

SALIENT RESEARCH ACHIEVEMENTS (2025-26)

- For genetic improvement of rice, a few QTLs associated with drought tolerance, and new crosses attempted to introgress QTLs for both biotic and abiotic stress tolerance and SNP based genotyping and phenotyping of ARAM panel for abiotic and biotic stress tolerance has been initiated
- Identified and functionally characterized acid tolerance genes (Na^+/H^+ antiporter, nahC, cysW, and a hypothetical protein gene) in *Priestiamegaterium* G18 through targeted mutagenesis. The proC gene from *P. megaterium* is being validated for its role in conferring acid tolerance in plants, with CRISPR/Cas-based constructs, successfully transformed into *Agrobacterium*, followed by completed *Agrobacterium*-mediated transformation into *Nicotiana tabacum*.
- Technology on application of instant mixture of 5.0 kg Zinc ha^{-1} ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ 24.0 kg ha^{-1}), 1.5 kg Boron ha^{-1} (Borax 13.0 kg ha^{-1}) and recommended dose of N: P2O5:K2O (20:10:10 kg ha^{-1}) with 1.0 t ha^{-1} of Vermicompost in Scented Rice has been recommended
- Significantly highest filled grains per panicle (240.9 No.) & Seed yield (5017 kg/ha) is recorded in treatment (RDF 75% + Vermicompost@1 t/ha) instant mixture + Panchagavya 3% as Foliar Spray at 30 DAT) in soil after harvest of rice.
- HDPE bags performed better in maintaining lower seed moisture, which is important for maintaining seed quality and viability during storage
- Dry seeding treatment of oat seeds recorded the lowest fodder yield (124.75 g/plant), while seed soaking in water @1: 1.5 @ 20°C overnight improved fodder yield (134.13 g/plant) compared with dry seeding. Moreover, GA_3 @ 200 ppm treatment recorded the highest fodder yield per plant (143.50 g/plant) as Gibberellic acid (GA_3) stimulates cell elongation, faster germination, and enhanced vegetative growth, which results in increased plant height and higher fodder biomass.
- A total of twenty weed species is documented and identified from different parts paddy field of AAU-ICR farm, of which, *Cyperus spp.* is found as dominant and a total of five different species of *Cyperus* is recorded.
- Seed treatment with *T. harzianum* (Th) @ 10g/Kg + Root dip treatment with Th @ 10g/litre + Foliar spray with Th @ 2g/litre at 70 and 80 days after transplanting significantly reduced the sheath rot incidence and severity of rice.
- Spraying of 3% 'Panchagavya' and 10% Vermiwash recorded lowest the dead heart (2.98 %) after first spray at 25 DAT and 2.65% deadheart after 2nd spray against 8.55% and 5.60 % in control respectively.
- Spraying of Pongamia oil @ 3ml/l of water at 20-25 days after transplanting followed by 2-3 sprays at 10 days interval is effective in managing rice stem borer population which resulted in 36.25 % increase of yield (4.52 t/ha) over control (3.32 /ha) with C:B=1:1.78
- Seed Treatment 50ml/kg + Seedling Root dip Treatment with Vermipower@50ml/litre for 30 minutes + foliar spray with Vermipower @50ml/litre at 30 DAT and 60 DAT was found effective in management of sheath blight disease of rice.
- Lowest disease severity of sheath blight of rice (16.46%) with highest yield (4.02 ton/ha) was observed in plant treated with Propiconazole @1% followed by seed

treatment with Beejamrit @ 5% + Foliar spray with Bioveer (Trichoderma based bioformulation) @ 2% with disease severity (23.19%) and yield (3.81 ton/ha).

- Neutral silica @ 3500 ppm recorded germination of 88.67 per cent at 3 months and 87.67 per cent at 6 months, which was higher than untreated seeds of rice (71.67 % at 6 months).
- Broflanilide 300 SC and dinotefuran 20 SG treatments effectively maintained seed viability during storage.
- Application of Zinc @ 2.5 kg ha⁻¹ (Zinc Sulphate Heptahydrate or ZnSO₄.7H₂O @12 kg ha⁻¹) along with the recommended dose of NPK (60:40:40 kg ha⁻¹ and three foliar spray of 0.50 % ZnSO₄.7H₂O (3 kg ZnSO₄.7H₂O in 600 litre water ha⁻¹ per spray) at Knee high, Tasseling and Silking stage has been recommended for Assam.
- For the late kharif season (upto 1st fortnight of October), a black gram variety SBC-50 has been released and recommended
- Significantly highest (33.50 q/ha) Blackgram Equivalent Yield (BEY) of the blackgram-rajmah cropping system & B:C ratio (2.28) is observed in treatment (75% RDN+2 Foliar Spray 0.4% Nano Urea (Pre-flowering & Pod initiation) + 100% RDPK) and lowest is observed in absolute control (20.85 q/ha & 1.51).
- Significantly highest branches per plant (5.0), pods per plant (13.4) and seed yield (15.11 q/ha) rajmah were recorded in 75% RDP + 2 foliar sprays of 0.4% Nano DAP (25-30 & 55-60 DAS) + 100% RDNK of Rajmah and lowest was observed in absolute control.
- NSKE @ 5% followed by and Two sprays of SL-NPV(T5) were the most effective insecticides for managing *S. litura* in urdbean.
- Post-emergence application of propaquizafop 2.5% + imazethapyr 3.75% w/w ME @ 125 g a.i./ha at 15-20 days after sowing (DAS) controlled the weeds effectively (73.4 % and 68.8 % WCE at 25 and 45 DAS, respectively) in mungbean and thus, led to realize 75.1 % yield increase over weedy check.
- 75% NPKZn + soil application of NPKZn microbial consortia (2 kg/ha) fortified FYM @100 kg/ha resulted in the highest yield (993.71 kg/ha) with B:C ratio of 2.45.
- 75% RD of NPKZn + seed inoculation with NPKZn microbial consortia @ 50g per kg + NPK (19:19:19) @ 2% at pre-flowering and pod initiation stages resulted in the highest yield (1116.02 kg/ha) with B:C ratio of 2.52 in greengram and in blackgram 1245.84 kg/ha and B:C ratio of 3.06
- All the weather parameters except BSSH were negatively correlated with the web blight disease incidence in both mungbean and urdbean. However, only minimum temperature, morning RH, evening RH and rainfall were found highly significantly negatively correlated with the disease incidence except rainy days in case of mungbean.
- Growing two (2) rows of sesame as barrier crop and timely weeding along with installation of yellow sticky trap (30cm x 20cm) @ 30 nos./ha at 30 days after sowing followed by spraying with neem formulation (Azadirachtin 300 ppm) @ 5ml/l of water at vegetative stage against major insect pests of mungbean.
- Altogether nine novel insecticides were evaluated against flower thrips and whitefly in summer mungbean (var. SGC-20). All the tested insecticides significantly reduced

insect pest population and however, highest ICBR ratio of 13.08 was observed in Pyriproxyfen 10 EC and 14.62 (Pymetrozine 50 WG) in contrast to (Cyantraniliprole 10.26 OD) of 2.89.

- Chlorantraniliprole 18.5 SC (40 ml/acre) and thiodicarb 75 WP (250 g/acre) were the most effective insecticides for managing pod borer in mungbean
- Neem oil @20 ml/kg seed was found to be the most effective with 19.96 % damage of pulse beetle under storage.
- 2-3 sprays of Pongamia Oil (3 ml/lit) is effective in managing aphid population (64.93%) in rajmah which resulted in 12.56% increase of yield (1721 kg/ha) over control (1529 kg/ha) with C:B=1:2.75
- Seed Treatment (ST) and Soil Drenching (SD) with Tebuconazole 50%+Trifloxystrobin 25% WG at 30 DAS @ 1gm/ litre water can reduce the collar rot incidence (17.24%) and yield (16.22 q/ha) with B:C=2.04 in Rajmah.
- The lowest disease incidence and highest yield were recorded in chemical treatment (Vita-vax powder @ 0.2%) followed by treatment with biopesticide, AAU-Bioveer and Trichoderma (GBPUAT, Pantnagar).
- Seed dressing of lentil seed with Tebuconazole showed the highest mycelial inhibition over control (86.29%) followed by Pyraclostrobin + Metiram with 85.92% mycelial inhibition in single dose.
- Research on genetic improvement of grain legumes using gene technology to protect against insect pests led to field trials of 6 events of Bt chickpea expressing lines either Cry1Ac or Cry2Aa after receiving permission from RCGM to conduct event selection trials. Information on flanking sequences of Cry1Ac is made available for Event ID using whole genome sequencing by Nanopore and developed a new binary vector for expression of *Vip3Aa* gene in chickpea.
- The paired row planting recorded higher seed yield of chickpea as compared to normal row planting.
- The integration of band placement of 50% RDF along with bio-fertilizers seed treatment and foliar 'P' boosting @ 2% DAP at flowering and pod filling stages resulted in highest seed yield of chickpea which was closely followed by band placement of 50% RDF with bio-fertilizers seed treatment and band placement of 60% RDF.
- A study on transcriptional reprogramming in plastids of pigeon pea induced due to simulated herbivory and after 12 hours of simulated herbivory, ICPL-332 showed 1,628 upregulated and 2,121 downregulated genes, while ICPL-87 had 562 upregulated and 834 downregulated genes. A total of 2,309 genes were commonly expressed in both, with 76 exclusives to ICPL-332 and 88 to ICPL-87.
- Seed treatment of Rhizobium-PSB consortia@ 50 g/kg seed, FYM @ 2t/h and foliar spray with 0.5 % 19:19:19 graded NPK at pre-flowering stage and pod initiation stage of Horse gram. This technology is in pipe line for technology recommendation.
- *Trichoderma asperellum* ST was found most effective in field emergence of 84.33% followed by Herbal Kunapjal ST (83.67).
- Application of Salicylic acid @ 200 ppm during 50% flowering and silique formation stage mitigate the soil moisture stress and yield advantage 15-27 %.

- Irrigation water management in late sown Toria with micro-sprinkler irrigation system has been recommended
- Grow coriander as companion crop with rapeseed-mustard in a 1:4 ratio can serve as an eco-friendly strategy to suppress mustard aphid infestation in endemic areas.
- Seed treatment with *T. harzianum* based bioformulation (AAU product – Biozium) @ 10 g / kg + foliar spray with Biozium @ 6 g/l at 60 and 75 DAS reduced the *Alternaria* blight severity by 36.8 % on leaves and 33.2 % on pods and thus, led to realize 47.0 % yield increase over control.
- Spraying of *Lecanicillium lecanii* (AAU-J culture) (10⁷spore/g) @ 5ml/L or *Beauveria bassiana* (AAU-J culture) (10⁸spore/g) @ 5g/L at the time of first occurrence of the pest followed by second spraying at 15-20 days after first spray is effective for managing mustard aphid in toria has been recommended
- Apply N @ 30Kg/Ha, P@ 20Kg/ha,K@20kg/ha,B @1.5Kg/ha,Zn @10.5 Kg/ha as basal along with FYM @3t/ha and biofertilizer @ 50gm /kg seed as seed treatment (Azospirillum, PSB and KSB each) in Sesame
- Lathyrus varieties viz. JCL-21-1 (AAU Lathyrus-1), JCL-21-3 (AAU Lathyrus-2) and JCL-22-1 (AAU Lathyrus-3) and Rice bean varieties viz., JOR-21-1 and JOR-20-1(Muhita) has been approved recommended for the state of Assam
- Jute (L) + green gram (L) (1green gram row between 2 jute rows) intercropping resulted highest jute fibre equivalent yield of 39.57 q/ha i.e. 30.85 % more than sole jute crop yield of 30.24 q/ha
- Highest fresh weight and flax seed yield were obtained in T₇: Flax + Onion seed type (2:1)
- Among the treatment of nutrient management in Utera linseed cultivation revealed that the treatment with 25% of 40:20:10: NPK kg/ha recorded significantly higher plant population/ha, no. of capsule/plant, which was at par with N₄ treatment (100% RDF + 2% urea & KNO₃ spray at FI & CD stage).
- Among the treatment of weed management, the treatment with Clodinafop 15 % + metsulfuron methyl 1% @4 g ai/ha) as post emergence spray at 25-30 days after sowing, recorded significantly higher seed yield (557 kg/ha) and B:C of 2.0 statistically at par with Clodinafop @60g ai/ha + Metribuzin @150 g ai/ha with seed yield (536 kg/ha) and B:C 1.9.
- Study on Nitrogen Management in Linseed through Nano Urea supplementation revealed that 100 % N (Two Splits - 50% N as basal + 50% N as top dressing) along with two sprays of Nano-urea @ 3ml /liter each at flower initiation stage and capsule development stage showed 3.02 % increase in yield of linseed.
- Seed treatment with Azoxystrobin 25% SC and soil application of Azoxystrobin 25% SC @ 1ml/lit. of water at 30DAS was recorded lowest disease incidence for fusarium wilt and highest seed yield (Station trial).
- Under natural farming, autumn sugarcane intercropped with potato-cowpea sequence was found suitable giving highest cane equivalent yield (68.0 t/ha). Double row planting of sugarcane at a spacing of 60-120-60 cm was found suitable for growing intercrops.

- Application of Ghanajeevamrit @600 kg/ha 4 or 5 times at 40 days interval produced the highest cane yield (56 t/ha) and also improved sucrose content of cane juice under natural farming condition
- Spraying of chlorantraniliprole 18.5 SC @ 75g a.i./ha (8ml/10L of water) at 45 days after germination or initiation of symptoms of dead heart followed by 2nd spraying after 30-45 days is effective against the borer pests of sugarcane with 70.70% reduction of borer infestation.
- The Rose ringed parakeet, *Psittacula krameria* attacks sugarcane crop from the month of October and damage continues till cane maturity and harvest with 16.26 per cent cane damage. The damage was observed only in the periphery of the field in the first three - four rows.
- Varietal recommendation of Potato for Assam includes Kufri Lalit, Kufri Jamunia and Kufri Sukhyati
- Soil drenching with fipronil 40% + imidacloprid 40% WG @ 375 g/ha (300 g a.i./ha or 0.75 g/L of water) at 20-25 days (1st earthing up) and 55-60 days (2nd earthing up) after planting is effective for managing oriental army ants in potato with 82.34% reduction of tuber damage over control.
- A weather based predictive model for the population buildup of scarab beetles in Assam depicts positive influence of mean maximum temperature, total rainfall and rainy days in population buildup of scarabaeid beetles.
- BIPM consisting with racking and weeding, installation of cuelure @ 15 Nos. /ha (at 25 DAS), destruction of damaged fruits, spraying of NSKE @ 5 ml/L (at 20 DAS) and spraying of spinosad 45 SC @ 0.5 ml/L (at 30DAS) has been recommended
- In a drip irrigation system, it is recommended to use venturi manifold device as the fertilizer injector with pressure compensating emitter (discharge rate at 2 lph) in sandy loam soil for higher fertigation uniformity and higher crop yield in garlic
- Application of 50% recommended dose of NPK + Vermicompost @ 1 t/ ha followed by foliar spray with 2% 'Panchagavya' recorded the highest yield of French bean with B: C ratio 2.45.
- Application of Boron @ 2.0 kg ha⁻¹ (Borax Decahydrate, Na₂B₄O₇.10H₂O @18 kg ha⁻¹) along with the NPK dose of 80:60:60 kg ha⁻¹ and three foliar spray of 0.50 % ZnSO₄.7H₂O (3 kg ZnSO₄.7H₂O in 600 litre water ha⁻¹ per spray) at 30, 45 & 60 days after planting.
- Application of Zn @ 2.5 kg ha⁻¹ as basal (Zinc Sulphate Heptahydrate or ZnSO₄.7H₂O @ 12 kg ha⁻¹) and three foliar spray of 0.50 % Zinc Sulphate Heptahydrate (ZnSO₄.7H₂O 3 kg in 600 liter (per spray) ha⁻¹ at 30 and 45 and 60 days along with the recommended dose of N:P₂O₅:K₂O (50:50:50 kg ha⁻¹) in Okra and only recommended dose of N:P₂O₅:K₂O (120:100:100 kg ha⁻¹) in Potato of okra potato cropping sequence.
- An efficient and reproducible *Agrobacterium* mediated genetic transformation protocol established in Bhimkol (*Musa balbisiana*, BB genome, a seeded banana) using ECS as explants for genome editing of Bhimkol for seedless fruits. A total of 17 CRISPR edited Bhimkol plantlets regenerated and out of 17 plantlets, 4 plantlets showed varied level of mutation particularly deletion.

- Organic acid composition of 38 citrus germplasm from NE India showed that the juice is rich in citric acid (6394.89-351.47 mg/100ml); followed by succinic acid (2672.73-57.90 mg/100ml), malic acid (1181.20-5.08 mg/100ml), ascorbic acid (686.13-29.33 mg/100ml), tartaric acid (172.49-8.32 mg/100ml), oxalic acid (96.96-6.70 mg/100ml), fumaric acid (3.02.49-1.55 mg/100ml).
- Citrus leaf miner infestation in citrus was significantly reduced in *Isaria javanica* (Isa java 1x 10⁸ cfu/ml) @5 ml/L with 72.13% live mines reduction.
- New tuberose variety KHK TR-1, developed at AAU-HRS, Kahikuchi has been recommended for cultivation in the farmers' fields.
- Terrestrial Orchids recommended were *Spathoglottis plicata*, *Cymbidium aloifolium*, *Phaiustanker villeae*, and *Arundinagra minifolia* are recommended for pot culture based on inflorescence and flowering traits, with *Spathoglottis* noted for year-round flowering with intense purple color.
- Epiphytic Orchids recommended were *Aerides odoratum*, *Rhynchostylis retusa*, *Dendrobium aphyllum*, and *Dendrobium moschatum* are recommended for hanging baskets based on their inflorescence traits.
- Treat the soil with Fluensulfone 2% GR @ 3.3 kg a.i./ha at planting (165 kg formulation/ha) for management of root knot nematode in tuberose.
- Spray azoxystrobin 18.2% SC + difenoconazole 11.4% w/w SC @ 1.0 ml/l two times at 10 days interval starting from appearance of the disease to control *Alternaria* leaf blight/leaf spot of chrysanthemum.
- A carbon negative Integrated Farming System (IFS) model for 1.0 ha area under rainfed condition with crop (Field + Hort.) + Cattle+ Fishery + Duckery+ goaterly + Apiary along with supplementary components (Liquid manure and Vermi-composting unit) is designed, tested and validated with a higher total net income (25.56%) from the crop component followed by the fishery component (15.35%). The IFS model generated a B:C ratio 2.24 with the employment opportunities of 338 man days/ year under rainfed situation of Assam along with 46.7% increase in OC in soil over initial, and the IFS model was found to be during 2024-25 (-286.2 kg CO₂ equivalent).
- The brinaj variety, Pusa Purple Cluster was found moderately resistant to spider mite and 3 local cultivars viz. Short Pink, Kharua Round, Kharua elongated were found to be moderately resistant to spider mite as well as brinjal shoot and fruit borer.
- Amongst the natural farming crop protection bioinputs, *Dasparniastra* was highly effective against mite pests reducing 88.75 per cent population after 7 days of application, which was *on par* with the Neemazol 10,000 ppm @ 3 ml/L resulting 84.55% population reduction after 7 days of application.
- Biological control of *Tetranychus urticae* mite on cucumber by the predatory mite *Neoseiulus longispinosus* resulted 92.45% mite pest was controlled after 14 days of releasing predators when released @ 1:50 predator prey ratio.
- During 2025 a new mite pest of Arecanut was noticed and identified as *Raoiella indica* (Tenuipalpidae)
- Few bacterial isolates from the gut of Greater Wax Moth (*Galleria mellonella*) were identified as potentially involved in degradation of plastic and similar biopolymers. Most of them are from the genus *Bacillus*. Assays confirmed presence of certain enzymes, such

as esterase, to be present in some of those bacterial isolates. After 30-60 days of incubation on plastic media, some of those bacterial isolates could degrade plastic polymers by 1-3% by weight.

- Jaggery (50g) and the fermented honey + fermented brown sugar (1:1) mixture (40 ml) was found to be the most effective baits, particularly against *Vespa cincta*
- *Rattus rattus* was the predominant species in household and rural stores of Nagaon district under Central Brahmaputra Valley Zone of Assam; *Bandicota bengalensis* in urban godowns, kitchen garden, paddy fields and crop fields. *Dremomys lokriah* was the predominant rodent species in homestead gardens and orchards. *Bandicota indica* have been recorded from orchards and crop fields' near to human habitats
- In house and rural store, *Mus musculus* was recorded predominately with a species composition of 28.41% and 30.46 % and 24.67% in houses, rural store and urban godown, respectively.
- Rhesus monkey individuals ranged from 30 to 1000 in 1-2 numbers of troops. Based on questionnaire survey, damage percentage varied from 50 to 90%. In Lakhimpur district highest average individuals of 424 and damage percentage of 76% is recorded in Ghilamara block, while the number of troops is highest in Narayanpur block averaged to 2.9.
- Crops grown inside the solar fencing (AGRI- SOLAR); a potential method to reduce the problem of intrusion by higher vertebrates (Monkey) into the agricultural landscape gave significantly higher yield. The Agri Solar Energizer uses 12 V input solar energy, generate electrical shock to the higher vertebrates.
- HDPE net of 5 cm mesh and 1.5 mm thickness using bamboo poles of 6 feet in height were found to protect Rabi and Kharif vegetables and effective in preventing monkey's entry into the crop fields to the extent of 80-100 per cent and also a cost effective one.
- New bird species recorded in agro-ecosystem viz. 'Indian Peafowl', Swamp Francolin, in Narayanguri in Baksa (near Manas National Park), Biswanath, Golaghat district and Bengal Florican & Blue-breasted Quail were recorded in Baksa.
- Use of 3 rows of sugarcane crop as bio fencing was not found to be effective as the parakeet damage continued. Damage per cent in the periphery of the crop on the basis of numbers of damage cane was recorded to be 74% per cent. In case of use of Bioacoustics' device to used deter parakeets damage per cent in the periphery of the crop on the basis of numbers of damage cane was recorded to be 36% per cent.
- One potential new stain of *Trichoderma asperellum* isolate BC3 (Accession No.- PZ006141.1) was identified.
- Developed three solid and three liquid Biopesticide products under AICRP on Biological Control, AAU, Jorhat with the strains *Isaria javanica* (Accession No.- PP980524.1), *Beauveria bassiana* (Accession No. PX169377), and *Trichoderma turialbense* (Accession No. PX226020.1).
- Coconut-based agroforestry systems showed high profitability, with Coconut + Turmeric recording the highest B:C ratio (3.61).
- *Acacia mangium* supported higher soil microbial load, while *Artocarpus heterophyllus* and *Tectona grandis* showed notable seasonal variation in soil microbes.

- Decaffeinated tea waste was evaluated as a biosorbent for removing chromium and iron from aqueous solutions using batch adsorption experiments. Adsorption efficiency increased with higher adsorbent dosage and longer contact time, while it decreased with increasing pH, indicating that acidic conditions favored the adsorption process.
- Developed a Home Scale millet dehulling machine, a modified dehulling 6N40 rice mill with dehulling efficiency up to 91.6 % for Marua Dhan (finger millet) using 0.75 mm screen at 24 m/s blower air velocity and 73.5% Gossaigaon Crown (foxtail millet) using 0.65 mm screen at 12 m/s blower air velocity.
- Developed technology for the production of rice flakes from brown rice.
- Developed rice-based Ready-to-Eat Food for the Elderly by using linear programming.
- Design and Development of Remote-Controlled mini transplanter for small land holding:
- Development of Tractor-operated Hydro-mechanically controlled orchard weeder (MPKV)
- Development of Riding type paddy weeder: