

Educational Support to Agrarian and Agri-Food University Programmes in Mongolia



Implementation of a Joint-Laboratory for Food Analysis

NUM and MUST

Name of the deliverable: WP 2bis1 Implementation of a Food Analysis Platform

Project Erasmus + APFAA - 585593-EPP-1-2017-1-FR-EPPKA2-CBHE-JP

2017 – 2020



ХӨДӨӨ АЖ АХУЙН ИХ СУРГУУЛЬ
MONGOLIAN UNIVERSITY OF LIFE SCIENCES



NAME: Laboratory of Food analysis

LOCATION: NUM, Central Library building, 6th floor, room 607 and 612.

MUST, Main building, 4th floor, room 436.

AFFILIATION: Master, senior, junior students and re-training alumni

OBJECTIVES: Development of practice based education environment for the students with the specifications of food hygiene, food safety, food microbiology, food biotechnology.

ACTIVITIES: Practice based education

Within the framework of the joint project “**Pedagogical support for agricultural and food courses in Mongolian No 585593**” (project code: **CBHE-585593-EPP3-2017-1-FR-EPPKA2-CBHE-JP**) jointly organized by **MUST**, **NUM** and **MULS**, The National University of Mongolia (**NUM**) and the Mongolian University of Science and Technology (**MUST**) aim to create a new joint master's program to provide food quality and safety knowledge through a combination of distance and laboratory training, blended education program.

The index for this new program was obtained this year from the Ministry of Education and Science as a result of a long pursuit. The new program is currently being discussed by the program committees of the National University of Mongolia and the Mongolian University of Science and Technology.

All equipment and facility at NUM and MUST, which are obtained during this project, shareable between NUM and MUST in order to support practice based education process of new joint master’s program and the current bachelor's and master's programs too.

The equipment listed in **Table 1** and **Table 2** was purchased for the new program's laboratory classes. The equipment of the National University of Mongolia was installed in the laboratory **No.607 and 612** of the Central Library of the National University of Mongolia (Figure 1-2), and the equipment of the Mongolian University of Science and Technology was installed in the laboratory **No.436** of the Central building of the Mongolian University of Science and Technology (Figure 3).

In the framework of this project, a spray drier purchased by the National University of Mongolia will be installed in the laboratory building located in the yard of the “**Makh Impex**” of the Mongolian University of Science and Technology and will be used between the two schools.

Also in the framework of this project, a bioclimatic greenhouse was built on the land of the Mongolian University of Science and Technology in Bayan Khoshuu, and practical research and trainings on greenhouse hygiene will be conducted.

The laboratory for food analysis established at the National University of Mongolia and the Mongolian University of Science and Technology is fully accessible to students of the current bachelor's and master's programs.

In the **A** quarter of the **2019/2020** academic year, **120** students who chose “**Microbiology**” course with code **G.BN203**, **52** students who chose “**Biochemistry**” with code **G.BN201**, **103** students who chose “**Food Analysis**” with code **G.BN372**, and **9** students who chose the “**Student Experimental Activity**” course with code **BN314** used the equipment in their laboratory classes. The number of students can be seen in the credit report of 2019/2020 academic year (Table 3-5).

However, due to the quarantine of COVID19, in the **B** term of the **2019/2020** academic year, the laboratory classes became video lessons.

In the **2020/2021 A** quarter, laboratory classes were held before quarantine was announced. **77** students in **Microbiology** with code **G.BN203**, **79** students in **Biochemistry** with code **G.BN201**, **64** students in **Food Analysis** with code **G.BN372**, and **14** students in **Student Experimental Activity** with code **G.BN314** used the equipment they received under the project in their laboratory classes (Figure 6). This academic year's credit calculation will be finalized in January of 2021.

In addition, in the 2018/2019 and 2019/2020 academic years, undergraduate and graduate students who studied in “Food Biotechnology”, “Food Microbiology”, “Food Quality and Hygiene” in the Department of Biotechnology and Nutrition of the MUST and students who studied in “Food Biotechnology”, “Genetic” and “Applied biotechnology” in NUM used the laboratory equipment received under the project to complete the dissertation experiment (Figure 5).

Furthermore, now it is possible to change the current courses on food molecular biology and food biotechnology, which did not have laboratory hours due to lack of equipment and consisted only of lectures and seminars at MUST. Within the framework of the above courses, students will be able to learn genetic engineering methods based on PCR and Real time PCR. Now days, Genetic engineering is an essential part of food biotechnology and molecular biology.

After the training, at Agrocampus, Microbiology laboratory with Dr. Sophie JAN and Michel Gautier, Dr. Khulan J from NUM and Dr. Dulguun D. from MUST together prepared a student

laboratory manual for identification food born bacteria by microbiology and molecular biology methods based on experiences obtained in Rennes, France. This manual is available for students NUM and MUST. Translated form of this manual is attached to this report.



Figure 1. Laboratory room 607 at NUM



Figure 2. Laboratory room 612 at NUM



Figure 3. Laboratory room 436 at MUST

Table 1. List of equipment purchased by NUM

No	Name	Sum in MNT
1	Thermostat Incubator with Shaker	3,040,000.00
2	UV/VIS Spectrophotometer	8,900,000.00
3	PCR machine	17,510,000.00
4	Universal Centrifuges	22,000,000.00
5	Freeze dryer (Table Top type), Standard chamber	10,100,000.00
6	ESCO PCR cabinet	3,820,000.00
7	Bacterial Colony Counter	1,600,000.00
8	Benchtop pH Meter	1,100,000.00
9	Magnetic Stearrer with hot plate	1,970,000.00
10	Mi5 Lumin Epi-Fluorescence Microscope	13,960,000.00
11	Benchtop Autoclave	3,200,000.00
12	Dell Optiplex 7060i7	2,499,900.00
13	Dell P2319H	529,900.00
14	Team SSD 480GB	229,900.00
15	Apacer 278	279,000.00
16	Office equipments	1,010,400.00
17	KENW-KM082 Mixer	2,899,900.00
18	Document viewer	280,000.00
19	Ultra mini keyboard	70,000.00
20	LED Board	880,000.00
21	Spray dryer-LPG5	35,900,000.00
22	Kros Flo KR2i TFF System (KR21 TFF system complete; D04-E300-10-N; D02-	48,300,000.00

23	E005-05-N; S02-E005-05-N)	950,000.00
24		760,000.00
25		1,550,000.00
26	Tank 10L	900,000.00
27	Vacuum rotary evaporator	34,000,000.00
28	Low temperature cooling liquid circulating pump	15,486,000.00
29	Pump	12,370,000.00
30	Server (70%)	12,015,500.00
31	Server (30%)	5,149,500.00
	TotalSUM	263,260,000.00

Table 2. List of equipment purchased by MUST

No	Name	Quantity	Price of unit	Sum in MNT
1	Laminar box	1	5,200,000.00	5,200,000.00
2	pH meter	1	1,850,000.00	1,850,000.00
3	Autoclave	1	8,722,000.00	8,722,000.00
4	Centrifuge	1	5,400,000.00	5,400,000.00
5	Shaking incubator	1	4,400,000.00	4,400,000.00
6	Bench (support of shaking incubator)	1	380,000.00	380,000.00
7	Magnetic Stirrer MS-H280-Pro	1	1,658,600.00	1,658,600.00
8	UV/White transilluminator	1	3,200,000.00	3,200,000.00
9	Roller/Shaker MX-RD-Pro	1	3,272,000.00	3,272,000.00
10	MX-RD-Pro Disk accessory 18900160 for 1.5ml x 60 centrifuge tubes holder	1	618,000.00	618,000.00
11	MX-RD-Pro Disk accessory 18900161 15ml x 16 centrifuge tubes holder	2	315,000.00	630,000.00
12	MX-RD-Pro Disk accessory 1890016250ml	1	315,000.00	315,000.00

	x 8 centrifuge tubes holder			
13	MX-RD-Pro Disk support rods for accessories, 4 pcs	1	157,000.00	157,000.00
14	Water Purifier SCSJ-III 15	1	5,162,000.00	5,162,000.00
15	Filter /for SCSJ-III 15/	3	850,000.00	2,550,000.00
16	Portable Ultrasonic cell Disruptor	1	6,950,000.00	6,950,000.00
17	Dry bath DBI-1 /with BH01 block/	1	1,438,000.00	1,438,000.00
18	Digital Serology Rotators LW USA	1	5,005,000.00	5,005,000.00
19	Steel fume hood	1	5,895,900.00	5,895,900.00
20	Climate chamber RGX-250E	1	9,921,900.00	9,921,900.00
21	Deep freezer -80°C	1	11,000,000.00	11,000,000.00
22	Refrigerator	1	3,000,000.00	3,000,000.00
23	Electrophoresis	1	1,200,000.00	1,200,000.00
24	Thermal cycler	1	23,400,000.00	23,400,000.00
25	Jacketed glass Reactor JGR 5L	1	4,120,000.00	4,120,000.00
26	Ultrasonic	1	750,000.00	750,000.00
27	Soil ph, light, moisture meter	1	95,000.00	95,000.00
28	220-110V convertor	1	60,000.00	60,000.00
29	220-220 stabilizer	1	250,000.00	250,000.00
30	Real Time PCR machine	1	30,174,320.00	30,174,320.00
31	UPS prolink PRO903WS	1	1,212,500.00	1,212,500.00
32	Hydrometer of greenhouse	1	25,000.00	25,000.00
33	Soil moisture meter	1	119,000.00	119,000.00
34	Soil thermometer	1	94,000.00	94,000.00
35	Greenhouse	1	3,000,000.00	3,000,000.00
	Total SUM			151,225,220.00



Figure 4. Receiving the equipments and start setting up the laboratory.

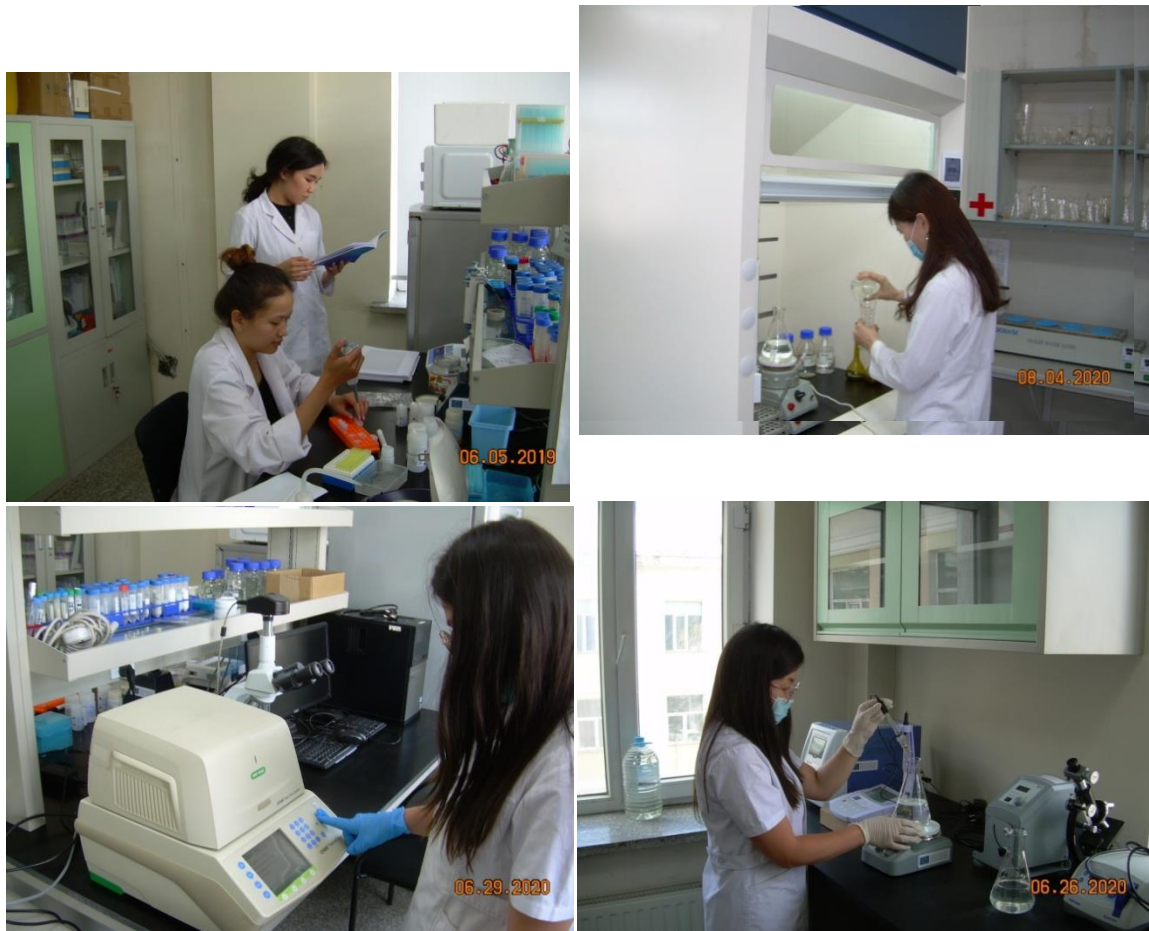










Figure 5. Undergraduate and graduate students experimenting with dissertations












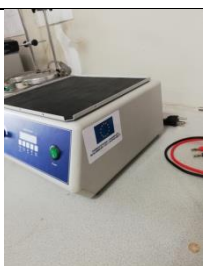

Figure 6. Laboratory class of Food analysis subject







Table 6. Photo all equipment purchased MUST



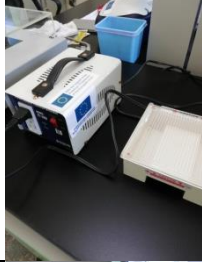




№	Name	Picture	Purpose	Price (Tugrik)
1	Laminar box		<p>A laminar is hood is a carefully enclosed bench designed to prevent contamination of semiconductor wafers, biological samples, or any particle sensitive materials. Air is drawn through a HEPA filter and blown in a very smooth, laminar flow towards the user. At MUST we use the laminar box in many laboratory subjects. For the examples GBN203 General microbiology, GBN204 food microbiology I, GBN308 food microbiology II, GBN310 Industrial microbiology, GBN311 food born microbiology, GBN221 hygiene microbiology</p>	5,200,000.0
2	Centrifuge		<p>Centrifugation is a technique used for the separation of particles from a solution according to their size, shape, density, viscosity of the medium and rotor speed. Centrifuge also supporting practice PCR process, molecular biology and microbiology education. For examples GBN307 Cell biology, GBN305 Molecular biology, GBN221 hygiene microbiology.</p>	4,400,000.0
3	pH meter		<p>The pH meter is determines the acidity or basicity of aqueous solutions. A pH meter acts as a volt meter that measures the electrical potential difference between a pH electrode and a reference electrode. This equipment is used in all lab education subjects where used solution.</p>	1,850,000.0




4	Autoclave		<p>The autoclave is used in sterilization process by using steam under pressure. This equipment is used in all lab education processes where need to sterilize solutions and tools.</p>	8,722,000.0
5	Shaking incubator		<p>Shaking incubator is used for microbial culturing, microbial aeration growth process. At MUST we use this incubator the following subjects: GBN305 Molecular biology, GBN203 General microbiology, GBN204 food microbiology I, GBN308 food microbiology II, GBN310 Industrial microbiology, GBN311 food born microbiology, GBN221 hygiene microbiology, GBN222 Food safety I</p>	5,400,000.0
6	Bench (support of shaking incubator)		<p>The support of shaking incubator is in the purpose of room saving in our laboratory.</p>	380,000.00
7	Magnetic Stirrer MS-H280-Pro		<p>The magnetic stirrer is used to ensure liquid samples are homogeneous in consistency and temperature. This equipment commonly used with pH meter.</p>	1,658,600.00
8	UV/White transilluminator		<p>The UV-transilluminator is used to view DNA (or RNA) that has been separated by electrophoresis through an agarose gel. During or immediately after electrophoresis, the agarose gel is stained with a fluorescent dye which binds to nucleic acid At MUST we use this incubator the following subjects: GBN305 Molecular biology, GBN203 General microbiology, GBN204</p>	3,200,000.00

9	Roller/Shaker MX-RD-Pro		<p>food microbiology I.</p> <p>Roller shaker provides smooth rocking and rolling action at a fixed speed. Used for mixing solid and liquid suspensions and viscous samples. The unit can be used with all conventional tubes and cylindrical bottles. At MUST we use this roller the following subjects: GBN305 Molecular biology, GBN203 General microbiology, GBN204 food microbiology I, GBN222 Food safety I GBN367 Toxicology, GBN201 Biochemistry, GBN300 General biotechnology, GBN302 Food biotechnology</p>	3,272,000.00
10	MX-RD-Pro Disk accessory 18900160 , for 1.5ml x 60 centrifuge tubes holder		Accessory Of Roller/Shaker MX-RD-Pro	618,000.00
11	MX-RD-Pro Disk accessory 18900161, 15ml x 16 centrifuge tubes holder		Accessory Of Roller/Shaker MX-RD-Pro	630,000.00
12	MX-RD-Pro Disk accessory 18900162, 50ml x 8 centrifuge tubes holder		Accessory Of Roller/Shaker MX-RD-Pro	315,000.00
13	MX-RD-Pro Disk support rods for accessories, 4 pcs		Accessory Of Roller/Shaker MX-RD-Pro	157,000.00
14	Water Purifier SCSJ-III 15		<p>A water purifier is a device used to remove contaminants, suspended solids and undesirable chemicals from water. This professional water purifier produce RO and DI water, widely used at university laboratories. This equipment is used in all lab education process.</p>	5,162,000.00

15	Filter /for SCSJ-III 15/		The filters in the device.	2,550,000.00
16	Portable Ultrasonic cell Disruptor		Ultrasonic Disruptor (homogenizer) is used to break cell walls to extract the cell contents, e. g. the proteins without damaging them. At MUST we use this the following subject: GBN308 food microbiology II, GBN221 hygiene microbiology, GBN201 Biochemistry, GBN305 Molecular biology	6,950,000.00
17	Dry bath DBI-1 /with BH01 block/		Digital block heater provides precise temperature control in small vessels to evaporate liquids. Use in process of DNA isolation from food samples for example meat, vegetables and bacteria. Identification GMO product or not. At MUST we use this the following subject: GBN308 food microbiology II, GBN221 hygiene microbiology, GBN201 Biochemistry, GBN305 Molecular biology.	1,438,000.00
18	Digital Serology Rotators LW USA		This equipment is used to mix or shake samples for long period of time at low speed. . At MUST we use this the following subject: GBN305 Molecular biology.	5,005,000.00
19	Steel fume hood		The fume hood is discharging the waste air. To protect the students and teachers to prevent the pollutant during tests from expanding in laboratories. At MUST we use this the following subject: GBN367 Toxicology, GBN201 Biochemistry, GBN222 Food safety I	5,895,900.00

20	Climate chamber RGX-250E		This is an enclosed greenhouse used for growing plants before transferring to greenhouse. At MUST we use this climate chamber in GBN300 General biotechnology, GBN302 Food biotechnology, GBN305 Molecular biology. Growing GMO plants in order to isolate DNA and use it in identification process	9,921,900.00
21	Deep freezer -80°C		This refrigerator freezes at ultra low temperature. It is used for storage samples and microbes (bacteria and yeast) This equipment is used in all lab education subjects where need to freeze at low temperature.	11,000,000.00
22	Refrigerator		It is an usual refrigerator for purpose of storage of samples and non toxic chemicals which are used in education process.	3,000,000.00
23	Electrophoresis		This equipment is used separation of DNA and proteins by the weight in acryl amide gel. At MUST we use this in GBN300 General biotechnology, GBN302 Food biotechnology, GBN305 Molecular biology	1,200,000.00
24	Thermal cycler		This a PCR machine and it is used in carry out a polymerase chain reaction. At MUST we use this in GBN302 Food biotechnology, GBN305 Molecular biology	23,400,000.00
25	Jacketed glass Reactor JGR 5L		This is a simple bioreactor in the purpose of education of fermentation. . At MUST we use this the following subject: GBN308 food microbiology II, GBN221 hygiene microbiology, GBN305 Molecular biology, GBN302 Food biotechnology.	4,120,000.00

26	Ultrasonic		This is an ultrasonic bath for the purpose of cleaning. Ultrasonic cleaning is a very efficient form of cleaning where dirt particles are completely and rapidly removed from A variety of objects. This equipment is used in all lab education subjects where it is needed.	750,000.00
27	Soil ph, light, moisture meter		Using this equipment we can monitor environment of greenhouse At MUST we use this in GBN302 Food biotechnology subject.	95,000.00
28	220-110V convertor		220-110V convertor is used in our agarose electrophoresis system. At MUST we use this the following subject: GBN308 food microbiology II, GBN221 hygiene microbiology, GBN305 Molecular biology.	60,000.00
29	220-220 stabilizer		220-220 stabilizer helps us for maintaining a constant voltage level. We use it for the deep freezer -80°C.	250,000.00
30	Real Time PCR machine		Real-time PCR permits the identification of specific, amplified DNA fragments using analysis of their melting temperature. At MUST we use this the following subject: GBN308 food microbiology II, GBN221 hygiene microbiology, GBN305 Molecular biology.	30,174,320.00
31	UPS prolink PRO903WS		This is an Uninterruptible Power Supply (UPS) products protect equipment and computer hardware from voltage spikes, and from data losses due to power fluctuations. We use this equipment with the real time PCR machine.	1,212,500.00
32	Hydrometer of greenhouse		Using this equipment for monitoring air humidity of greenhouse	25,000.00

33	Soil moisture meter		Using this equipment we can monitor soil of greenhouse	119,000.00
34	Soil thermometer		Using this equipment we can monitor soil of greenhouse	94,000.00
35	Bio climatic greenhouse		The greenhouse is planned to be used for the education process of Bachelor classes titled "Study of food raw materials"	3,000,000.00