेशक कार्यालय, प्रशासनिक खंड, मुख्य भवन का दौरा किया गया एवं हिन्दी के कार्यों का निरीक्षण किया गया। निरीक्षण के दौरान उप निदेशक महोदय ने संस्थान के कार्यों की प्रशंसा की एवं हिन्दी के प्रगामी प्रयोग द्वारा राजभाषा के विकाश के लिए संस्थान को आवश्यक सुझाव भी दिया।

राजभाषा कार्यशाला का आयोजन

राजभाषा प्रकोष्ठ, भा.कृ.अनु.प.–राष्ट्रीय शूकर अनुसंधान केंद्र, राणी, गुवाहाटी द्वारा दिनांक ३० अगस्त, २०२१ (सोमवार) को राजभाषा नियमों के अनुसार सरल व सहज हिन्दी में सरकारी कामकाज विषय पर राजभाषा कार्यशाला का आयोजन किया गया । इस कार्यशाला के मुख्य अतिथि, उपनिदेशक एवं कार्यालय प्रमुख, क्षेत्रीय कार्यान्वयन कार्यालय, गुवाहाटी के श्री बदरी यादव जी थे । सर्वप्रथम प्रभारी, राजभाषा प्रकोष्ठ एवं आयोजन सचिव डॉ सतीश कुमार ने निदेशक महोदय एवं मुख्य अतिथि का स्वागत किया एवं सभी प्रतिभागियों को इस कार्यशाला के विषय में जानकारी दी । कार्यशाला के आयोजन का उद्देश्य संस्थान के वैज्ञानिकों एवं कार्मिकों को राजभाषा नियमों के बारे में जानकारी देते हुए हिन्दी में कामकाज करने के लिए प्रेरित करना था । इस कार्यशाला का उद्घाटन निदेशक महोदय, डॉ विवेक कुमार गुप्ता जी के सम्बोधन के साथ हुआ । उन्होंने इस कार्यशाला के महत्व को उजागर करते हुए सभी अधिकारियों एवं कार्मिकों से अधिक से अधिक काम हिन्दी में करने की अपील की । मुख्य अतिथि, श्री बदरी यादव जी ने इस कार्यशाला में राजभाषा के उद्भव का इतिहास एवं इससे संबंधित नियमों के बारे में विस्तार से चर्चा की एवं सरल तरीके से हिन्दी का प्रयोग कार्यालय कामकाज में करने की जानकारी दी । संस्थान से २५ वैज्ञानिकों एवं कर्मचारियों ने अपनी सहभागिता प्रदान की । कार्यशाला का समापन सहायक प्रशासनिक अधिकारी, श्री उत्तम प्रकाश, के धन्यवाद ज्ञापन के साथ हुआ

राष्ट्रीय शूकर अनुसंधान केंद्र, राणी, गुवाहाटी में हिंदी पखवाड़ा-२०२१ का आयोजन

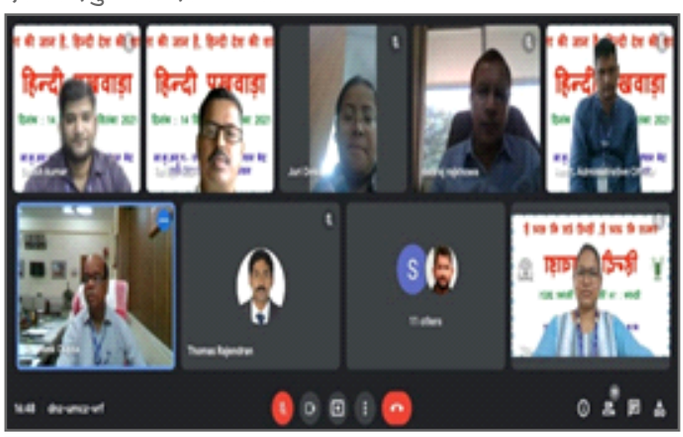
राष्ट्रीय शूकर अनुसंधान केंद्र, राणी, गुवाहाटी में १४.०९.२०२१ से २८.०९.२०२१ तक हिंदी पखवाड़ा का सफलतापूर्वक आयोजन किया गया । हिंदी पखवाडा का शुभारम्भ निदेशक, राष्ट्रीय शूकर अनुसंधान केंद्र, राणी, डा. विवेक कुमार गुप्ता, द्वारा हिंदी दिवस के शुभ अवसर पर किया गया । निदेशक महोदय ने हिंदी भाषा का महत्व और सरकारी कार्यालयों में इसकी उपयोगिता के बारे में बताया तथा कार्यालय के सभी कर्मचारियों को अधिक से अधिक कार्य हिंदी भाषा में करने का आह्वान किया । तत्पश्चात प्रभारी राजभाषा अधिकारी एवं वैज्ञानिक, डॉ सतीश कुमार राजभाषा के उद्भव एवं इसके इतिहास के बारे में जानकारी दी । उन्होंने हिंदी पखवाड़ा के दौरान होने वाली विभिन्न प्रतियोगितायों एवं कार्यक्रमों के बार में सभी को जानकारी दी । इस अवसर पर सभी लोगों ने राजभाषा प्रतिज्ञा भी लिया । उद्घाटन कार्यक्रम के दौरान माननीय कृषि एवं किसान कल्याण मंत्री भारत सरकार, श्री नरेन्द्र सिंह तोमर, माननीय कृषि एवं किसान कल्याण राज्यमंत्री, भारत सरकार, श्री कैलाश चौधरी के साथ साथ हिन्दी भाषा से संबंधित सूक्तियाँ एवं माननीय सचिव एवं महानिदेशक, भारतीय कृषि अनुसन्धान परिषद्, त्रिलोचन महापात्र जी का शुभकामना सन्देश पढ़ कर सुनाया गया ।

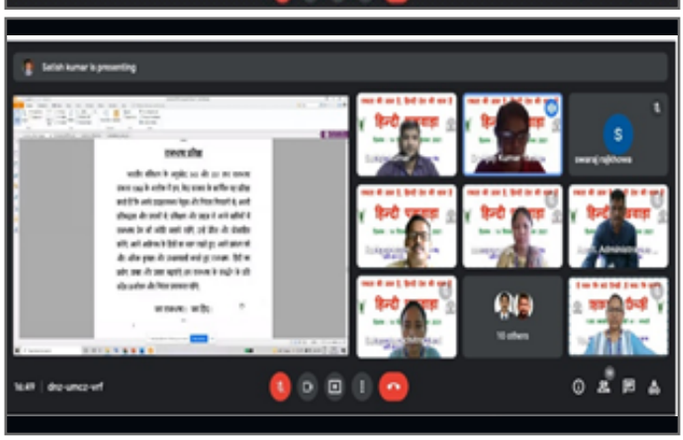
हिंदी पखवाड़ा के अंतर्गत निम्नलिखित कार्यक्रम का आयोजन किया गया

दिनांक	कार्यक्रम
14.09.2021, 4:00 बजे	उद्घाटन सत्र, निदेशक, राष्ट्रीय शूकर अनुसंधान केंद्र द्वारा
15.09.2021, 3:00 बजे	श्रुतिलेख प्रतियोगिता
15.09.21 स 17.09.2021	हिंदी हस्ताक्षर प्रतियोगिता
16.09.2021, 3:00 बजे	हिंदी कार्यशाला –०१ (डॉ अजय यादव एवं डॉ जया)
17.09.2021, 3:00 बजे	हिंदी निबंध प्रतियोगिता
18.09.2021, 3:00 बजे	वाद–विवाद प्रतियोगिता
20.09.2021, 3:00 बजे	हिंदी कार्यशाला –०२ (डॉ सतीश कुमार)
21.09.2021, 3:00 बजे	बताओ और इनाम पाओ प्रतियोगिता
23.09.2021, 3:00 बजे	हिंदी निबंध प्रतियोगिता, स्थान: राणी हाईस्कूल
24.08.2021, 3:00 बजे	काव्य पाठ प्रतियोगिता, समय : ३.३० बजे से
25.08.2021, 3:00 बजे	युनिकोड टंकण प्रतियोगिता, गूगल फॉर्म के द्वारा
27.09.2021, 3:00 बजे	वाद–विवाद प्रतियोगिता, स्थान: राणी हाईस्कूल
28.09.2021, 2:00 बजे	गायन प्रतियोगिता एवं समापन समारोह

हिंदी पखवाड़ा का सफलतापूर्वक समापन दिनांक २८.०९.२०२१ को हुआ । इस समारोह के मुख्य अतिथि, गुवाहाटी विश्वविद्यालय के हिन्दी विभाग के उप आचार्य, डॉ अच्युत शर्मा थे । उन्होंने हिन्दी भाषा के योगदान एवं उत्तरपूर्वी भारत में हिन्दी भाषा के विकास की चर्चा की एवं हिन्दी भाषा के उपयोग के विभिन्न पहलुओं पर विस्तार से चर्चा की । उन्होंने हिन्दी भाषा के कवियों एवं लेखकों के योगदान को भी याद किया तथा कुछ कविताओं का भी पाठ किया । संस्थान के निदेशक महोदय ने हिंदी का प्रयोग सिर्फ सिर्फ हिंदी पखवाड़ा तक सीमित न रखकर उसे वर्ष भर अधिक से अधिक प्रयोग पर बल दिया जिससे हिंदी भाषा का अधिक से अधिक प्रसार एवं प्रचार हो सके । संस्थान के प्रभारी राजभाषा अधिकारी एवं वैज्ञानिक डा. सतीश कुमार ने हिंदी पखवाड़ा के आयोजन का उद्देश्य हिंदी का अधिक उपयोग कर राजभाषा का विकास करना बताया । उन्होंने हिंदी पखवाड़ा में बढ़–चढ़ कर भाग लेने के लिए संस्थान के सभी कर्मचारियों एवं वैज्ञानिकों का आभार प्रकट किया एवं राजभाषा के विकास में योगदान देने के लिए सभी को प्रेरित किया । हिंदी पखवाड़ा में विभिन्न प्रकार के प्रतियोगिताओं का आयोजन किया गया जिसमें हिंदी श्रुति लेखन, निबंध प्रतियोगिता, वाद–विवाद प्रतियोगिता, हिंदी–गायन एवं हिंदी हस्ताक्षर, हिन्दी टंकण प्रश्नोत्तरी आदि शामिल थे । इसके अलावा दो हिंदी कार्यशाला का आयोजन किया गया जिसमें हिंदी वर्णमाला, हिन्दी बोलचाल में

पुल्लिंग एवं स्त्रीलिंग का सही प्रयोग एवं कार्यालय आवेदन पत्रों के प्रारूप की जानकारी दी गई । प्रतियोगिता के विजेताओं को प्रमाण–पत्र एवं पारितोषिक राशि देकर सम्मानित किया गया । इस अवसर पर वर्ष भर हिन्दी में कार्य करने के लिए विशेष पुरस्कार योजना के तहत संस्थान से दो कर्मियों को प्रशस्ति पत्र एवं नकद पुरस्कार देकर सम्मानित किया गया।





उद्घाटन सत्र

श्रुतिलेखन प्रतियोगिता

निबंध प्रतियोगिता

वाद विवाद प्रतियोगिता

गायन प्रतियोगिता

आओ बताओ इनाम पाओ प्रतियोगिता

हिंदी कार्यशाला का आयोजन

काव्य पाठ

हिंदी कार्यशाला

समापन समारोह

विशेष अतिथि का संबोधन

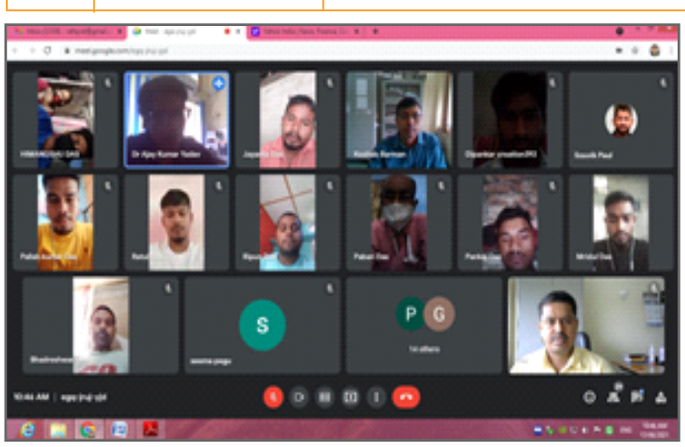
विजेताओं के साथ निदेशक एवं अतिथि

पुरस्कार वितरण कार्यक्रम

Training Programmes Organized

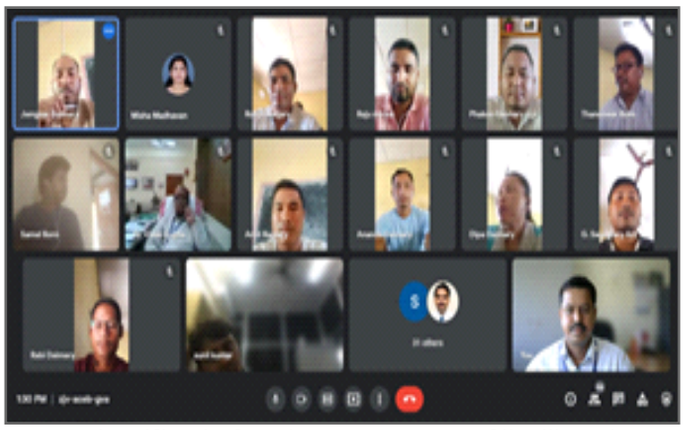
Training Programs Organized during 2021

Sl. No.	Sponsorship	Name of the training Program	Date	No. of Beneficiaries
1	Institute TSP	Online training programme on 'Scientific Piggery farming for livelihood Security'	February 1-5, 2021	18
2	Institute SCSP	Online training programme on 'on 'Scientific Pig farming for Self Employment''	February 1-5, 2021	30
3	Institute Agri Business Incubation	Programme for Entrepreneurship Development Programme (Virtual) on “Scientific Pig Production Practices and Value Addition of Pork”	January 20, 2021	13
4	Individually Paid training	Online training on 'Scientific Piggery farming for self-employment'	April 21-23, 2021	27
5	Institute TSP	Online Training Programme on AI in Pig	February 23-25, 2021	10
6	Individually Paid training	Online training on 'Scientific Piggery farming for self-employment'	April 21-23, 2021	27
7	Institute	5 days virtual Sensitization training programme for SC candidates on 'Pig Husbandry”	August 17-21, 2021	40
8	Institute	5 days virtual training programme on “Scientific pig farming as a means of livelihood security for tribal farmers of Udalguri District”	September 21-25, 2021	42
9	Institute Agri Business Incubation	Entrepreneurship Development Programme (Virtual) on “Scientific Pig Production Practices and Value Addition of Pork”	November 2, 2021	7



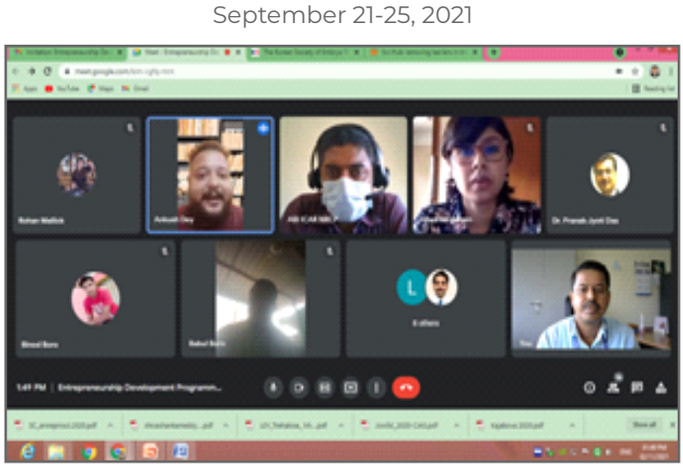
Sensitization training programme for SC candidates
August 17-21, 2021

Scientific pig farming as a means of livelihood security for tribal farmers of Udalguri District
September 21-25, 2021

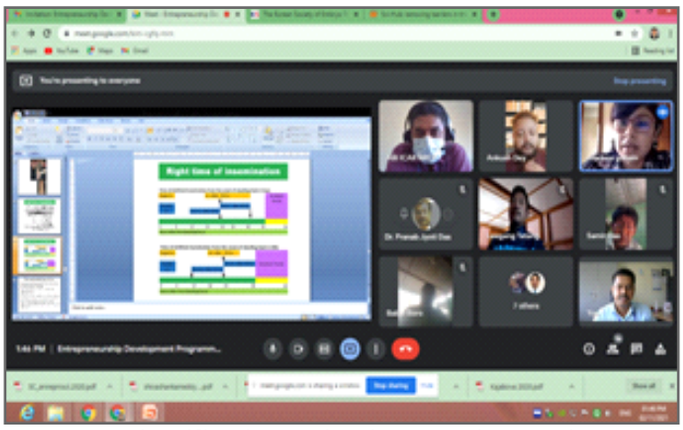


Scientific pig farming as a means of livelihood security for tribal farmers of Udalguri District September 21-25, 2021

Scientific pig farming as a means of livelihood security for tribal farmers of Udalguri District September 21-25, 2021



Scientific Pig Production Practices and Value Addition of Pork; November 2, 2021



Scientific Pig Production Practices and Value Addition of Pork; November 2, 2021

Awareness programme for tribal women involved in pig farming

An awareness programme on scientific pig production practices was organized at Rangia, Kamrup on 26th October, 2021 was organized under NASF project. A film on scientific Interventions for upscaling rural piggery in local language Assamese was shown to the tribal women during this program. The scientists were interacted with the women farmers and educated them regarding different scientific pig production practices and also regarding the marketing avenues. The importance of group-based activities in farming and marketing were also suggested to the farmers. To motivate the adoption of scientific practices, some health care and biosecurity inputs like deworming tablets, small packets of Potash, mineral mixture & gloves were also given to all the women participants.

Awareness programme organized for tribal women at Rangia, Kamrup

Organized focus group discussion

A group formation of 25 selected tribal women farmers was done on 30th December, 2021 at Barmura Village, Rangia. The group members were belonged to 4 different Self Help Groups in the village and selected based on certain criterias. The 25 selected women will attend the 6 months capacity building program known as 'Piggery Farmer Field School" organized by ICAR-NRCP under the ongoing NASF project. A Focus Group Discussion (FGD) on "Scientific Pig Production Practices and Marketing" was also organized for the tribal women farmers involved in pig farming on this occasion.

Group Formation and Focus Group Discussion at Barmura Village, Rangia

Workshop on pork marketing chains in North East India for Sustainable livelihood of tribal women

The ICAR- National Research Centre on Pig organized a one-day workshop on "Pork marketing chains in North East India for Sustainable livelihood of tribal women (Assam, Meghalaya and Nagaland) on 4th October, 2021 under the NASF project. The program was attended by 27 persons including 18 scientists from ICAR-NRC on Pig. The workshop was conducted in two major sessions. One was the presentation and discussion regarding the salient project findings with the project team members and the second one was a brainstorming session including all the scientists of ICAR-NRC on Pig along with the project team members from different collaborating centres. A roadmap for capacity development of tribal women was prepared considering the challenges in the field situation.

Workshop organized at ICAR-NRCP

Awards and Recognitions

AWARDS

National Level Awards

- ICAR-National Research Centre on Pig has awarded 2nd prize for Best Hindi Performance, Region C from Department of Official Language, Ministry of Home Affairs for the year 2019-2020.
- Breed conservation Award (Institute Category) for conservation of Ghungroo Pig conferred by ICAR-NBAGR, Karnal (Team Members: Dr. Santanu Banik, Dr. P. J. Das and Dr. V. K. Gupta)

Awards instituted by Scientific Societies

- Associate Fellow of National Academy of Veterinary Sciences (NAVS) India (Recipient: Dr. Santanu Banik)
- Indian National Young Academy of Sciences (INYAS), INSA Membership Award, 2021. (Recipient: Dr. Rajib Deb)
- Best Paper Award during the National Conference on Techno-Scientific challenges and sustainable solutions for living beings during changing environment (TCSE-2021), 29-30, January, 2021.Organized by National Environmental Science Academy, New Delhi. (Recipient: Dr. Rajib Deb)
- Young Scientist Award by Indian Society for Study of Animal Reproduction in International Symposium on "Novel Knowledge, Innovative Practices and Research in Theriogenology" organized by C.V.Sc., Mannuthy, KVASU, Kerla from December 27-29, 2021. (Recipient: Dr. Sunil Kumar)
- Best Poster Award for the "The dynamics of immunogenic genes during different physiological stages of development in porcine corpus luteum" in the IIIrd Annual Conference of APA and National Symposium on Physiological interventions for the augmentation of Sustainable Animal Production. during 24th -25th Sept. 2021 at DUVASU Mathura in online mode. (Recipient: Dr. Jaya, Scientist)

Institutional Level

- वर्ष 2020-21 के दौरान राजभाषा हिन्दी के प्रयोग में उत्कृष्ट योगदान के लिए विशेष राजभाषा पुरस्कार (Recipient: Dr. Satish Kumar Mr. Uttam Prakash)

RECOGNITIONS

Dr. V. K. Gupta, Director

- Chaired session of challenges in Pig farming, webinar organized by Nanaji Deshmukh Veterinary Science University, Jabalpur, 29.01.2022
- Member of Governor's task force on African Swine Fever, 2021, Government of Assam
- Chairman, Award Committee, Indian Association of Hill Farming, ICAR RC for NEH Region
- Regional Resource Person-Asia Pacific, OIE, France
- Chairman, Departmental Promotion Committee of Technical Staff, ICAR RC for NEH Region
- Nominee of DDG (Animal Science), ICAR for Departmental Promotion Committee, ICAR-NRC on Mithun
- Nominee of DDG (AS), ICAR for Departmental Promotion Committee, ICAR-NRC on Yak
- Member of selection committee of Head, Goat research station, under Assam Agricultural University.
- Chairman, Departmental Promotion Committee of Technical Staff, ICAR- Central Avian Research Institute, Izatnagar, UP
- Coordinator for ARS Main 2021 examination, Guwahati centre on 28.11.2021

Dr. Santanu Banik, Principal Scientist

- External examiner of one Ph.D. Dissertation (Animal Genetics Breeding) of College of Veterinary Sciences and Animal Husbandry of Assam Agricultural University.
- Expert for the District Committee of ARYA Project for ATARI Zone-VI.
- Panelist of Round Table on "Challenges and Opportunities in Implementation of Breeding Policies/Genetic Improvement Programs for Livestock and Poultry in India" during XVth Annual Convention of ISAGB and a National Conference on "Animal Breeding Strategies in the Era of Genomics and Phenomics" at ICAR-NBAGR, Karnal through virtual mode (17-18th Dec 2021).

Dr. Keshab Barman, Principal Scientist

- Certificate of Appreciation received from Bharatiya Kisan Sangh, Assam, India as a mark of gratitude for encouraging & motivating farmers as a distinguished Resource Person in the programme, "E-OUTREACH AND EXTENSION ACTIVITIES", held online during Covid-19 pandemic (2nd phase) in the year 2021.
- External examiner for evaluation of MVSc thesis of Dr. Dangshawa Morung, Roll No.2018-VMK-08 for M.V.Sc. Degree in Animal Nutrition of AAU vide order no AAU/DPGS/PF/2021-22/3140 dtd 03-02-2022
- External examiner for evaluation of MVSc thesis of Dr. Aibaniairi Fancon, Roll No 2019-VMK-06 for M.V.Sc. Degree in Animal Nutrition of AAU vide order no AAU/DPGS/PF/2021-22/3028 dtd 24-01-2022.
- Question Setter for M.V.Sc. Comprehensive Qualifying Written Examination of post graduate programme for subject Animal Nutrition of CAU, Aizawl, 2021 vide order no 10/CAU/CVAH/ACAD/PG/CQE/2021/ dtd Selesih, the 7th April, 2021
- Reviewer for evaluation of research articles published in Indian Journal of Animal Nutrition; Animal Nutrition and Feed Technology Journal and Indian Journal of Animal Science for the period from 2021.
- Member of FAD 5 of Bureau of Indian Standards
- Member of advisory committee of Ph.D. student of Dr. Ikramul Haque of CVSc, Khanapara.
- Station Guide of Ph.D. student of Dr. Kanak Ch. Barman of ICAR-IVRI Bareilly.
- Co-Chairman in National E-Conference on 'Emerging Trends in Agricultural and Biological Sciences (ETABS 2022) w.e.f. 14th and 15th January 2022 in the Vety Science II Session organized by Society for bio-informatics and biological sciences with applied research and development organization, India.

Dr. Mohan N. H., Principal Scientist

- Invited lecture on Electrocardiography in Veterinary Practice in Five Days Online Vocational Training on "Advancements in Physiological Function Tests in Domestic Animals and Pets", College of Veterinary Science, Junagadh Agricultural University, Gujarat during March 1-5, 2021.
- Invited practical demonstration on Electrocardiography in Veterinary Practice: Assessment of cardiac function and analysis of heart rate variability in Five Days Online Vocational Training on "Advancements in Physiological Function Tests in Domestic Animals and Pets", College of Veterinary Science, Junagadh Agricultural University, Gujarat during March 1-5, 2021.
- Invited lecture on management of pigs during natural disaster: Action points from the perspective of Sendai Framework. In Mainstreaming of Livestock for Disaster Risk Reduction" (June 21st -25th, 2021) organized by National Institute of Rural Development and Panchayati Raj – North Eastern Regional Centre (NIRDPR – NERC), Guwahati.
- Resource person in National Stakeholder Consultation on Draft National HWC Strategy and Action Plan & Guidelines on Sep 18, 2021 organized by jointly Ministry of Environment, Forests and Climate Change- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)-ICAR-NAARM-WII.

Dr. Rafiqul Islam, Principal Scientist

- External thesis evaluator for Two Ph.D. Theses (Dr. Mitali Dutta, Roll No. 2015-VDK-04 and Dr. Prasanta Kumar Das, Roll No. 2017-VDK-03, Assam Agricultural University, Khanapara, Guwahati) for the discipline of Animal Reproduction, Gynaecology and Obstetrics.
- Reviewed manuscripts as reviewer for Theriogenology (Elsevier), Indian Journal of Animal Science and Veterinary World during the year.
- Councilor in the Executive Council of the Indian Association of Hill Farming for the year 2021-2024 by the Indian Association of Hill Farming, ICAR Research Complex for NEH Region, Umiam, Meghalaya.
- Station guide for one Ph.D. Scholar (Dr. N. Linda) from College of Veterinary Science, CAU,

Aizawl.

- Editor, Animal Reproduction, Gynaecology & Obstetric Section for "Journal of Advanced Veterinary and Animal Research, https://bdvets.org/JAVAR/editorial-board.html
- Editorial Board Member for "Asian Pacific Journal of Reproduction", https://www.apjr.net/editorialboard.asp, Official Publication of Hainan Medical University, Hainan -571100,CHINA./

Dr. P. J. Das, Principal Scienitist

- Invited reviewer for the following journals: Theriogenology, Pharmaceutical Research International; Asian Journal of Research in Animal and Veterinary Sciences; Journal of Research in Animal and Veterinary Sciences and Frontiers in Veterinary Science.
- Invited reviewer for Romanian Evaluation Process PED2021 - The Ministry of Education and Research and the Executive Agency for Higher Education, Research, Development and Innovation Funding, Romania (UEFISCDI - www.uefiscdi.gov.ro).
- Editorial Board member for the Journal of Veterinary Science and Animal Medicine - Gnome Publications.
- Supervisor for the Department of Biotechnology, Govt. of India sponsored DBT-RA (Dr. Manasee Choudhury) project (2021-2022)

Dr. R. Thomas, Senior Scientist

- Represented the institute and provided the required inputs in the 16th meeting of Scientific panel on meat and meat products of FSSAI on 28th April, 2021.
- Represented the institute and provided the required inputs in the 14th meeting of slaughter house and meat industry sectional committee of Bureau of Indian Standards on 31st August, 2021.
- Represented the institute and provided the required inputs in the 17th meeting of Scientific panel on meat and meat products of FSSAI on 29th April, 2021.
- Represented the institute and provided the required inputs in the 18th meeting of Scientific panel on meat and meat products of FSSAI on 2nd December, 2021.
- Empanelled as Expert in Meat Plant Inspection Committee by APEDA.
- Represented the Institute in FAD -18 Sectional Committee meeting of Bureau of Indian Standards (BIS) to review Indian Standards under FAD 18 to align the same with the corresponding Codex Standards and FSSAI regulations.
- Represented the institute in FAD 18/P-5 and FAD 18/P-3 panels to review Indian Standards under FAD 18 to align the same with the corresponding Codex standards and FSSAI regulations and to review the Indian standards older than 20 years in FAD-18 sectional committee.
- Represented the institute as member of inspection team of APEDA to assess the infrastructure developed at Export Oriented Pork Processing Unit at Nazira, Sivasagar, Assam.
- Represented the institute and provided the required inputs in the meeting as a Member of Steering Committee for developing integrated livestock and poultry development policy of the State of Assam.
- Represented the institute and provided the required inputs in the Meeting of State Project Coordination Committee (SPCC) of World Bank funded APART Project during 2021-22.
- Represented the institute and provided the required inputs in the 35th GB meeting of the ARIAS Society under the World Bank funded APART Project during 2021-22.

Dr. Seema Rani Pegu, Senior Scientist

- External examiner for evaluation of M.V.Sc. Thesis of Veterinary Pathology from College of Veterinary Science, Khanapara, Assam.
- Expert for setting paper of Animal Science for conduction of exam for SMS selection by Assam Agricultural University, Jorhat.

Dr. Rajib Deb, Senior Scientist

- Editorial board member of Frontiers in Bioscience -Land mark (Impact Factor-2.747; NAAS Rating: 8.75)
- Member (MRSB) by the Royal Society of Biology's Council, UK on 1st October, 2021

- Rapporteur in an International conference on Research initiatives for agriculture, biotechnology and allied sciences-2021 organized by SoAS IIMT University Meerut 20-21 March, 2021
- Resource Person INYAS (INSA) North East local chapter for an Interactive Mentoring Sessions with Schools and College Students on September 5th 2021 (On occasion of Teacher's Day) on "Career Opportunities in Science: Changing Scenarios" Children Science Academy, Lakhimpur Assam and Nowgong Autonomous college Assam.
- Core team member of COVID 19 Vaccine awareness campaign at National level organized by INYAS (INSA), India.
- Delivered invited lecture on "Entrepreneurship opportunity in livestock sector of India" at 15th National Frontiers of Engineering (NatFoE) Symposium organized by Indian National Academy of Engineering (INAE) in collaboration with IIT Hyderabad on 10.07.2021.

Dr. Sunil Kumar, Scientist

- Resource person for a lecture on Improving the reproduction and making piggery profitable on 28th Oct., 2021 organized by IDP-NAHEP, College of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram.
- Resource person for training programme invited by All Assam Pig farmers association at Tridhara Ancholik Kala Hangha, Amranga Borihat (Kamrup (R) on 5th August 2021.
- Resource person to deliver a lecture on Artificial Insemination in Pig (23rd Sept., 2021) in training programme conducted by SAMETI, Govt. of Assam.
- Reviewer for publications by the Journal, The Haryana Veterinarian

Dr. Satish Kumar, Sceintist

- Rapporteur in the National e-Workshop cum Webinar on "Current Perspective of Swine Diseases in India and its Management Practices" held on 11-12th January, 2021, jointly organized by ICAR-National Research Centre on Pig, Guwahati, Assam & Indian Association for the Advancement of Veterinary Research (IAAVR).
- Reviewer for peer reviewing a manuscript for journal "Microbial physiology" and "BMC Genomics".

Dr. Jaya, Scientist

- Reviewer for peer reviewing research manuscripts for Journal Research in Veterinary Science, Elsevier and Cell Stress and Chaperons, Springer Nature Publications.
- Rapporteur in the National e-Workshop cum Webinar on "Current Perspective of Swine Diseases in India and its Management Practices" held on 11-12th January, 2021, jointly organized by ICAR-National Research Centre on Pig, Guwahati, Assam & Indian Association for the Advancement of Veterinary Research (IAAVR).

Salam Jayachitra Devi, Scientist

- Reviewer for the 2nd International Symposium on Automation, Information and Computing (ISAIC 2021) was organized by Beijing Jiaotong University and has held online during December 3rd-6th, 2021.

HUMAN RESOURCE DEVELOPMENT

Dr. V. K. Gupta, Director

- Attended annual review meet of AICRP on Pig and MSP on Pig on 16.02.2021
- Attended Brain Storming Conclave & Techno-fair for Transforming Meghalaya State Specific Technology Applications for upliftment of livelihood avenues and entrepreneurship in Meghalaya organized by North East Centre for Technology Application & Reach (NECTAR) on 09.04.2021.
- Attended consultative group meeting of NCDC on 14.09.2021
- Attended ICAR Regional Committee (zone VIII) meeting on 14.09.2021
- Attended DBT-BIRAC leadership dialogue series lecture on 16.09.2021
- Participated in Indian Association of Hill Farming Award committee meeting, ICAR RC for NEH Region on 17.09.2021
- Attended North East Summit on Food Processing, held at IIM, Shillong on 24.09.2021.
- Participated in XV Agricultural Science Congress organized by National Academy of Agricultural Sciences at Institute of Agricultural Sciences, Banaras Hindu University, Varanasi from 13.11.2021 to 16.11.2021
- Attended National Mission on Edible Oil-Oil Palm Business summit for NE Region on 05.10.2021
- Attended Yak Mela, organised by ICAR-NRC on Yak, 17-19 Nov 2021
- Meeting with representatives of All Assam Pig Farmers Association on 28.07.2021
- Meeting with ICAR- NBAGR on zero nondescript germplasm 11.08.2021
- Participated in discussion on ASF along with Director, AH & Vety. Govt. of Assam telecasted by NE Now on 17.08.2021
- Organized Interface Meeting on African Swine Fever: Strategies for Prevention & Control in North Eastern India on 26.08.2021
- Participated in OIE regional virtual training on the diagnosis, prevention and control of swine bacterial diseases from 15.11.2021 to 16.11.2021
- Attended International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario organized by NAAS Regional Chapter for NER, Barapani, Meghalaya, IUOA & CoA, CAU, Kyrdemkulai, Meghalaya from 7.12.2021 to 09.12.2021
- Attended 25th Regional Committee Meeting of ICAR, Zone-III on 11.12.2021

Dr. Swaraj Rajkhowa, Principal Scientist

- Attended Annual Review meeting of All India Network Programme on neonatal mortality in farm animals on 20th January, 2021.
- Attended Regional livestock and poultry show (held from 8-10 February, 2021 at Khanapara) on 9th Feb, 2021 organized by Assam Animal Husbandry & Vety Department.
- Attended farmers awareness programme conducted by KVK, Dudhnoi on 18th June, 2021
- Attended a training programme (online/virtual mode) on “Establishment of entrepreneurship and marketing of piglets and pork products” w.e .f. 24.06.2021 to 25.06.2021 for pig farmers of eight aspirational districts of eight north eastern states of India under Biotech - KISAN Project on 24th June 2021.
- Attended online awareness programme for piggery farmers of Assam on 26-06-2021organized by ICAR-NRC on Pig.
- Attended Sensitization program on Technology commercialization and licensing on 5th July, 2021 organized by ICAR-NRC on Pig.
- Attended 41st IMC Meeting (as member) of ICAR NEH, Umiam on 31/07/2021
- Attended Review meeting (virtual mode) of DBT funded Biotech Kisan Project on 11th August, 2021.
- Attended workshop on "Pork Marketing Chains in North East India for Sustainable Livelihood of Tribal Women (Assam, Meghalaya and Nagaland)" on 4th Oct, 2021 organized by ICAR-NRC on Pig.
- Attended brainstorming meeting of One Health project and International Mini-symposium on “The Essentials of One Health” and Interactive Sessions for the One Health Consortium on 20th and 21st October 2021 held

at NIAB, Hyderabad.

- Attended 42nd IMC Meeting, ICAR Res Complex for NEHR, Umiam, Meghalaya held on 20th November,2021 as Member.
- Attended meeting of the assessment committee for CAS (in the discipline of Veterinary Medicine and Veterinary Public Health) as Expert member nominated by the DG, ICAR, New Delhi.
- Attended the meeting of evaluation committee (as an expert) for selection of Best Scientist for the years 2019-21 of ICAR Research Complex for NEH Region Umiam, Meghalaya on 24th December, 2021.

Dr. Santanu Banik, Principal Scientist

- Workshop on "Mission Towards Zero Non-descript AnGR of India" organized by NBAGR, Karnal
- 19th Annual Convocation cum Scientific Convention on Transforming livestock health and production with innovative technologies and policy reforms to boost farmer's income (Virtual Mode) organized by National Academy of Veterinary Sciences (India)
- XVth Annual Convention of ISAGB and a National Conference on "Animal Breeding Strategies in the Era of Genomics and Phenomics" at ICAR-ICAR-NBAGR, Karnal through virtual mode.
- Online Annual Review meet and of AICRP on Pig and Mega Seed Project on pig
- Review meeting of ARYA Project of KVKs of Zone VI & Zone VII on at 10:30am at College of Veterinary Science, Khanapara
- SAC meeting, KVK Goalpara organized by KVK, Goalpara.
- Interface Meet on "Characterization and Documentation of Animal Genetic Resources of Ladakh: A mission towards Zero Non-Descript" by NBAGR, Karnal
- 25th Regional Committee Meeting Zone-III organized by ICAR-RC for NEH, Barapani
- Meeting for Kisan Divas And Breed Conservation Award 2021 of ICAR-NBAGR, Karnal (virtual)
- Review Meeting on Animal Science and Fisheries of the KVKs under ICAR-ATARI Zone VI Guwahati
- Meeting for Inauguration of Administrative Building of ICAR-ATARI, Zone-VI
- Interface Meet on Characterization and Documentation of Animal Genetic Resources of Telangana State: A mission towards Zero Non-Descript Population by NBAGR, Karnal
- EFC preparation Meeting chaired by DDG (Animal Sciences), ICAR (virtual)
- Virtual Meeting for Developing National Breeding Policy for Mithun organized by ICAR-NRC on Mithun
- Interface Meet on Characterization and Documentation of Animal Genetic Resources of Haryana State: A Mission towards Zero Non-Descript Population" by NBAGR, Karnal
- Virtual meeting to discuss the suitable strategies, research priorities, institutional linkage, extension and monitoring mechanism for the Eastern Himalayas zone organized by ICAR-RC for NEH, Barapani
- SAC meeting, KVK Goalpara organized by KVK, Goalpara

Dr. N. H. Mohan, Principal Scientist

- Attended online training programme on Exercising Leadership: Foundational Principles conducted by Harvard University Nov 6-Dec 5, 2021.
- Attended XV Agricultural Science Congress organized by National Academy of Agricultural Sciences at Institute of Agricultural Sciences, Banaras Hindu University Nov 13-16, 2021
- Attended North East Summit on Food Processing held at IIM, Shillong on 24th Sep 2021.
- Attended Interface Meeting on African Swine Fever: Strategies for Prevention & Control in North Eastern India on 26.08.2021

Dr. Rafiqul Islam, Principal Scientist

- Attended sensitization program on Technology commercialization and licensing"; Lecture delivered by Ms. Bidisha Garg, Senior Advocate of the Empanelled law firm of Anand & Anand organized by ITMU, ICAR-NRCP on 05.07.2021.

- Attended online programme Organized by ICAR-New Delhi on the Topic "Corona Viruses: Burgeoning and Enduring Threats" where lecture delivered by Dr B. N. Tripathi, Deputy Director General (Animal Sciences), ICAR on 14.07.2021
- Attended online inauguration programme of "TECH @75": Azadi Ka Amrit Mahotsav, Organized by Ministry of Science and Technology [Department of Science and Technology (DST), Department of Biotechnology (DBT) and Council of Scientific and Industrial Research (CSIR)] in collaboration with Ministry of Earth Sciences (MoES) on 15th November 2021, 11-2 PM.
- Attended online 3 day programme of Tech @75; I: Community Feedback and experience sharing; II: Conclave of social change makers; III: Roundtable discussion to strengthen and nurture the local innovation on 6 December 2021 at 2 PM.
- Attended International Symposium on "Novel Knowledge, Innovative Practices and Research in Theriogenology organized by Indian Society for Study of Animal Reproduction (ISSAR) held at College of Veterinary Science, Mannuthy, Thrissur, KVASU, Kerala during December 27-29, 2022, where two research papers (Abstracts No. 106 and 106a) have been presented.

Dr. P. J. Das, Principal Scientist

- Attended awareness cum training programme: Use of balance fertilizer for higher productivity (Soil test based fertilizer) organized by KVK, Dhudhnoi, ICAR-National Research Centre on Pig on 19th June 2021.
- Attended National Dialogue on "Innovative Food for Hospitality Industry" organized by IP& TM unit ICAR, under the Chairmanship of Secretary (DARE) & Director General (ICAR), held on 22nd June, 2021 at 10.00 A.M. through video conferencing.
- Attended Hindi workshop on "Hindi typing by using phonetics" organized by Hindi Cell ICAR-NRC on Pig on 29th June, 2021
- Attended webinar on "Improving quality of Agricultural Research in India", organized by CCSHAU/Elsevier, on Wednesday 30th June, 2021.
- Attended biannual international conference on "Transgenic Animal Research" hosted by UC Davis focusing on current developments on the genetic engineering and gene editing of livestock, poultry and fish conducted in virtual mode from Mon-Thurs , August 9-12, 2021, 9 AM-12 Noon in USA Pacific Timing.
- Attended Interface Meeting on African swine fever: Strategies for Prevention & Control in North Eastern India organized by ICAR-National Research Centre on Pig with the objective to update status of ASF in each NE region States for prevention and control. Held on 26th August 2021 on online platform.
- Attended and participated review and sensitization workshop of ZTMUs/ITMUs/PMEs under NAIF scheme, organized by Intellectual Property & Technology Management (IP&TM) unit, Indian Council of Agricultural Research, held on 5th -11th October 2021.
- Attended and participated 2nd International Agrobiodiversity Congress - Agrobiodiversity for food system transformation virtually held in Rome, Italy Nov. 15th -18th, 2021.
- Attended webinar on "How to write claims in a patent application?" organized by Institute technology Management Unit, ICAR-National dairy Research institute, held on 1st December 2021.
- Attended and participated International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario, December 7-9, 2021, India.
- Attended international webinar on "Fighting the Hunger using Smart Technology" organized by ICAR-IIOPR, Pedavegi, Andhra Pradesh, held on 26th December 2021.
- Attended and participated Dr. C.M.Singh Birth Centenary Year Celebrations (30-11-2021to30-11-022) cum National Webinar on Advances of Veterinary Sciences during 75Years of Indian Independence (1947-2022) jointly organized by ICAR-National Research Centre on Pig, Guwahati and Dr. C.M.Singh Endowment Trust, Bareilly, UP held at ICAR-National Research Centre on Pig, Guwahati on 311st January 2022.

- Participated in the Exhibition Show in Rani Guwahati on 7th Oct. 2021. (Act as member Exhibition committee).
- Participated in the Exhibition Show and awareness campaign at Jirang, Meghalaya during the SHG Mela &Health Camp organized by Govt. of Meghalaya held on 15th Nov. 2021

Dr. R. Thomas, Senior Scientist

- Delivered invited talk on the topic 'Avenues and prospects of pork processing as entrepreneurship options in Assam' on 10th July, 2021 to the students and entrepreneurs of AAU under NAHEP. (Virtual mode).
- Delivered invited talk on the topic ' Avenues in value addition of pork and its commercial potential' on 25-08- 2021 organized by APEDA. (Virtual mode).
- Delivered invited talk on the topic 'Market oriented entrepreneurship in value added meat and poultry products' on 20-10-2021 organized by ICAR-NRC on Meat and MANAGE. (Virtual mode).
- Delivered an invited talk on 'Prospects of piggery and pork processing as an entrepreneurship' on 10th December, 2021 in connection with Azadi Ka Amrit Mahotsav of ICAR-NRC on Meat.
- Taken classes for PG and PhD students of LPT Division, Kerala Veterinary and Animal Sciences University on the topics of 'development of meat products' and 'chemical contaminants in muscle foods and analytical techniques for its detection' during 17th and 21st July, 2021.
- Major guide of PhD Scholar Ms. Songeeta Singha (Subject: Microbiology, Student ID: DU2019PHD0026) at Assam Don-Bosco University.
- Member, Advisory Committee for Dr. Kalpita Saikia (Subject: LPT, Regn. No. 2018-VDK-08) at CVSc, AAU, Khanapara.
- Conducted PhD. Comprehensive Viva-voce Examination of Dr. Rashmi Rekha Saikia, Roll No. 2019-VDK-15, Dept. of LPT CVSc, Khanapara, AAU on 11th November, 2021.
- Evaluated the PhD thesis and conducted the PhD viva voce examination of Mr. Arcadius Puwein of Department of Biotechnology, Assam Don-Bosco University during November, 2021.

Dr. Seema Rani Pegu, Senior Scientist

- Attended International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario, December 7-9, 2021 at CAU, Meghalaya.
- Attended Hindi workshop on “Hindi typing by using phonetics” organized by Hindi Cell ICAR-NRC on Pig on 29th June , 2021
- Attended Interface Meeting on African swine fever: Strategies for Prevention & Control in North Eastern India organized by ICAR-National Research Centre on Pig with the objective to update status of ASF in each NE region States for prevention and control. Held on 26th August 2021 on online platform.
- Attended and participated Dr. C.M.Singh Birth Centenary Year Celebrations (30-11-2021to30-11-022) cum National Webinar on Advances of Veterinary Sciences during 75Years of Indian Independence (1947-2022) jointly organized by ICAR-National Research Centre on Pig, Guwahati and Dr. C.M.Singh Endowment Trust, Bareilly, UP held at ICAR-National Research Centre on Pig, Guwahati on 311stJanuary 2022.
- Participated in the Exhibition Show and awareness campaign at Jirang, Meghalaya during the SHG Mela &Health Camp organized by Govt. of Meghalaya held on I 5th Nov. 2021
- Participated online workshops & Sensitization Programme on “Technology Commercialization and Licensing” on 5th July 2021 from 11.00 AM -12.30 PM on the virtual mode by the Institute Technology Management Unit (ITMU) of ICAR-National Research Scientist on Pig, Rani Guwahati.

Dr. Juwar Doley, Senior Scientist

- Attended training on 'Recent Advances in Disease Diagnosis & Vaccines' during July 27 - August 16, 2021 organized by department of Veterinary Microbiology, College of Veterinary Science & Animal Husbandry, Jabalpur (M.P.)

Dr. Kalyan De, Senior Scientist

- Attended Master trainers training program on Meat & Poultry Processing Phase-II under PM-FME scheme to be held from 10-08-2021 to 13-08-2021,organised by ICAR-NRC Meat, Hyderabad.
- Participated and presented abstract on "International Congress of Biometeorology on "Connecting our World: Biometeorology 2021" September 21-22, 2021, International Society of Biometeorology.

Dr. Sunil Kumar, Scientist

- Participated in Online Training Workshop on Data Visualization Using R from 9-11 March, 2022 organized by ICAR-NAARM.
- Participated in Dr C. M. Singh Birth Centenary Year Celebrations (30-11-2021 to 30-11-2022) cum National Webinar on Advances of Veterinary Sciences during 75 Years of Indian Independence on 31st January, 2022 Jointly Organized by ICAR -National Research Centre on Pig, Rani and Dr C.M. Singh Endowment Trust, Bareilly, UP.
- Participated in the virtual Hindi Workshop on " Computer main Unicode aadharit Hindi Typing" on 29 June, 2021 organized by Rajbhasha Unit, ICAR-National Research Centre on Pig, Rani, Guwahati.
- Participated in the virtual "Sensitization Programme on Technology Commercialization and Licensing" on 5th July 2021 organized by Institute Technology Management Unit (ITMU), ICAR-National Research Centre on Pig, Rani, Guwahati.
- Participated in Scientific writing workshop (Online) organized by ICAR- NDRI, Karnal during June 23-24, 2021 organized by ICAR-NDRI, Karnal.
- Participated in National Webinar on Smart Agriculture and Budget Implementation on 24.02.2022.
- Participated and Institute Technology exhibited at Jirang, Meghalaya on 15.11.2021 in the SHG Mela and Health Camp, Organized by Govt. of Meghalya.
- Participated and completed one year post-graduate diploma in animal welfare.
- Participated and Institute Technology exhibited in Momentum North East-2022 at Shilpagram, Six Mile from 24-25 March, 2022.
- Participated and Institute Technology in Agricultural exhibition at Rani High School, Rani
- Participated in International Symposium on "Novel Knowledge, Innovative Practices and Research in Theriogenology" organized by C.V.Sc., Mannuthy, KVASU, Kerla from December 27-29, 2021.
- Participated in the International Symposium on Harnessing the potentials of genome editing tools to augment the productivity and health of farm animals organized by Animal Biotechnology Centre of ICAR- National Dairy Research Institute, Karnal on July 19-20, 2021
- Participated in World Zoonosis day (virtual mode) on 6th July 2021 organized by ICAR-NRC on Pig, Rani

Dr. Satish Kumar, Scientist

- Attended online training programme on "Time Series Data Analysis" organized by ICAR-NAARM, Hyderabad during 04-09 Jan 2021.
- Attended Three days Programme on "Basic and Applied Bioinformatics in Animal Sciences" organized by Centre of Advanced Agricultural Science & Technology- Advanced Centre for Livestock Health, ICAR-Indian Veterinary Research Institute, Izatnagar (UP) during 09-11 Feb 2021
- Attended online training programme on "Data Visualization in Agribusiness and Agricultural Research" organized by ICAR-NAARM, Hyderabad from 17-22nd January, 2022
- Attended DBT sponsored one day online training on "SNP Data Analysis for detecting parentage in animals." Organized by College of Animal Biotechnology and DBT-CRCN of GADVASU, Ludhiana on 23rd September 2021.
- Participated in the National e-Workshop cum Webinar on "Current Perspective of Swine Diseases in India and its Management Practices" jointly organized by ICAR-National Research Centre on Pig, Guwahati, Assam & Indian Association for the Advancement of Veterinary Research (IAAVR) during 11-12 Jan

2021

- Participated in the XVIII Annual Convention and National Webinar on “Harnessing Potential of Indigenous Animal Genetic Resources for Enhancement of Productivity and Profitability” organized by Society for Conservation of Domestic Animal Biodiversity and ICAR- National Bureau of Animal Genetic Resources, Karnal during 11-12 Feb 2021.
- भाकृअनुप –भारतीय गन्ना अनुसंधान संस्थान, लखनऊ द्वारा १६–१७ मार्च २०२१ कोआत्मनिर्भर भारत: लोकल के लिए वोकल विषय पर आयोजित ऑनलाइन राष्ट्रीय संगोष्ठी में भाग लिया
- Participated in International Webinar entitled "Alternative Therapies to Mitigate Microbial Resistance" organized by ICAR-IVRI, Izatnagar during 23-24 Feb 2021
- Participated in Webinar on “Outreach Program by India Alliance- ICAR-IVRI” organized by India Alliance on 29 Jan 2021
- Virtually participated in the International Symposium on Harnessing the potentials of genome editing tools to augment the productivity and health of farm animals organized by Animal Biotechnology Centre of ICAR-National Dairy Research Institute, Karnal July 19-20, 2021
- Attended Dr C. M. Singh Birth Centenary Year Celebrations (30-11-2021 to 30-11-2022) cum National Webinar on Advances of Veterinary Sciences during 75 Years of Indian Independence (1947-2022) jointly organized by ICAR-National Research Centre on Pig, Guwahati and Dr C.M. Singh Endowment Trust, Bareilly, UP held at ICAR-National Research Centre on Pig, Guwahati on 31st January 2022
- Participated in the National Webinar on "Challenges for Piggery Sector in India” organized by college of Veterinary Science & A.H., Jabalpur on September 27th, 2021
- Participated in the virtual “Sensitization Programme on Technology Commercialization and Licensing” on 5th July 2021 organized by Institute Technology Management Unit (ITMU), ICAR-National Research Centre on Pig, Rani, Guwahati
- Participated in the National Webinar on "Implementation and use of Agricultural Research Management System (ARMS)” organized by ICAR_IASRI on 25th November 2021.
- Participated in the National Webinar on "Application of Multi-omics in Animal Production” organized by ICAR-NBAGR on 27th October 2021
- Participated in the National Webinar on "FAO Guidelines on Genomic Characterization of Animal Genetic Resources” organized by ICAR-NBAGR on 11th October 2021.
- Attended the Public Lecture in the area of animal health and productivity by Dr. A.K. Srivastava on 11th June 2021.
- Attended Annual Review meet of AICRP and MSP on Pig 2021 on 23rd Feb 2022 and prepared the proceedings of the meeting
- Attended Interface Meeting on African Swine Fever: Strategies for Prevention & Control in North Eastern India organised by ICAR-National Research Centre on Pig on 26th August 2021.

Dr. Jaya, Scientist

- Participated in 3 days online training program on “Basic and Applied Bioinformatics in Animal Sciences” organized by Centre of advanced agricultural science and technology-Advanced Centre for Livestock Health, ICAR-IVRI, Izatnagar-U.P. 9-11th Feb. 2021
- Participated in the virtual “Sensitization Programme on Technology Commercialization and Licensing” organized by Institute Technology Management Unit (ITMU), ICAR-National Research Centre on Pig, Rani, Guwahati on 5th July 2021 in online mode.
- Participated in the International Symposium on “Harnessing the potentials of genome editing tools to augment the productivity and health of farm animals” organized by Animal Biotechnology Centre of ICAR - National Dairy Research Institute, Karnal during 19-20 July 2021 in online mode.
- Attended 4 days online training program on “Climate Resilient Animal Husbandry”, from 18-21st August 2021 organized by ICAR-CRIDA & MANAGE, Hyderabad

- Participated in the International Workshop Asia Oceania Biotechnology Regional Virtual Workshop on “Impact of Gene Technology in Animal Agriculture and Food Production, The Science, the Opportunities and Regulation of Animal Biotechnology: Genetic Engineering (GE) and Genome Editing (GnEd)” organized by ISAAA and USDA from 31st Aug. to 1st Sept. 2021
- Participated in 5 days online training program on “Application of Bioinformatics in Agricultural Research and Education” from 20-24th Sep. 2021 organized by SKILL-BIF, ICAR-NAARM, Hyderabad
- Participated in the National Webinar on "Challenges for Piggery Sector in India” organized by college of Veterinary Science & A.H., Jabalpur on 27th September, 2021 in online mode.
- Participated in Workshop on “Pork marketing chains in North-East India for sustainable livelihood of tribal women (Assam, Meghalaya and Nagaland)” organized at ICAR-NRC on Pig 4th Oct. 2021
- Participated in 3 days online training program on "Protein Structure Modelling and Dynamics" from 27-29th October, 2021 organized under ICAR Consortium Research Platform on Genomics by ICAR-Indian Agricultural Statistics Research Institute, New Delhi
- Participated in the National Webinar on "Implementation and use of Agricultural Research Management System (ARMS)” organized by ICAR-IASRI on 25th November 2021 online mode.

Dr. Misha Madhavan M, Scientist

- Attended training program on “Extension Strategies for doubling Farmers' income” organized by MANAGE, Hyderabad (Virtual mode) from 07.06.2021 to 11.06.2021
- Attended a training program on “Data Analysis in Social Sciences Research” organized by ICAR-NAARM, Hyderabad (Virtual mode) from 04.10.2021 to 08.10.2021
- Attended a training program on “Impact Assessment of Agricultural Research and Technologies” organized by ICAR-NAARM, Hyderabad (Virtual mode) from 18.12.2021 to 22.12.2021
- Attended a national webinar on 'Role of Rural India in Sustainable Development' organized by DESM Division, ICAR-NDRI, Karnal (Virtual mode) on 26.06.2021
- Attended national webinar series 'EXPERTOPEDIA' (Talk 1 and 2) organized by ICAR-CIPHET, Ludhiana (Virtual mode) on 18.10.2021
- Attended 2nd review meeting of NASF funded project on “Pork Marketing Chains in North East India for sustainable livelihood of tribal women (Assam, Meghalaya and Nagaland)” at ICAR-Research Complex for NEH Region, Umiam, Meghalaya on 23.11.2021
- Attended International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario organized by NAAS Regional Chapter for NER, Barapani, Meghalaya, IUOA & CoA, CAU, Kyrdemkulai, Meghalaya (Virtual mode) from 7.12.2021 to 09.12.2021
- Attended 2nd National Conference on 'Transformation of Agricultural Extension-Strategies for Effective Reformation' (TAESERE 2021) organized by S.V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University (Virtual mode) 22.12.2021 to 23.12.2021
- Attended sensitization programme on 'Technology Commercialization and Licensing' organized by ITMU of ICAR-NRC on Pig, Guwahati on 05.07.2021

Dr. Nitin M Attupuram, Scientist

- International webinar on “Impact of oxidative stress on male and female reproduction” organised under NAHEP, ICAR-NDRI, Karnal on 01st July, 2021.
- Attended National Webinar on “Expertopedia” organised by ICAR-CIPHET Ludhiana, on 18th October, 2021.
- Attended virtual sensitisation programme on “Technology commercialisation and licencing” organised by ITMU, ICAR-NRC on Pig on 5th July, 2021.

- Completed online training workshop on ta visualization using R" organized by ICAR-NARRM, Hyderabad during 09-11th March 2022
- Got recognition as Certified Livestock Advisor after successfully completing the one year training programme organised by MANAGE, Hyderabad and ICAR-CIRC, Meerut
- Got certified as Master Trainer for Food Micro & Small Enterprises by Food Industry Capacity & Skill Initiative, Ministry of food processing Industries, GOI

Ms. Salam Jayachitra Devi, Scientist

- Attended Online Training Programme on "Time Series Data Analysis" Organized by ICAR-NAARM, Hyderabad during 04-09 January, 2021.
- Participated in one week online Training on "Internet of Things (IoT)" for women Scientist, Engineers and Technologies from 25th to 29th October 2021. Sponsored under Women Component DISHA Under the scheme: National Training Programme for Technologists and Scientists working in Govt. Sector by Ministry of Science and Technology, Govt. of India.
- Participated in the virtual programme on "Sensitization Programme on Technology Commercialisation and Licensing" on 5th July 2021 organised by Institute Technology Management Unit (ITMU) , ICAR-National Research Centre on Pig, Rani, Guwahati.
- Attended Online Training Programme on Application of Bioinformatics in Agricultural Research and Education Organized by ICAR-NAARM, Hyderabad during 20-24 September, 2021
- Attended Online Training on Programming of Web & Mobile Applications using Low-code Platforms Organized by ICAR-NAARM, Hyderabad during 07-12 July, 2021
- Participated in the webinar on "Artificial Intelligence for Smart Agriculture" on 22nd July, 2021, organized by ICAR-Research Complex for Eastern Region, Patna, Bihar - 800014
- Participated in the CAU-Regional Agri Fair 2020-21 organised by the Directorate of Extension Education, Central Agricultural University, Imphal at CAU Central Farm, Lamphelpat, Manipur during March 08-10, 2021 with Exhibition Stall.

Ongoing Research Projects

Sl. No.	Project Title	Name of PI and Co-Investigarors	Funding
Animal Genetics and Breeding			
1.	Generation-wise genetic evaluation of Rani crosses	S. Banik (PI), P.J. Das, KBarman R. Thomas, S.R. Pegu Sunil Kumar	Institute
2.	Characterization and expression profiling MSY of Pig (male-specific region of Y chromosome) genes for boar fertility.	P.J. Das (PI), S. Banik, Sunil Kumar, S. Rajkhowa	Institute
3.	Exploring genetic variability in different candidate genes and their association with (re)production traits in pigs	Satish Kumar (PI), S. Banik, P.J. Das Sunil Kumar, Jaya	Institute
4.	Molecular characterization of indigenous pig breeds	Satish Kumar (PI), S. Banik, P.J. Das Sunil Kumar, A.R. Sahu (ICAR-CCARI)	Institute
5.	Development of IRT image-based systems for examining the health status of pigs	P.J. Das (PI), S. Banik, Sunil Kumar, S.R. Pegu, S. Rajkhowa	Institute
6.	All India Coordinated Research Project on Pig, KVK-Goalpara centre	S. Banik (PI), P.J. Das, K. Barman, S. Rajkhowa and Satish Kumar	ICAR
Animal Physiology			
7.	Physio-genomic responses and MCT profiling of exotic and Indigenous pig breeds in heat stress during different seasons	B.C. Das (PI), N.H. Mohan, Jaya, K. De, J. Doley, A. Paul	Institute
8.	Development of early fertility markers in pigs	N.H. Mohan (PI), Sunil Kumar, R. Thomas	Institute
9.	Investigations on myogenesis in myostatin gene knockout cells through CRISPR-CAS9 based genome editing	N.H. Mohan (PI), Jaya, B.C. Das	Institute
10.	Development of thermo-tolerant pig through biomarker assisted selection	Mohan.N.H (PI)	ICAR-National Fellow
11.	Characterization of immunogenic and angiogenic growth factors regulating ovarian function in pigs.	Jaya (PI), N.H. Mohan, P.J. Das, S.R. Pegu, Sunil Kumar, Satish Kumar	Institute
12.	Investigation of notch signalling in regulation of ovarian function in pigs	Jaya (PI), B.C. Das, N.H. Mohan, Satish Kumar	Institute
Animal Reproduction			
13.	Preservation of boar semen using different additives in liquid and frozen state	R Islam (PI), Sunil Kumar, K Barman, S Banik	Institute
14.	Flagship programme: Artificial Insemination in Pigs	R Islam (PI), Sunil Kumar	Institute
15.	Propagation of Artificial Insemination for establishment of multiplier units and optimizing reproductive efficiency in pigs at farmers' field	Sunil Kumar (PI), R. Islam, S. Banik, K. Barman, P.J. Das	Institute
16.	Biochemical characterization of seminal gel and its application for biostimulation in pigs	Sunil Kumar (PI), Rafiqul Islam, Santanu Banik, P.J. Das, S.R. Pegu, S. Rajkhiwa and Manish Kumar	DBT
17.	Establishment of modern boar semen production centre and creation of extension facilities for capacity building of piggery stakeholders	S. Banik (PI), Sunil Kumar, R. Islam and V.K. Gupta	NEC

Animal Nutrition			
18.	Development of vegetable waste/fruit waste based pig feeds	K Barman (PI), S.R. Pegu, R. Thomas	Institute
19.	Molecular detection of aflatoxins producing Aspergillus spp.	K Barman (PI), P.J. Das, S.R. Pegu, Rajib Deb, Sunil Kumar	Institute
20.	Maize Production in NEH region for sustainable livestock production	K. Barman (PI), S. Banik, S.R. Pegu, Sunil Kumar and Swaraj Rajkhowa	ICAR-IIMR, Ludhinana
Livestock Production and Management			
21.	Assessment and optimisation of the water footprint in pig production and processing	Nitin M Attupurum (PI), Kalyan De, R. Thomas, K. Barman, N.H. Mohan	Institute
22.	Dynamics of gut microbiome to dietary management and antibiotic treatment in pigs	Nitin M Attupurum (PI), Kalyan De, R. Thomas, S.R. Pegu, K. Barman, R. Islam, N.H. Mohan	Institute
23.	Ethogram development and welfare assessment of growing desi and crossbred pig	Kalyan De (PI), S. Paul, R. Islam, N.H. Mohan, B.C. Das	Institute
Livestock Product and Technology			
24.	Optimizing the processing conditions to prevent the occurrence of selected FSSAI listed food borne pathogens in pork and pork products and to develop risk mitigation strategies.	R Thomas (PI), K. Barman, S.R. Pegu	Institute
25.	Setting up of food testing laboratory	R. Thomas (PI), S.R. Pegu, S. Rajkhowa	MoFPI
26.	Technical Advisory Services for Piggery Value Chain Improvement in Assam, under the World Bank financed Assam Agribusiness and Rural Transformation Project (APART).	R. Thomas (PI), Seem R. Pegu, K. Barman, Sunil Kumar, S. Rajkhowa	World Bank
27.	Farm-to-Fork Risk profiling of hazards associated with pork supply chain in India, developing a database on hazards and associated unique pig husbandry / processing practices, developing food safety interventions towards reducing hazards and effective risk communication strategies as guidance to the industry.	R. Thomas (PI)	ICAR -LBS Award
Animal Health			
28.	Sero-prevalence and molecular epidemiology of important porcine viral diseases in pigs in northeastern part of India with special reference to Assam	S.R.Pegu (PI), S. Rajkhowa, P. J. Das , Rajib Deb, A.K.Yadav, S.Paul and J. Doley	Institute
29.	Epidemiology of Intestinal protozoan parasitic diseases of Pigs, with special reference to Cryptosporidium and Coccidia.	S. Paul (PI), S. Rajkhowa, S.R. Pegu, J. Doley, Kalyan De, Rajib Deb, S. Banik	Institute
30.	Molecular and Serological detection of Porcine Parvovirus (PPV) and its characterization.	J. Doley (PI), P. Deka, Rajib Deb, S.R. Pegu, P.J. Das, S. Paul, N.H. Mohan, S. Rajkhowa	Institute
31.	Expression and evaluation of diagnostic potential of immunogenic proteins of porcine reproductive and respiratory syndrome virus.	Ajay Kumar Yadav (PI), Seema Rani Pegu, Rajib Deb, Pranab Jyoti Das and Swaraj Rajkhowa	Institute
32.	Development of CD163 host receptor based sero-diagnostic for early detection of porcine respiratory and reproductive syndrome virus.	Rajib Deb (PI), A.K. Yadav, S. Rajkhowa S.R. Pegu J. Doley, S. Paul	Institute

33.	Epidemiology, patho-physiology and development of nucleo-diagnostics against porcine coronaviruses from North-Eastern India.	Ajay Kumar Yadav (PI), Swaraj Rajkhowa, Kaushal Kishor Rajak (IVRI), Seema Rani Pegu, Rajib Deb, Juwar Doley & Souvik Paul	Institute
34.	Epidemiology and Molecular Epidemiology of African Swine Fever Virus (ASFV) in North-Eastern region of India	Juwar Doley (PI), Gaurav Kumar Sarma, Seema Rani Pegu, Pranab Jyoti Das, Misha Madhavan M, Souvik Paul, Salam Jaychitra Devi, N H Mohan and Swaraj Rajkhowa	Institute
35.	Kinetics of FMD virus serotype specific protective antibody response induced in pigs vaccinated with commercial FMD vaccine intended for use in cattle	NRC Pig: Juwar Doley (PI), Seema Rani Pegu,Pranab Jyoti Das, Rafiqul Islam, Kalyan De and N H Mohan ICAR-DFMD: R P Singh, Jajati K Mohapatra, C Jana, N R Sahoo, M Rout, A Sahoo, R Ranjan and S A Khulape	Institute
36.	SWINOSTICS: A platform for development and validation of on-field diagnostics of important pig pathogens in NE Region of India for commercial exploration	Seema Rani Pegu (PI), S.Rajkhowa, P.J.Das, Rajib Deb, A.K.Yadav and V.K.Gupta	DBT
37.	Establishment of a Consortium for One Health to address Zoonotic and Transboundary Diseases in India including North-East Region	S Rajkhowa (PI), S.R. Pegu, J. Doley, Ajay Yadav, Rajib Deb, S Paul, V.K Gupta	DBT
38.	Development of a virus like particle- based vaccine against Indian isolate of Porcine Circovirus	Rajib Deb (PI), Swaraj Rajkhowa, Juwar Doley, Hemanta Kumar Maity (WBUAFS), Aditya Pratap Acharya (WBUAFS), Sachinandan De (NDRI)	DBT
39.	Development of loop-mediated isothermal amplification (LAMP) assay for rapid detection of important zoonotic bacterial pathogens of pig	S. Rajkjhowa (PI), S. R. Pegu and V. K. Gupta	Institute
Extension			
40.	Fostering the adoption of scientific pig production practices among small holders in Assam	Misha Madhavan (PI), K. Barman, N.H. Mohan, S. Banik, R. Thomas, S.R. Pegu, Sunil Kumar	Institute
41.	Pork Marketing chains in North-East India for sustainable livelihood of tribal women (Assam, Meghalaya and Nagaland)	Misha Madhavan (PI), Mohan N.H	ICAR-NASF
Computer Application for pig production			
42.	Design and development of Image based growth rate estimation algorithm for different categories of pigs.	Salam Jayachitra Devi (PI), Kh. M. Singh R. Islam, S. Kumar, J. Doley	Institute
Tribal Sub Plan			
43.	Tribal Sub Plan	Vivek Kumar Gupta, Keshab Barman, BC Das, S. Rajkhowa, S. Banik, Mohan NH, Rafiqul Islam, P.J. Das, R. Thomas, S.R. Pegu, , Juwar Doley, Souvik Paul, Rajib Deb, Sunil Kumar, Kalyan De, Satish Kumar, Jaya, Misha Madhavan, Salam Jayachitra Devi	ICAR
Scheduled Caste Sub Plan			
44.	SCSP	Seema R. Pegu, Kalyan De, Jaya, Salam Jayachitra Devi, Nitin M. Attupuram	ICAR

Personnel

ICAR-National Research Centre on Pig
RMP and Scientist Cadre

Dr. Vivek Kumar Gupta	Director	
Dr. Bikas Chandra Das	Principal Scientist (Animal Physiology)	
Dr. Swaraj Rajkhowa	Principal Scientist (Veterinary Medicine)	
Dr. Santanu Banik	Principal Scientist (Animal Genetics & Breeding)	
Dr. Keshab Barman	Principal Scientist (Animal Nutrition)	
Dr. Mohan N.H	Principal Scientist (Animal Physiology)	

Dr. Rafiqul Islam	Principal Scientist (Animal Reproduction & Gynaecology)	
Dr. Pranab Jyoti Das	Principal Scientist (Animal Genetics and breeding)	
Dr. Rajendran Thomas	Senior Scientist (Livestock Products & Technology)	
Dr. Seema Rani Pegu	Senior Scientist (Veterinary Pathology)	
Dr. Juwar Doley	Senior Scientist (Animal Biotechnology)	
Dr. Souvik Paul	Senior Scientist (Veterinary Parasitology)	

Dr. Rajib Deb	Senior Scientist (Animal Biotechnology)	
Dr. Kalyan De	Senior Scientist (Livestock Production Management)	
Dr. Sunil Kumar	Scientist (Animal Reproduction and Gynaecology)	
Dr. Jaya	Scientist (Animal Physiology)	
Dr. Satish Kumar	Scientist (Animal Genetics & Breeding)	
Dr. Misha Madhavan M	Scientist (Agricultural Extension)	

Ms. Salam Jayachitra Devi	Scientist (Computer App. And IT)	
Dr. Nitin M. Attupuram	Scientist (Livestock Production Management)	
Administrative Cadre **Shri. P.K. Nayak**	Assistant Finance and Accounts Officer	
Shri Uttam Prakash	Assistant Administrative Officer	

Smt Jonali Nath	Upper Divisional Clerk
Ms. Kabyawati Rabha	Personal Assistant
Ms. Hiramoni Thakuria	Personal Assistant
Sri Ratul Baishya	Lower Divisional Clerk

Technical Cadre

Dr. Rajib Kumar Das	Sr. Technical Assistant
Dr. Anil Das	Sr.Technical Assistant
Dr. Gagan Bhuyan	Sr.Technical Assistant
Sri Siba Chandra Deka	Technical Assistant
Sri Kailash Choudhury	Sr.Technician
Sri Rana Pratap Kakati	Sr.Technician

Supporting Staff Cadre

Sri Naren Chandra Deka	Skilled Supporting Staff

Krishi Vigyan Kendra, Goalpara

Dr. Santosh Kumar Baishya	Principal Scientist and Head (Animal Reproduction and Gynaecology	
Dr. Hitu Choudhury	SMS/ACTO (Animal Science)	
Dr. Biswajit Dey	SMS/ACTO (Horticulture)	
Dr. Utpal Kumar Bhattacharyya	SMS/ACTO (Plant Protection)	
Dr. Hari Charan Kalita	SMS/ACTO (Agronomy)	
Mrs. Poli Saikia	SMS (Community Science)	

Er. Benjamin Kaman	Technical Officer (Soil & Water Conservation Engineering)	
Mrs. Minakshi Borah Kaman	Technical Officer (Community Science)	
Mrs. Mousumi Bhuyan	Technical Officer (Horticulture)	

Mr. Jayanta Choudhury	Sr. Technician
Sri Jitumoni Kalita	Skilled Supporting Staff
Sri Drubha Lochan Rabha	Skilled Supporting Staff

Publications

Research Papers

Banik, S., Naskar, S., Barman, K., Das, P.J., Kumar, S. and Rajkhowa, S. 2021. Nonlinear prediction models for estimation of pre-weaning body weight of pigs using morphometric traits.Indian Journal of Animal Research.55(11) 1383-1386.

Chakraborty, S., Kannan K. and Banik, S. 2021.Graph Synthesis for Pig Breed Classification from Muzzle Images. IEEE Access 9: 127240-127258. (DOI: 10.1109/ACCESS.2021.3111957).

Choudhury, M., Barman, K., Banik, S. and Das, P.J. 2021. Effect of dietary inclusion of Muga silkworm pupa meal on the growth performance of Large White Yorkshire grower pigs.International Journal of Creative Research Thoughts. 9 (5): 493-498.

Das, S., Das, P.J., and Handique P.J. 2021. Molecular characterization of porcine group A rotavirus to contain piglet diarrhea for productivity enhancement in North East India. Virus Disease. https://doi.org/10.1007/s13337-021-00659-6.

De, A.K., Sawhney, S., Ponraj, P., Sunder, J., Banik, S. and Bhattacharya, D. 2021. Physiological and immune responses to long road transportation in Andaman local pigs.Tropical Animal Health and Production. 53:247. https://doi.org/10.1007/s11250-021-02692-5.

Devi, S.J. and Singh, K.M., 2021. Counting Pig using Marker-Controlled Watershed Segmentation. Int.J.Curr.Microbiol.App.Sci.10(1):2069-2078.doi:https://doi.org/10.20546/ijcmas.2021.1001.238.

Doreswamy, R., Deb, R., De, S. 2021. Potential use of piggery excreta as a viable source of bioethanol production.Journal of Cleaner Production. doi.org/10.1016/j.jclepro.2021.128246.

Mohan, N. H., Madhavan, M. and Gupta, V.K. 2021. Consequences of AfricanswinefeverinIndia : Beyondeconomic implications. Transboundaryand Emerging Diseases.68, 3009-11.

Thomas, R., Singh, V and V.K. Gupta. 2021. Current status and development prospects of India's pig industry. Indian Journal of Animal Sciences. 91 (4): 255–268.

Thomas, R., M. Saikia, S. Singha, Z. Baruah, R. Kalita, N. Saharia, S. Rajkhowa. 2021. A Method for Authentication of Meat by PCR Amplification of Species-specific Markers of Mitochondrial Origin. Indian Journal of Animal Research, 7: 780-785.

Thomas, R., M. Saikia, S. Singha, Z. Baruah, R. Kalita, N. Saharia, S. Rajkhowa. 2021. A PCR based method for authentication of pork in raw and processed products as well as in binary meat mixtures. Indian Journal of Animal Sciences. 91: 15–19.

Yadav, Sharma, V.P.K., Murty, U.S.N., Mohan, N.H., Thomas,R., Dwivedy, S.K. and Banerjee, S. 2021. 3D printedhollowmicroneedlesarrayusing stereolithographyforefficient transdermaldeliveryofrifampicin.International Journal of Pharmaceutics, 605, 120815: https://doi.org/10.1016/j.ijpharm.2021.120815.

Technical/ popular articles

Das, B.C., Barman, K., Doley, J., Paul, S., Kumar, S., Pegu, S.R., Yadav, A.K., De, K., Islam, R., Das, P.J., Banik, S., Devi, S.J., Kumar, S., Jaya, Attupuram, N.M., Rajkhowa, S., Mohan, N.H. and Gupta, V.K. 2021. Success stories under TSP programme of the Institute. 2021. Newsletter published by ICAR-National Research Centre on Pig, Jan-Jun

Doley, J., Yadav, A.K., Paul, S., Pegu, S.R., P.J. Das, Das, B.C., Rajkhowa, S., Devi, S.J. and Gupta, V.K. 2021. Detection of Porcine Parvovirus (PPV) from Kamrup Assam.Newsletter published by ICAR-National Research Centre on Pig, Jan-Jun

Gadekar, Y. P., A.K. Das, R. Thomas, R. Banerjee et al. 2021. Importance of food safety management in meat value chain. Indian Journal of Animal Health, 60 (2); doi.org/10.36062/ijah.spl.01621

Jaya, Kumar, S. and Das, B.C. 2021. Genome Editing Technologies for Generating Disease Resistant Pigs. Newsletter published by ICAR-National Research Centre on Pig, Jan-Jun, 2021. Pp 7.

Kumar, S. 2021. Improving Pig Reproduction and Making Piggery Profitablein training manual for the training programme conducted under

IDP-NAHEP by C.V.Sc., C.A.U., Aizwal.

Kumar, S., Jaya, Thomas, R. and Gupta, V. K. 2021.शूकरमाँसकेप्रसंस्कृतउत्पाद,Kheti, October 2021 issue, ICAR publications. Pp 17-20.

Milton, A. A.P., Das, S., Ghatak, S., Deori, S., Kadirvel, G., Islam, M., Mukhim, B., Puro, K. Sen, A., Das, M., Marwein, Y., Swer, I., Roy, A., Rajkhowa, S., Kumar, S., Barman, K., Banik, S.andLaha, V. 2021. Success story on Cluster Based Scientific Pig Rearing Model for Tribal Farmers of Meghalaya by Biotica Research Today – An International E-Magazine", 3 (3), 2021 Issue Article: RT506.

Mohan, N.H, Pathak, P. and Madhavan, M.M. 2021. Profitable pig farming through management of heat stress.Indian Farming71(07): 12–15.

Paul, S., De, K., Doley, J., Yadav, A.K, Deb, R., Pegu, S.R., Rajkhowa, S., and Gupta, V.K. 2021. African Swine Fever (ASF) among pigs amid pandemic of covid19 in NER India. NRC P Newsletter Jan-Jun 2021.

Thomas, R., M. Saikia, S. Singha, R. Kalita, Z. Baruah and N. Saharia(2021).Food safety risk communication – Strategies for FBOs. Indian Food Industry Magazine, 3(2): 12-25.

Thomas, R., M. Saikia, S. Singha and R. Kalita. 2021. Food Safety and Food Borne Diseases in India. Agrigate, 3: 59-84.

Thomas, R., M. Saikia, S. Singha and R. Kalita. 2021. National Regulatory Framework for Food Safety. Agrigate, 3: 96-122.

Yadav, A. K., Pegu, S.R., Deb, R., Rajkhowa, S., S. Paul, Doley, J. and Gupta, V.K. 2021.Detection of Porcine Reproductive and Respiratory Virus from Pigs.Newsletter published by ICAR-National Research Centre on Pig, Jan-Jun

Books

Deb, R., Yadav, A. K., Rajkhowa, S., Malik, Y.P.S. (2021) (Eds.) Protocols for the Diagnosis of Pig Viral Diseases.Springer Protocols Handbook Series.Published by Springer Nature.ISBN 978-1-0716-2043-4.

Book Chapter

Ghosh, P., Mustafi, S., Mukherjee, K., Dan, S., Roy, K., Mandal, S.N. and Banik, S. 2021. Image-Based Identification of Animal Breeds Using Deep Learning In:Koubaa, A., Azar, A.T. (eds) Deep Learning for Unmanned Systems. Studies inComputational Intelligence, vol 984.Springer, Cham. https://doi.org/10.1007/978-3-030-77939-9_12 (Print ISBN 978-3-030-77938-2, Online ISBN 978-3-030-77939-9).

Singh, N. J., Banik. S. and Aslam. 2021. Overview of African Swine Fever in India. In: Research Trends in Medical Sciences (Vol-14). SergiyFedorov (eds). AkiNik Publications, New Delhi. (ISBN: 978-93-91538-51-4).

Training Manuals/Technical bulletins/Reports

Banik, S., Mohan, N.H., Kumar S., Das, P.J., Barman, K. and Kumar, S. 2021. Annual Report All India Coordinated Research project and Mega Seed Project on Pig (2020-21), ICAR NRC on Pig, Guwahati (Pages-124).

Leaflets/Brochures

Attupuram, N.M., Pegu, SR., De, K., Rajkhowa, S., Mohan, N.H., Thomas, R., Islam, R., Das, R., Das, B.C., Gupta, V.K. 2021. Biosecurity in scientific pig production. ICAR-NRC on Pig, Rani, Guwahati 781131.

Attupuram, N.M., Pegu, SR., Yadav, A.K., Kumar, S., Jaya, Misha, M.M., Kumar, S., Deb, R., Gupta, V.K. 2021. वैज्ञानिकशुकरउत्पादनमेंजैवसुरक्षा | ICAR-NRC on Pig, Rani, Guwahati 781131.

Attupuram, N.M., Pegu, S.R., Das, P.J., Paul, S., Barman, S. and Banik, S. 2021.Biosecurity in scientific pig production (Assamese).ICAR-NRC on Pig, Rani, Guwahati.

De, K., Attupuram, N.M., Kumar, S., Jaya.,Pegu, S.R., Rajkhowa, Gupta, V.K. 2021. नवजातशूकरोंकीदेखभालएवंप्रबंधन. ICAR-NRC on Pig, Rani, Guwahati 781131.

De, K., Attupuram, N.M., Pegu, S.R., Deb, R., Rajkhowa, S., Islam, R., Das, R.K., Bhuyan, G. And Gupta, V.K. 2021. Care and Management of neonates, ICAR-NRC on Pig, Rani, Guwahati 781131.

Madhavan, M. M., Pegu, S.R., Mohan, N.H., Barman, K., Jaya, Kumar, S., Attupuram, N.M., Devi, S. J. and Gupta, V. K. 2021. Effective waste management options in pig farm. ICAR-NRC on Pig, Guwahati.

Scientific Abstracts

Attupuram, N.M., De, K., Paul, S., Madhavan, M.M., Dev, S.J., Kumar, S., Gupta, V.K. 2021. Optimization of water usage and waste water treatment in piggery to reduce the environmental impact. In: Extended Summaries of International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and RuralBio-Entrepreneurship under Changing Climate Scenario. The NAAS Regional Chapter-Barapani, Meghalaya-793105, India, pp 1-339.

Banik, S., Das, P.J., Kumar, S., Barman, K., Choudhury, H., Brahma, A., Kumar, S., and Gupta, V.K. 2021. Conservation approaches of doom pig: A unique genetic resource of Assam.Extended Summaries: International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario, December 7-9, 2021, India.Pp: 198-199.

Banik, S., Mandal, S.N., Das, P.J., Barman, K., Kumar, S. and Gupta, V.K. 2021. Image-based Identification of Pig Breeds using Convolution Neural Network: An IT-based new Dimension in Breed Recognition" in XVth Annual Convention of ISAGB and a National Conference on "Animal Breeding Strategies in the Era of Genomics and Phenomics" at ICAR-ICAR-NBAGR, Karnal through hybrid mode during 17-18 December, 2021. Pp: 127-128.

Barman, K., Das, P.J., Pegu, S.R., Banik, S., Kumar, S., Jaya, Bhattacharyya, B.K., Debnath, D., Barman, K.C. and Gupta, V.K. 2021.Integrated pig fish farming for self-employment.Extended Summaries: International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario, December 7-9, 2021, India.Pp: 83-84.

Choudhury, M., Barman, K., Pegu, S.R., Banik, S., Das, P.J., 2021. Integrated pig fish farming for self-employment.Extended Summaries: International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario, December 7-9, 2021, India.Pp: 92-94.

Das, B.C., Mohan, N.H., Jaya, Barman, K., Paul, S., De, K. 2021. Porcine adaptive response in summer stress. In: Extended Summaries of International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario. The NAAS Regional Chapter- Barapani, Meghalaya-793105, India, pp 1-339.

Das, G., P. P., Kumar, S., and Islam, R. 2021. Lead paper presentations on Control of ovarian activity in pigs: an overview of practical uses, recent advances and prospects in Compendium of Lead Papers and Abstracts for International Symposium on "Novel Knowledge, Innovative Practices and Research in Theriogenology" organized by C.V.Sc., Mannuthy, KVASU, Kerala from December 27-29, 2021. Pp 63-69.

Das, P.J., Choudhury, M., Kumar, S., Kumar, S., Barman, K., Banik, S. and Gupta, V.K 2021. Diversity and Domestication of Native Pigs of Northeast India.2nd International Agrobiodiversity Congress- Agrobiodiversity for food system transformation virtually held in Rome, Italy Nov. 15-18, 2021.

De, K., Attupuram, N.M., Paul, S., Deb, R., Das, B.C., Gupta, V.K. 2021. Piggery micro environment modification under environmental extremes in North-East India's shifting climatic setting. In: Extended Summaries of International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario. The NAAS Regional Chapter- Barapani, Meghalaya-793105, India, pp 1-339.

De, K., Bhuyan G., Attupuram, N.M., Paul, S., Deb, R., Das, B.C. and Gupta, V.K. 2021.Effect of ambient meteorological factors on the core body temperature of neonatal piglets. 22ND International Society of Biometeorology's Virtual Conference - Connecting Our World - Biometeorology 2021, 21-22 September, 2021.

De, K., Kumawat, P.K, Sharma, S., Mohapatra, A., Kumar, D., Sahoo, A. 2021.Effect of simulated summer on growing Malpura lambs under

hot semi-arid region.Presented at 22nd International Congress of Biometeorology, Connecting Our World: Biometeorology 2021, from 20-22 September 2021.

Deb, R. and De, S. 2021. Development of a nano particle captured amplification free visual assay for detecting Escherichia coli in cow milk. In proceeding of 7th International Conference on Advances in Biochemistry and Molecular Biology (CABMB 2021) December 4-6, 2021 in Sanya, China- Oral Presentation (Virtual mode).

Deb, R. and De, S. 2021. Lateral Flow Immune assay for rapid detection of Staphylococcus Species in cow milk. In proceedings of 4th Asian conference Science, Technology & Medicine, 20-21Nov,2021, Dubai, U.A.E-Oral Presentation (Virtual mode).

Deb, R., Chaudhary, P., De, S. 2021. CRISPR/Cas9 based targeting of extended-spectrum beta-lactamase (ESBL) producing bacteria. In proceeding of the National Conference on CRISPR/Cas: From Biology to Technology, 25-27 November, 2021 organized by Institute of Bioinformatics and Applied Biotechnology, Bengaluru, India-Oral Presentation (Virtual Mode).

Deb, R., Pal, P. and De, S. 2021. Alternative approach to mitigate antimicrobial resistance in food animals. In the proceeding of International conference on Research initiative for agriculture, biotechnology and allied sciences organized by New Age mobilization society, New Delhi 24-25th April, 2021 (Virtual Mode).

Jaya, Kumar, S., Mohan, N.H. and Das, B.C. 2021. The dynamics of immunogenic genes during different physiological stages of development in porcine corpus luteum" in compendium of IIIrd Annual Conference and National Symposium on "Physiological interventions for the augmentation of Sustainable Animal Production" organized by APA at DUVASU, Mathura. Sept. 24th -25th 2021.

Jaya, Kumar, S., Mohan, N.H., Borah, S., Chouhan, V.S. and Sarkar, M. 2021. RNA-Seq based approach for transcriptome analysis during different developmental stages in porcine corpus luteum" in compendium of XXIX Annual conference on "Recent approach to escalate livestock productivity under current socio-economic scenario" organized by SAPI at BASU, Patna. Feb. 25th -26th 2021.

Kumar, S., Islam R., Banik S., Das P.J., Pegu S.R., Barman, K. and Rajkhowa,S. 2021. Biochemical characterization and sexual behavior in response to biostimulatory effects of boar seminal gel and saliva in pigs published in Compendium of Lead Papers and Abstracts for International Symposium on "Novel Knowledge, Innovative Practices and Research in Theriogenology" organized by C.V.Sc., Mannuthy, KVASU, Kerala from December 27-29, 2021. Pp 77.

Kumar, S., Islam, R., Hussain, S.M., Banik, S., Das, P.J., Pegu, S.R., Barman, K. and Rajkhowa, S.2021. Electron microscopy of frozen-thawed boar spermatozoa of indigenous and exotic breeds published in Compendium of Lead Papers and Abstracts for International Symposium on "Novel Knowledge, Innovative Practices and Research in Theriogenology" organized by C.V.Sc., Mannuthy, KVASU, Kerala from December 27-29, 2021. Pp 77.

Madhavan, M. M., Mohan, N. H., Chetri, T. K., Pator, S., Bhattacharjee, M. and Gupta V.K. 2021. Market Led extension for Promoting Piggery in North East India: Challenges and Opportunities. Abstract published in compendium of ISEE National Seminar on "Transforming India Agriculture through Pluralistic & Innovative Extension Approaches for Self-reliant India" on 4-6th October, 2021 organized by Indian Society of Extension Education. Pp.240.

Madhavan, M. M., Mohan, N.H., Barman, K., Pegu, S. R., Pator, S., and Gupta V.K. 2021.The impact of Tribal Sub Plan interventions in improving the livelihood of pig farmers in Assam, India. Abstract published in compendium of 2ndNational Conference 'Transformation of Agricultural Extension- Strategies for Effective Reformation' (TAESERE 2021) during 22nd-23rdDecember, 2021 organized by S.V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University. Pp.158.

Madhavan, M. M., Mohan, N.H., Pator, S., Chetri, T. K. And Gupta, V. K. 2021. Pig farm based

entrepreneurship development of tribal women in Assam, In Extended Summaries of International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario during 7th-9thDecember, 2021 organized by NAAS Regional Chapter for NER, Barapani, Meghalaya, IUOA & CoA, CAU, Kyrdemkulai, Meghalaya. Pp.299-301

Mohan, N.H., Pathak., P. and Gupta, V.K. 2021. Optimizing energy consumption in animal farms in climate change scenario in XV Agricultural Science Congress is being organized by National Academy of Agricultural Sciences at Institute of Agricultural Sciences, Banaras Hindu University Nov 13-16, 2021.

Paul, S., Pegu, S.R., Das, P.J., Banik, S., Kumar, S., De, K., Attuprurum, N.M., Barman, K., Das, B.C. and Rajkhowa, S. 2021. Harnessing natural resilience against African swine fever (ASF) in indigenous pigs for breeding of disease resistant animals.Extended Summaries: International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario, December 7-9, 2021, India.Pp: 55-56.

Paul, S., Pegu, S.R., Rajkhowa, S., Deb, R., De, K. and Gupta, V.K. 2021. Conservation of biodiversity and protection of pygmy hogs and wild boars in North East India under ongoing African swine fever outbreak.In Extended Summaries of InternationalConference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and RuralBio-Entrepreneurship under Changing Climate Scenario. The NAAS Regional Chapter- Barapani, Meghalaya-793105, India, pp 1-339.

Pegu, S.R., Paul, S., Kylla, H., Mylliem, P., Thomas, R., Das, P.J., Deb, R., Yadav, A.K., Sengar, G.S., Doley, J., Barman, K., Rajkhowa, S. and Gupta V.K. 2021. Climate change and surge in Japanese Encephalitis (JE) in the North-East Region of India. Extended Summaries: International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario, December 7-9, 2021, India.Pp: 124-125.

Rajkhowa, S., Pegu, S.R., Paul, S., Deb, R., Sengar, G.S, Doley, J. and Gupta, V.K. 2021. Risk of superbugs and anti-microbial resistance (AMR) in pig-fishintegrated farming systems. In Extended Summaries of International Conference on Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario. The NAAS Regional Chapter- Barapani, Meghalaya-793105, India, pp1-339.

Sequences submitted to NCBI database

Das, P.J., Choudhury, M., Ahmed, S.P., Saikia, T., Kakati, S., Banik, S. and Rajkhowa, S. 2021. Complete mitochondrial genome sequence of Ghungroo(Sus scrofadomesticus) Pig1-Accession No. MT501674.

Das, P.J., Choudhury, M., Banik, S., Choudhury, H., Kumar, S., Kumar, S., Barman, K., Rajkhowa, S. and Gupta, V.K. 2021. Complete mitochondrial genome sequence of Doom (Sus scrofaomesticus) Pig of North East India. Accession No. MZ846190.

Das, P.J., Choudhury, M., Banik, S., Kumar, S., Kumar, S., Pegu, S.R., Rajkhowa, S. and Gupta, V.K. (2022). Complete mitochondrial genome sequence of Mali (Sus scrofadomesticus) Pig-Accession No. OM069301.

Das, P.J., Choudhury, M., Banik, S., Pegu, S., Kumar, S., Kumar, S., Rajknowa, S. and Gupta, V.K. 2021. Complete mitochondrial genome sequence of NiangMegha (Sus scrofadomesticus) Pig of North East India. Accession No. MZ703185.

Das, P.J., Choudhury, M., Banik, S., Pegu, S.R., Kumar, S., Rajkhowa, S. and Gupta, V.K. (2021) Complete mitochondrial genome sequence of Ghungroo(Sus scrofadomesticus) Pig2-Accession No. MZ647672.

Pegu, S.R., Das, P.J., Rajkhowa, S., Yadav, A.K., Choudhury, M., Doley, J., Deka, N.J., Gulati, B.R. and Gupta, V.K. 2021. Complete Genome Sequence of Japanese Encephalitis Virus Genotype III reported from a Pig in North East India. Accession No. MZ702743.

Pegu, S.R., Das, P.J., Yasmin, S., Rajkhowa, S., Begum, S.A., Tamuli, S.M. and Gupta, V.K. 2021. Molecular characterization of Streptococcus parasuis isolated from piglets of Assam. Accession No. OL512947-OL512948.

Audio-visual tools

Attupuram, N.M., Pegu, S.R., De, K., Mohan, N.H., Das, B.C., Rajkhowa, S., Banik, S., Barman, K., Islam, R., Das, P.J., Thomas, R., Doley, J., Paul, S., Deb, R., Kumar, S., Jaya, Kumar, S., Misha, M.M., Devi, S.J., Das, R., Bhuyan, G., Gupta, V.K. 2021. Biosecurity in scientific pig production (Film; DVD in English, Hindi and Assamese), ICAR-National Research Centre on Pig, Rani, Guwahati.

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