MEMORANDUM OF UNDERSTANDING (MoU)

BETWEEN

SHER-E-BANGLA AGRICULTURAL UNIVERSITY (SAU)

AND

JAGANNATH UNIVERSITY (JnU)

Whereas the **SHER-E-BANGLA AGRICULTURAL UNIVERSITY** (hereinafter referred to as "SAU") as a Govt. financed full fledged public university of Bangladesh. Sher-e-Bangla Agricultural University is the oldest agricultural institute in Bangladesh and South Asia. It is situated in Sher-e-Bangla Nagar, Dhaka.

and

JAGANNATH UNIVERSITY (JnU) as a Govt. financed full fledged public university of Bangladesh has a history of about 156 years which started in 1858 when Dhaka Brahma School was founded in 1858. It was transformed into the Jagannath University in 2005 (Under the Jagannath University Act. 2005).

Innovation in the field of Science and Technology is one of the prime requirements for achieving the Sustainable Development Goals (SDG) of Bangladesh. Exchange of knowledge and ideas through mutual collaboration is important for the development of indigenous knowledge and technology. In order to accomplish excellence in Science and Technology, Jagannath University (JnU) and Sher-e-Bangla Agricultural University (SAU) are seeking to improve understanding between their respective academic & research institutions and to establish mutually beneficial collaborations for benefiting their faculties and students, have agreed to sign this Memorandum of Understanding [hereinafter referred to as the "MoU") as a first step toward achieving these shared goals.

NOW THEREFORE PURSUANT THERETO, the Parties hereby agree as follows:

1. SCOPE AND FIELDS OF ACADEMIC COOPERATIONS

(1) The Parties hereby agree to implement within the framework of the rules and regulations applicable in each of the institutions and subject to availability of funds and resources, the following programmes and activities, which may include, but not limited to:

(a) Exchange of faculty and staff;
(b) Exchange of students for studying and/or practical trainings/internships;
(c) Capacity building and laboratory establishment;
(d) Organizing of joint seminars, conferences or workshops on topics of mutual interest;
(e) Exchange of publications, reports and other academic materials and information;
(f) Allowing students of JnU or SAU to use the laboratory and training facilities at

SAU or JnU under mutual understanding of both the parties;

(g) Sharing of other activities and programmes in areas of mutual interest, where such sharing shall result in benefit to both parties;

(2) It is agreed that the terms and conditions of any agreed programme and activity contemplated in this MoU shall be the subject matter of separate written agreements to be negotiated and agreed upon by both Parties and/or any third parties, wherever applicable. Provided always the decision whether to initiate and/or implement any programme or activity shall be at the sole discretion of each Party.

2. Areas of Cooperation:

Article 1

The Parties agree upon academic exchange and research development in the following fields of interest

a. **Plant and Environmental Biotechnology:** Study of algae, phytoplankton, aquatic macrophysics, plant succession, ecosystem and their roles in ecological balance, Investigation on plant biodiversity and their importance with special reference to environmental changes, taxonomical and ethnobotanical survey. To investigate the economic importance and ethnobotanical aspect of medicinal plants in Bangladesh and extraction of chemical compounds form medicinal plants which could help to discover novel drug for the mankind

b. **Plant pathology and microbial biotechnology:** study of microscopic causal agents (virus, bacteria, fungi, etc.) responsible for plant diseases in Bangladesh and development of disease resistant plants through molecular modification of causal agents isolated form plants. Exploration of different microorganism to develop single cell protein, enzyme biotechnology, waste management (both in water and soil) and bioremediation using existing microbes in different environmental sources. Investigation of rhizosphere microorganisms to know their role on plant growth which could improve the yield of crop plants or economical important plants by stimulating plant growth. The microbes can be used as biofertilizer, bioinsecticides and so forth which could play key role in crop improvement in Bangladesh

c. **Plant breeding and agricultural biotechnology:** Different techniques e.g. germplasm exchange and collection, hybridization, backcross, test cross, are applied to improve the crop yield through developing disease resistant variety, drought resistant species, photo neutral variety, water resistant variety, etc. Development of callus from meristem for tissue culture to overcome the natural fertilization incompatibility which could play vital role to conserve rare species, highly economical important endangered species, genetically important endemic plant species. DNA extraction of economical, medicinal plants including crop plants, ornamental plants of knows their gene profile through conducting genome sequence. Genome sequence of plants will help us to know their specific function of individual gene which could be applied to modify plants based on our demands

d. **Cellular study of plants:** study of plant anatomy and embryology to know the internal structure of different groups plants. Mitosis and Meiosis cell division,

karyotype, idogram, DNA hybridization, banding pattern, evolution of chromosome study could help to know the differences among plant species which could be used to know their phylogenetic relationship and plants evolution pattern

e. **Fisheries branch:** Fish taxonomy and systematics, fish diversity, fish population genomics, fish phylogeny, plankton and benthos diversity, ecology, water pollution and heavy metal analysis, aquaculture, taxonomy of mollusca and shell fish culture, fisheries resource management and conservation, fish preservation and marketing.

f. **Wildlife and Biodiversity Conservation Branch:** Wildlife management–vertebrate biogeography, taxonomy and systematics (morphological and molecular); wildlife farming; vertebrate pest management and zoonotic disease (epidemiology and management).

g. **Entomology branch:** Toxicology, pollution and integrated pest management strategies-IGR, SIT and others; Organic pesticide and safe Food production; management of harmful insects and enhancing the economically important insect-production; insect systematic. Diversity and biotechnology: polymorphism, transgenic insects, gene annotation and expressions on insect color, medically important insects and their significant features.

h. **Animal Biotechnology-**Vaccine development and production; testing of semen quality and fertility; livestock and poultry barcoding; animal genotyping, genetic marker detection, whole genome sequencing, QTL mapping, gene editing; detection of drug resistant genes, impact of drugs residue in animal products or in farms, cryopreservation, In Vitro fertilization, MOET, AMR and surveillance.

i. **Bioinformatics-** Analysis of qualitative and quantitative data (proteomes, transcriptome, interactomes, metabolomes and microbiomes) to investigate living organisms and their communities; development of most comprehensive range of freely available and up-to-date research databases against common diseases of Bangladesh; designing the analogues from medicinal plant compounds for novel drug discovery; design and development of molecular therapy (vaccines and drugs) against common diseases of Bangladesh; biological data analysis by designated software's and tools, SNPs detection in disease progression, characterization of protein and protein-protein Interaction Network (PPIN).

j. **Environmental Biotechnology-** Development and improvement of biofertilizer for different agricultural crops; development of indigenous plants and microorganisms based technologies for environmental remediation and monitoring of organic and inorganic pollutants; development of eco-friendly and cost effective biopesticide production of biosurfactant from oil contained sites, production of value added product through fermentation, management of solid and hospital waste

k. **Fisheries Biotechnology-** Diagnosis of bacterial fish diseases; probiotics production for fish feed; artificial propagation of economically important and threatened fish species; fish genome sequencing, genotyping, and genome

editing, sustainable fish production strategy in inland water ecosystem, impact of antibiotic in fish feed and residual effect.

l. **Microbial Biotechnology-** Enzyme technology (specially for commercial production of keratinase, amylase, cellulase and pectinase enzyme), Anti-viral therapies, Antibacterial therapy, antifungal therapy diagnostic tools against bacterial pathogens; development of probiotics for human health and nutrition; development of new generation antibiotics and diagnostic kits against viral and bacterial pathogens.

m. **Molecular Biotechnology-**Whole genome sequencing and annotations of indigenous species; mutational and functional genomics analysis of non-communicable diseases; molecular diagnosis of genetic disorders and various infectious diseases; monitoring the presence and progress of cancer through analysis of gene expression; exploration of bioreactive compounds from marine flora; CRISPR/Cas9, genome editing & GMO development; biosafety guidelines and precautions DNA sequencing services.

n. **Plant and Agricultural Biotechnology-** Tissue culture; molecular physiology and genetic transformation of plants; molecular breeding; genetic and photochemical diversity analysis; detection of plant diseases; development of biotic and abiotic stress tolerant transgenic plants; functional genomics to understand metabolomics of plant for extraction of active natural compound and so on, post harvest management and increment of shelf life for various plant derived product.

o. **Soil, Water and Environmental Analysis:** Study of physical and chemical parameters in any fragile site, analysis of physical and chemical properties of water (colour, hardness, etc. of water, determination of P^H, Do, salinity, TS, TSS, TDS) Determination of chemical oxygen demand (COD) and biological oxygen demand (BOD), measure air quality level in urban and rural area, field level soil sample collection and experimental observation, study of physical properties and chemical measurement of soil (colour porosity, humidity, texture, bulk density, temperature, particle size analysis (sieve methods), and particle density, soil reaction and buffering, determination of soil P^H, organic matter and humus.

3. FINANCIAL ARRANGEMENTS

This MoU does not place any financial obligation on either institution. Both parties will be responsible for their respective costs and expenses in establishing and conducting collaborative activities envisaged under good understanding. Neither party shall make a claim against the other party for any expenditure unless such expenditure has been agreed upon in writing between the parties.

4. JOINT PROPERTY

(1) The Parties agree that any intellectual property rights arising from or in connection with any programme or activity under this MoU, through and by the joint and collaborative efforts of both Parties shall be jointly owned and subject to any other terms and conditions as may be agreed upon in writing.

(2) Both Parties shall acknowledge one another in any form of writing, publication or presentation based on research derived from the cooperative efforts of both Parties under this MoU, unless otherwise mutually agreed upon in writing by the Parties.

5. CONFIDENTIALITY

The Parties agree and undertake to keep confidential at all times any information or data that may be exchanged, acquired or shared in connection with any programme or activity conducted pursuant to this MoU.

6. DURATION AND TERMINATION

(1) This MoU shall take effect on and from the date of execution of this MoU and shall continue to be effective for a period of five (5) years and may be extended for such further period as may be agreed by the Parties in writing.

(2) Notwithstanding clause 6(1) above, this MoU may be terminated by either Party giving written notice to the other at least six (6) months prior to the proposed date of termination.

(3) Notwithstanding clause 6(2) above, the provisions of this MoU or any other written agreement in respect of any on-going exchange programme or any other form of cooperative activity under this MoU shall continue to apply until their completion unless both Parties mutually agree in writing to the earlier termination of the programme or co-operative activity.

7. NOTICE

Every notice, request or any other communication required or permitted to be given pursuant to this MoU shall be in writing, in English and delivered personally or sent by registered or certified post via surface mail or by courier or facsimile (which shall be acknowledged by the other Party) to the signatories of this MoU.

8. MISCELLANEOUS

(1) This MoU may be modified, varied or amended at any time after due consultation and with the written agreement of both Parties.

(2) This MoU is not intended to be legally binding. It merely expresses the intentions and understanding of the parties which will form the basis of any legally binding agreement to be drafted and executed in the future.

(3) The Parties hereby agree that they are not bound exclusively by this MoU and shall be at liberty to enter into any separate agreements or arrangements with any third party without reference to the other Party.

IN WITNESS THEREOF the parties have caused this MoU to be executed by their duly authorized representatives on the date indicated below.

For and on behalf of
SHER-E-BANGLA AGRICULTURAL UNIVERSITY (SAU)

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Professor Dr. Md. Shahidur Rashid Bhuiyan
Vice-Chancellor
Sher-e- Bangla Agricultural University
Dhaka-1207, Bangladesh

Date:

In the presences of
SHER-E-BANGLA AGRICULTURAL UNIVERSITY (SAU)

27.06.2022

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Sheikh Rezaul Karim
Registrar
Sher-e- Bangla Agricultural University
Dhaka-1207, Bangladesh
Date:

27.6.2022

Prof. Dr. Md. Abdur Razzaque
Sher-e- Bangla Agricultural University
Dhaka-1207, Bangladesh
Date:

For and on behalf of
JAGANNATH UNIVERSITY (JnU)

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Professor Dr. Md. Imdadul Hoque
Vice-Chancellor
Jagannath University
Dhaka-1100, Bangladesh

Date: 27/06/22

In the presences of
JAGANNATH UNIVERSITY

.....23.6.22

Engineer Md. Ohiduzzaman
Registrar
Jagannath University
Dhaka-1100, Bangladesh
Date:

27.06.2022

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Professor Dr. Parimal Bala
Director (Research)
Jagannath University
Dhaka-1100, Bangladesh
Date: