The status of Animal Gene Editing Policy Considerations in Bangladesh

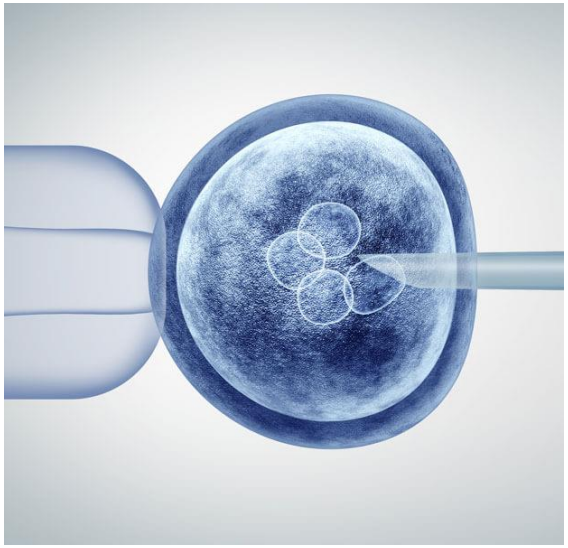
Professor Dr. Md. Munir Hossain
Department of Animal Breeding & Genetics
Bangladesh Agricultural University
Email: **mmhossain@bau.edu.bd**

Introduction

- Livestock contributes 1.6% to the national GDP, which shares 14.31% of the agricultural GDP (FY 2016-17).
- About 20% of employment is directly associated with livestock and partly employment is about 50%
- 23.93 million Cattle, 25.93 million goat, 1.48 million buffalo, 3.40 million sheep, 275.2 million chicken and 54.01 million duck (DLS, 2017).
- Potential for significant impact with gene editing.
- Animal gene editing to enhance productivity, animal health, and scientific research.
- According to the 2012 Action Plan of the National Biotechnology Policy, the GOB expressed interest in supporting GE animal

Status of animal gene editing in Bangladesh

- **Crop sector:** Institutes under the National Agricultural Research System (NARS), National Institute of Biotechnology (NIB), Bangladesh Agricultural University, and research laboratories in Bangladesh have initiated efforts to apply genome editing for improvement of crop plants



- **Current Landscape:** Limited application and research on gene editing in animals.
- **Research Initiatives:** Few ongoing projects in academic institutions (only in Dept. of Animal Breeding and Genetics, Bangladesh Agricultural University). Cloning, IVM, IVF, IVC, SCNT, ICSI, Microinjection (In vitro culture and genome editing lab of BAU)
- **Regulatory Framework:** No specific regulations; general biotech policies in place.
- **Technology Adoption:** Initial explorations mainly in academic settings.

Relevant Regulatory framework

- **Standard Operating Procedures for Research and Release of Genome Edited Plants of Categories SDN-1 and SDN-2 in Bangladesh, 2023”Revised Biosafety Guidelines of Bangladesh, 2018**
- **National Technical Regulatory committee (NTRC) (MoFL)**
- **National Technical Committee on Fisheries and Livestock Biotechnology (NTCFLB) (functionally inactive)**
- **National Guidelines for Fish and Animal Biotechnology, 2006**
- **Mostly non functional due to limited application in livestock and veterinary fields.**
- **Few research projects in gene editing, primarily at academic institutions (BAU).**
- **Regulatory Framework: No specific national regulations for gene editing; general biotech policies in livestock.**

Country Needs

- Enhance Livestock Productivity: Improve breed traits for better output and efficiency.
- Disease Management: Develop disease-resistant breeds to combat prevalent diseases.
- Food Security: Ensure a stable and high-quality supply of animal products.
- Economic Growth: Strengthen the biotech sector and create new job opportunities.
- Economic Development: Stimulate growth in the biotech sector and related industries.
- Research Capacity: Build local expertise and infrastructure to support advanced research.

Gaps

- Regulatory Framework: Lack of comprehensive and clear regulations for gene editing technologies.

- Technical Expertise: Limited skilled professionals and research facilities in gene editing.
- Public Awareness: Insufficient public understanding and awareness on gene editing technologies.
- Infrastructure: Inadequate infrastructure for conducting and monitoring gene editing research.

Opportunities

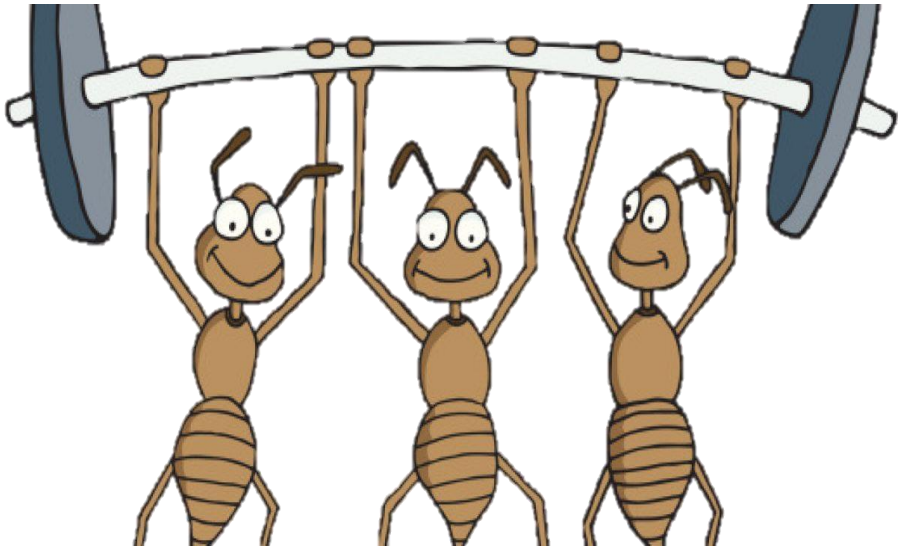
- Agricultural Enhancement: Potential to significantly improve livestock/poultry breeds.

- Disease Resistance: Create animals with better resistance to diseases, low veterinary costs.
- Research Collaboration: Potential to partner with international research institutions & biotech firms.
- Economic Growth: Stimulating biotech industry growth and creating new job opportunities.

- Potential to increase the contribution of livestock to the economy.
- Health Benefits: Enhancing animal health and preventing the spread of zoonotic diseases.

Cooperation

- International Collaboration: Partner with global biotech companies and research organizations.



- Regional Alliances: Engage with neighboring countries for shared research and policy alignment.
- Academic Partnerships: Engaging with universities and research institutions for knowledge exchange (BAU, BLRI)
- Public-Private Partnerships: Foster collaborations between government, industry, and academia. Leveraging private sector innovation and funding (BAU, BLRI, Large commercial farms)

Regulatory Alignment and policy development

- Global Standards: Aligning with international guidelines and best practices.
- National Policy Development: Formulating a comprehensive national policy and framework for gene editing in animals.
- Ethical Considerations: Address ethical concerns and ensure public engagement in policy development.
- Monitoring and Enforcement: Implement robust mechanisms for monitoring compliance and enforcing regulations.
- Regulatory framework: Need for a dedicated legal framework for gene editing.
- Compliance: Integration with existing biosafety and animal welfare laws.
- Biosafety Act: Covers general genetic modifications but lacks specific provisions for gene editing in animals. So, need for Specific Legislation.
- Initiation of dialogues with stakeholders including farmers, scientists, and policymakers.
- Approval Processes/body/certification: National Committee comprising (expert from BAU, MoFL, MoST, BLRI)

- Safety and Risk Assessment: Biosafety Protocols, Risk Mitigation Strategies and Post-Release Monitoring
- Animal Welfare: Ethical Considerations, Welfare Standards
- Public Awareness and Engagement: Stakeholder Involvement, Public Education, Transparency in research and policy decisions
- Socio-Economic Considerations: Impact on Agriculture and Livelihoods, Economic Benefits and Equity, Intellectual Property Rights
- Research and Development: Capacity Building, Collaboration and Partnerships, Innovation Encouragement
- Environmental Considerations: Ecosystem Impact, Conservation of Native Species, Sustainability
- Economic and Trade Implications: Market Access and Trade, Export Potential

Conclusion

- Impact: Effective gene editing policies can significantly impact agriculture, health, and economic growth in Bangladesh.
- Address: the country's needs, bridging gaps, leveraging opportunities, fostering cooperation, and aligning regulations are crucial for effective gene editing policy.
- Action Plan: Prioritize regulatory development, capacity building, and collaborative efforts. Engage stakeholders to drive forward gene editing initiatives responsibly
- Final Thought: Embrace gene editing as a transformative tool while ensuring ethical and regulatory safeguards.

Thank You Very Much

Ethical Considerations

- Animal Welfare Concerns:

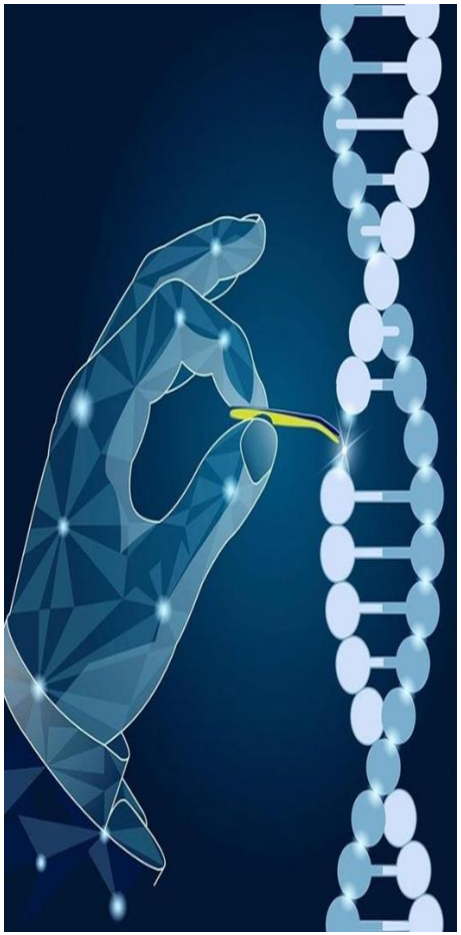
  - Potential Risks: Unintended genetic changes, long-term health impacts.

  - Ethical Concerns: Modifying genetic material raises questions about animal rights.

- Public Perception:

  - Awareness: Low public awareness about gene editing benefits and risks.

  - Resistance: Potential opposition from animal rights groups and ethical concerns from the public.



Economic Implications

- Cost-Benefit Analysis:

  - High initial investment in gene editing technologies.

  - Potential for long-term savings and increased agricultural productivity.

- Impact on Livestock Industry:

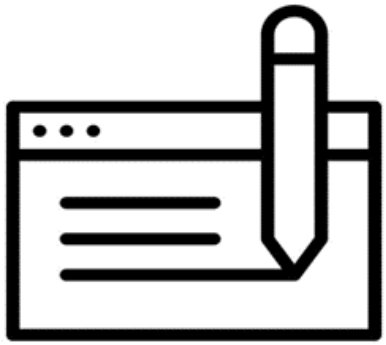
  - Improved disease resistance can reduce veterinary costs.

  - Enhanced productivity may increase farm profitability.

(Proudfoot et al., 2020)

Recommendations

- Adaptation: Tailoring international best practices to fit the local context and needs.
- Develop Regulations: Formulate comprehensive national regulations specific to gene editing.
- Build Capacity: Invest in education and infrastructure for gene editing research and development.
- Encouragement: Support local research and development initiatives.
- Increase Awareness: initiatives to educate the public about gene editing benefits and risks.



- Foster Collaboration: Enhance partnerships with international and regional stakeholders.
- Partnerships: Foster collaborations between academia, industry, and government.
- Monitor Progress: Establish monitoring systems to evaluate and guide gene editing projects.
- Pilot projects: Livestock production and health improvement.
- Initiating discussions: National strategy and regulatory framework for animal gene editing.