



SUMMARY REPORT

Brainstorming Session and Subject Matter Expert Round Table

on

“Agriculture & Livestock Innovations for India: Identifying Challenges & Opportunities for Impact”

Date, Time and Venue:

Friday | 31 July 2026 | 3:00 to 5.00 PM IST | Online via Zoom



Ms Pradnya Aradhye



pradnya@venturecenter.co.in



+91-88050 09010

20+ subject matter experts joined the kick-off session to validate the landscape across four themes, identify gaps, and begin building a community of experts, a wishlist, and a mailing list for ongoing collaboration. Please find names in Appendix 1

Following is the summary of the full discussion, categorized under the four thematic areas covered in the session (Seed & Crop Improvement, Agriculture for Health & Nutrition, Animal Health & Productivity, and Data/AI/Prediction Systems):

1. Seed & Crop Improvement

- Gene-edited, climate-resilient hybrid seeds (drought, heat, pest tolerance); crop diversification away from rice-wheat monocultures toward millets, pulses and oilseeds; genome editing/clone development in tea; mechanization of tea harvesting
- Access to quality seed in dryland ecosystems remains a core gap; forage/fodder seed supply chains are weak with low institutional integration; trait-specific breeding needed for drought, heat and salinity tolerance; millet productivity and palatability both need improvement
- Genotyping and phenotyping of germplasm accessions; AI-guided multi-parent breeding and predictive breeding; nutrient-use efficiency; mainstreaming minor legumes with reduced anti-nutrients; exploring seaweed/algae as a novel crop resource
- Small landholding size limits mechanized harvesting; cash crop dependency (India imports ~80% of its cotton need); genome editing traits still lack the specific traits needed to move the needle; spurious/illegal seed cultivation (e.g. unauthorized herbicide-tolerant cotton) needs addressing
- Need for breeding resilience to both biotic and abiotic stress; mainstreaming millets; biofungicides/biopesticides; post-harvest losses and crop toxin (aflatoxin/mycotoxin) contamination require fast field-level detection
- Emphasis needed on orphan crops, high-nutritive storage crops, precision agriculture/IoT, biomanufacturing, genome editing (SDN1/SDN2) and speed breeding for value-added, endemic and medicinal crops
- Understanding plant specialized metabolism and defense mechanisms; engineering synthesis of plant-derived molecules in bacteria/yeast systems; crop protection against fungicides and pathogens needs more research focus
- Region-specific, climate-resilient breeding using AI/digital twins for genomics; biofertilizer development; water resource management for farmers; extension of new technology and good agricultural practices to farmers is currently missing
- Regulatory challenges are a direct bottleneck to farmer adoption of new agri-technology
- Precision farming, gene editing/molecular breeding for drought-tolerant varieties; horticulture as a rising export opportunity; residue-free/organic food production; biofertilizers
- Low productivity of small millets requires hybridization to raise yields; dryland areas in particular lack organized seed systems, limiting the mainstreaming of best hybrids and varieties to farmers
- Sorghum and other millets show potential as alternatives to corn in poultry feed formulations
- Conservation of cultivars, land races and fodder trees — including genetic resources from pastoralist populations — offers further breeding potential for climate-resilient fodder varieties

2. Agriculture for Health & Nutrition

- Post-harvest crop losses and toxin contamination (aflatoxin, mycotoxin) pose direct health risks — including impacts on child and maternal health — and require better on-farm detection/biosensor technology
- Crop diversification toward nutrient-dense millets, pulses and oilseeds; organic and residue-free food production; mega food clusters with cold-storage and quality-testing infrastructure needed to meet export and domestic quality standards
- Mainstreaming millets and minor legumes as nutrition sources, while reducing anti-nutrient content to improve absorption
- Malnutrition and rehabilitation programs need stronger links to agriculture — e.g. high-quality sorghum currently diverted almost entirely to ethanol production rather than food/nutrition use; millets need to be made more palatable to drive real consumption
- Contaminated meat and food safety are recurring national concerns; quality of protein-rich diets needs direct attention
- Farmer awareness and clean food/meal production practices need reinforcement at the last mile
- Additional technological needs flagged: storage-stable fortification and premix technology, climate-resilient nutrient-dense crops, dynamic formulations tailored to local conditions, and better cold-chain storage for nutrient preservation
- Last-mile needs include strengthening farmer-to-consumer linkages and improving food product R&D

3. Animal Health & Productivity

- Most livestock/poultry research remains lab-bound with limited commercialization; a dedicated precision-livestock consortium is needed; AI can support flock health and growth monitoring; alternatives to antibiotic growth promoters are a major opportunity area
- Strong livestock-environment interdependence: 85% of India's animals are held by small farmers with meagre resources, making new technology hard to adopt without integrated tech + policy + training support; unsustainable grazing is degrading land
- AI adoption in rural livestock settings needs field-adapted sensors/biomarkers; traditional disease-control programs need retention alongside new tools; feed consumption prediction and reducing anti-nutrient/blocking factors in feed; fodder access remains a core constraint for small poultry farms
- Fodder crop intensification and breeding are underinvested; conservation of genetic pool from climate-resilient hotspot areas; genetic resources for livestock resilience need active development
- Fodder needs a closed-loop value chain the way milk already has one; dry fodder mandis, silage and TMR adoption need strengthening; demonstrated success cases exist in Wardha, Nagpur and Kolhapur
- Multi-trait, multi-breed genomic selection is needed at national scale; affordable parentage-testing tools; precision nutrition; affordable pen-side diagnostic kits for AMR/mastitis detection are a clear market gap
- AMR and lack of alternatives to antibiotic growth promoters is a critical gap; emerging zoonotic diseases and vaccine-failure risk require next-generation, scalable, thermostable vaccine technology; microbiome-based tools (pro/pre/para/postbiotics) can reduce antibiotic reliance and methane emissions; mycotoxin transmission from livestock affects rural child health
- Genomic and phenotypic data exist but aren't pooled into a larger reference program; need markers/chips for parentage and indigenous-breed identification, plus a statistical model to estimate breeding value; early detection of viral and protozoal disease is a priority; AI can improve phenotype data capture accuracy
- Lack of awareness/database on feedstock diversity and nutrient quality; feed-quality regulation is weak, driving microtoxicity issues; disease solutions for Mycoplasma and Coccidiosis are inadequate; calf nutrition is neglected despite its productivity impact; mastitis still has no foolproof solution; dairy fertility remains a persistent issue
- Farmers lack access to technology and a knowledge-sharing bridge to experts; traditional farming knowledge isn't transferring to the next generation; rising chicken prices point to an opportunity for a low-cost, high-protein indigenous poultry breed
- Fresh forage digestibility and animal nutrition security through enriched, more bioavailable forage crops; understanding the molecular biology behind Brown Rib Pearl Millet's superior digestibility, with a view to extending that trait to other forage crops; developing high-quality, silage-able forage varieties to secure forage supply under climate change; and engineering feed formulations to reduce methane emissions from livestock
- Fodder-related unawareness among farmers is a barrier; pest-resistance sustainability of fodder needs attention
- Fodder quality and crop adaptability need improvement; farmers need stronger motivation/incentive to accept quality fodder over traditional residue-based feeding
- India's livestock population totals roughly 55 crore animals, including about 30 crore buffaloes and cows, with highly variable per-animal resources and geological conditions across regions
- Cross-breeding technology initially faced resistance due to its impact on traditional farming practices, requiring gradual intensification rather than abrupt technology shifts
- A larger program integrating livestock with environmental conditions is needed; India faces criticism in Western literature for environmental deterioration linked to large livestock populations and methane emissions
- Success stories from Wardha, Nagpur and Kolhapur districts — including intercropping fodder with sugarcane, dedicated acreage, staggered cultivation, mechanization and regenerative practices — demonstrate how smallholder farmers can break the low-resource, low-fodder-yield cycle
- Microbiome metabolites show potential as both nutritional supplements and therapeutic agents, alongside precision probiotics and oral vaccine delivery systems

3. Animal Health & Productivity (continued...)

- Feed quality regulation gaps extend to DDGS (Distillers Dried Grains with Solubles), where weak regulation can raise microbial load and mycotoxin risk; a nationwide database on agro-residue nutritional quality is needed
- Genomic selection needs a larger reference population, SNP-based breed composition data, and standardized statistical models for national use, alongside AI-driven phenotype capture and better detection of FMD, LSD and protozoal diseases

4. Data, AI & Prediction Systems

- New crop breeding lines increasingly use AI, including digital-twin approaches for genomics
- AI-guided multi-parent breeding and AI-assisted phenotype analysis are needed to enable predictive breeding at scale
- AI adoption in rural settings needs sensors and biomarkers specifically adapted to Indian field conditions, not imported models
- Systematic genomic selection and phenomics are needed for multi-trait, multi-breed livestock improvement
- Phenotype and genotype data already exist but sit unpooled; consolidating them into a shared reference dataset, alongside a standard statistical model for breeding-value estimation, is a clear near-term opportunity; AI can improve phenotype capture accuracy
- A central knowledge/technology access point (cloud or hub-based) connecting farmers directly with experts would address the current information gap
- Precision agriculture and IoT, alongside digital and technology-based agriculture more broadly, were flagged as priority growth dimensions
- Real-time, actionable advisory tailored to local conditions is needed, along with a livestock-side data foundation comparable to AgStack for crops
- Reaching farmers who currently access no advisory sources, and delivering advisory in vernacular formats, remain key last-mile gaps
- Feedback loops connecting prediction/advisory output to actual farmer action are still missing
- AI integration is needed for accurate phenotype data capture and improved disease detection (FMD, LSD, protozoal diseases)

Cross-Cutting Themes

- Last-mile delivery and farmer adoption were the most frequently repeated bottleneck across all four domains — technology often exists but doesn't reach India's small and marginal farmer base (85%+ of livestock holders).
- Policy and regulation were raised as direct blockers to adoption, not just technology gaps.
- Fodder — quality, seasonal availability, and closed-loop supply chains — emerged as a recurring cross-domain priority spanning crop, nutrition and livestock discussions.
- Multiple experts called for consolidating existing but fragmented data (genomic, phenotypic, feed, market) into shared reference systems rather than generating more raw data.

APPENDIX 1

Attendees (in ascending order of first names)		
Name	Affiliation	Profile link
Dr Anjan Banerji	IISER Pune	https://www.iiserpune.ac.in/research/department/biology/people/f
Dr Asha Kembhavi	Jinsei Bioscience	https://www.linkedin.com/in/asha-kembhavi-8b33aa1a/
Dr Ashok Giri	NCL	http://academic.ncl.res.in/ap.giri/profile
Dr Ashwin Kashikar	Ankur Seeds	https://www.linkedin.com/in/ashwin-kashikar-a431699/
Dr Avishek Dey	KRYSP-R / GENE2GO	https://www.linkedin.com/in/dr-avishek-dey/
Dr B R Mangurkar	Ex-BAIF	https://www.researchgate.net/profile/Br-Mangurkar
Dr BK Sarmah	Assam Agricultural University	https://www.aau.ac.in/faculty/profile/Dr-Bidyut-Kumar-Sarmah/12
Dr Chandrasekar	Kemin Animal Nutrition & Health (South Asia).	https://www.linkedin.com/in/drchandrasedkars/
Dr Debashish Chattopadhyay	BRIC-National Institute of Plant Genome Research	https://nipgr.ac.in/nipgrv4/dr_dchattopadhyay/
Dr D P Tiwari	Retd GBPUAT	https://www.gbpuat.ac.in/colleges/COV/D1/dp_tiwari_profile.html
Dr Girish Sohani	Ex-BAIF	https://www.linkedin.com/in/girish-sohani-6093454/
Dr Marimuthu Swaminathan	International Livestock Consultant	https://www.linkedin.com/in/marimuthu-swaminathan-4910a632/
Dr Narendra Kadoo	NCL	http://academic.ncl.res.in/profile/ny.kadoo
Dr Nidhi Jain	Gates Foundation	https://www.linkedin.com/in/nidhi-jain-2506/
Dr Pandurang Patil	Advanta Seeds	https://www.zoominfo.com/p/Pandurang-Patil/5313397378
Dr Prashant Pyati	Ajeet Seeds	https://www.linkedin.com/in/prashantpyati/

APPENDIX 1 (continued...)

Attendees (in ascending order of first names)		
Name	Affiliation	Profile link
Mr Pramod Takawale	BAIF	https://baif.org.in/cop16/mr-pramodkumar-takawale/
Dr Ravi Gandham	NIAB	https://www.niab.res.in/peoplervigandham/
Dr Seetharam Annadana	Nuziveedu Seeds	https://www.linkedin.com/in/seetharamannadana/
Dr Sambuddha Ghosh	Abel Biosolutions	https://www.linkedin.com/in/sambuddha-ghosh-b768b522/
Mr Santosh Jadhav	BAIF	https://www.linkedin.com/in/santosh-kumar-jadhav-43234843/
Dr Sachin Joshi	BAIF	https://baif.org.in/dr-sachin-joshi/
Dr Santosh Vyas	Kemin Animal Nutrition & Health (South Asia).	https://www.linkedin.com/in/dr-santosh-vyas-a1748621/
Dr Tarjan Kaliaperumal	Kemin Animal Nutrition & Health (South Asia).	https://www.linkedin.com/in/tarjan-kaliaperumal-61362a30/
Dr Vidya Gupta	Ex-NCL	https://www.linkedin.com/in/vidya-gupta-0977399/
Dr Vilas Tonapi	ADVANTA SEEDS	https://www.linkedin.com/in/vilas-tonapi-59363470/