

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



## Online Master's Program in Food Technology NUM & MUST

Name of the deliverable: WP 2bis Online Master's Program in Food Technology NUM & MUST

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

2017 - 2020



National University of Mongolia, Mongolian University of Sciences and Technology  
“FOOD CHAIN BUSINESS MANAGEMENT” INTER-SECTORAL MASTER'S TRAINING PROGRAM

GENERAL INFORMATION (Introduction to the program)

1. Name and index of the program: `

FOOD NETWORK BUSINESS MANAGEMENT

Interdisciplinary professional master

FOOD SYSTEM & BUSINESS MANAGEMENT

1. Degree of education:

Professional Master

2. Information on the program's official approval, accreditation, and external evaluation (date of the license to conduct the program, academic year in which the program was implemented / started, year of accreditation)

Date of program implementation-2021.01.01

3. Purpose and definition of the program:

The purpose of this program is to train specialists and bio-entrepreneurs in the field of research and development of cooperatives, small and medium enterprises in the field of food and biotechnology with a combination of knowledge in bioengineering and business.

After studying for a master's degree in food chain business management:

1. To have the right to hold advanced positions in technology, management and marketing in the FAO biotechnology production organization
2. You will have the opportunity to work as a researcher, training engineer and teacher at universities and technical colleges.

1. Program affiliation:

Sub-committee on curriculum, School of Science, Department of Biology.

2. Outcomes of the program:

The key requirements for a master's degree program in the food chain business management program are as follows. The special requirements for the natural sciences are developed in three main parts: bioengineering, business science academics, problem solving, and general integrated competencies.

Name of program subcommittee:

NUM, School of Science, Department of Biology Program Subcommittee.

7. Contact address:

Name: B.Ochirkhuyag

Position and academic degree: Associate Professor, Ph.D.

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## I. PROGRAM DETAILS

### Rationale for the program:

1.1. Due to the globalization of the world economy, there is high competition in the food and agriculture sectors. As a result, knowledge in many fields is required from the personnel working in the field. Therefore, there is a great need for personnel in the field who are able to develop new products and new technologies with deep knowledge of biology, engineering and business sciences and use them in their daily activities. Therefore, in collaboration with the National University of Mongolia and the European Union, the Erasmus Plus program will implement a master's degree program in bioengineering and business management. This master's program prepares problem-solving professionals focused on professional activities at many scientific intersections.

Among the issues facing our country today:

- providing safe food to the public;
- personnel to produce products that are competitive in the face of market changes and to innovate in the food and agriculture sectors;
- There is a lack of bio-entrepreneurs to initiate new cooperatives and small enterprises in the food and agriculture sectors based on their basic knowledge of biology and biotechnology;

Based on the achievements of biological, chemical, physical and technological sciences, research and development of new technologies, training of personnel in this space.

1.2 Enrollment / Student Demand - The statistical data of the last 3 years confirm the probability that the program will be chosen by the entrants and the students' willingness to choose (Table 2).

1.3 Requirements for students - Information on general requirements for entrants to the program, knowledge and skills of graduates (results to be achieved), Table 1.

General requirements for entrants:

Bachelor's degree in Biochemistry, Biophysics, Microbiology, Food Chemistry, Agrochemistry, Food Technology, Biotechnology, GPA of at least 2.8, English language proficiency as some subjects are taught in English.

Table 1. Program objectives, knowledge and skills of graduates

Academic Competence	Problem solving competence	General competence
Knowledge of the concept and application of any theoretical or experimental model of biochemistry, biotechnology, microbiology and biophysics	Use active techniques to search for information and sources, and critically evaluate any scientific information	Ability to acquire knowledge and skills independently, self-directed, supervised and responsible learning
Be able to be critical and creative in solving and analyzing common problems in food science	Ability to solve technological problems based on basic scientific knowledge, taking into account changes in commodity prices, market fluctuations and consumer needs	Acquired basic statistical processing skills. Acquire analytical skills as a result of research
Have in-depth knowledge of market structure and market capacity	Ability to anticipate market needs, market risks, and solve problems by correctly estimating the factors influencing market changes	Summarize and apply analytical methods to predict expected results and make testable hypotheses
Acquire theoretical knowledge on biochemistry and technology of traditional Mongolian fermented milk products, taxonomy of lactic acid bacteria, yeast, and biologically active properties.	Students will be able to isolate microorganisms from traditional fermented milk products, make taxonomic determinations by molecular biological methods, and study biologically active properties.	Have a deep understanding of the goals and methods of natural science and technology, the differences and similarities between the branches of science, the specifics of laws, theories, and rational interpretations, experiments, and the role of reality

II. PROGRAMS CONTENT, PACKAGE AND PROGRAM

Training plan - Fill in the table below.

Table 4. Program plan

Components of the ..... program approved by the Director's Order No. ....

Reviewed by: ..... Head of the General Training Office

**National University of Mongolia**  
**BRANCH OF NATURAL SCIENCES OF THE SCHOOL OF SCIENCE**

**Training Plan**  
**(Inter-Sector Master Degree)**

**Profession:** Food Chain Business Management  
**Profession index:** E-0512200  
**Degree of Education:** Master

**Study Period:** 1.5-2 years  
**Total Credit Hours:** 34  
**Enrollment education:** Bachelor

#	Course index	Course name	Credit hour	Season	Explanation
<b>A. General Basic course</b>			<b>4</b>		
<b>A1. Communication skills</b>			<b>4</b>		
1	1	MNGT703 Business relationships and managerial leadership and skills	2	Autumn	
2	2	BIBM 612 Statistic	2		
<b>B. Professional course</b>			<b>12</b>		
<b>B1. The required course</b>					
3	1	BIBM 600 Professional Introduction	1	Autumn	
4	2	BIBM 601 Food study basic of Sciences issues	3	Autumn	
5	3	BIBM 602 Food, agriculture and small and medium business management strategies	3	Autumn	
6	4	BIBM 611 Food bioproduct safety	2	Autumn	

7	5	BIBM 612	New product development, innovation and marketing	3	намаг	
<b>B. SPECIALIZATION COURSES</b>				<b>8</b>		
<b>B1. FROM THE DEPARTMENT</b>						
5	1	BIBM 610	Food product biochemistry	2	Spring	
6	2	BIBM 613	Food storage and packaging safety	2	Spring	
7	3	BIBM 615	Food control analysis	2		
8	4	BIBM 616	Nutrigenomics	2	Spring	
<b>B2. INTERNSHIP</b>						
16	1	BIBM 618	Industrial internship	4	Spring	<i>MUST, SIT</i>
<b>D. OTHERS</b>						
17			Write project	<b>4</b>		<i>Perform professional internships and write based on internship results</i>
			Method of business project	<b>1</b>		
18			Unified professional examination	1		
<b>Total credit hours</b>				<b><u>34</u></b>		

Eligible undergraduate students can study in a parallel master's program.

Developed by:

Head of the Department of Biology Program Committee

..... /N.Soninkhishig/

Approved by:

Chairman of the Science School Sub-Committee on Science

..... / Ts. Amartaivan /



Course code	Course name, classification and form		Academic competencies to be taught in the course (1)	Comprehensive problem-solving skills (2)	General competencies to be taught in the course (3)	Evaluate the complex competencies specified in (1), (2), (3). Form and size of evaluation
<b>MNGT721</b>	Statistics					40+40+20
<b>MNGT703</b>	Business relationships and managerial leadership and skills					40+40+20
<b>BIBM 600</b>	Professional Introduction		Bioengineering is the intersection of many sciences, including biological sciences, engineering sciences, and technological sciences. Therefore, having a deep knowledge of the above-mentioned sciences in solving biotechnological problems will help you to understand that solving the problems of bioengineering requires not only natural science knowledge, but also business science.	Studying in this master's program will allow you to graduate with special skills from other majors	Develop a willingness to learn consciously and purposefully	40+40+20

BIBM 601	Food study basic of Sciences issues		Acquire knowledge that the food processing process is based on knowledge in many fields (inorganic, organic, colloid chemistry, biochemistry, biophysics, materials science, biology)	In solving food processing problems, students will learn about the physical and chemical properties of raw materials and how the properties of raw materials change during processing.	Be able to approach any scientific problem with logical thinking and explain the reasons	40+40+20
BIBM 602	Food, agriculture and small and medium business management strategies		Master the theoretical issues of food, agricultural cooperatives and small business management. Earn knowledge of the differences between cooperative and small and medium enterprise management Provide management guidance to cooperatives and small and medium enterprises and provide theoretical knowledge on how to overcome economic difficulties	To be able to innovate in the management of small and medium enterprises, taking into account the specifics of cooperative management and market factors Be able to make decisions based on basic science of chemistry, physics, biology,	Must be highly educated, meticulous, self-organized, responsible, independent and creative Model and plan experiments for the purpose of making and testing hypotheses To be able to analyze the situation in a scientific way	40+40+20

				and business when estimating economic risks and choosing ways to avoid economic risks		
BIBM610	Food product biochemistry		By studying this course, students will be able to explain macromolecular interactions and changes in macromolecular nutrient quality at the molecular level during the processing of raw materials.	Have the ability to make scientifically decisions about food safety based on changes in the substances contained in food	Ability to read scientific articles Ability to take a scientific approach to food, agriculture, health and the environment and analyze the reasons for their attitudes	
BIBM 611	Food bioproduct safety	2	Theoretical knowledge of the causes of pathological processes in the human body, methods of their diagnosis and the basics of microbiology of the principles of prevention.	Prevention of human-to-human transmission bacterial disease through food  They have the ability to do PR on the proper use of food	You will be able to apply healthy food and proper nutrition in your life	40+40+20
BIBM 612	New product development, innovation and marketing		Timely analysis of the activities of cooperatives and small and medium enterprises in the event of market changes	Be able to innovate based on the achievements of biochemistry, biophysics,	You will be able to take a scientific approach to food, agriculture, health, and the environment, and analyze the reasons for your attitudes.	40+40+20

		<p>Acquire theoretical knowledge to anticipate social and economic changes in the country Correctly identify food needs, develop technology and policy for new products, and develop theoretical and practical knowledge</p> <p>Acquire theoretical knowledge to control the fermentation process, ensure stable operation, and purify the metabolites formed during the fermentation process</p> <p>Acquire knowledge of traditional Mongolian fermented milk production technology, variety of dairy products, chemical and biological properties</p> <p>Master the basic theoretical issues of marketing</p>	<p>genetics and microbiology, as well as the principles of marketing and management science</p> <p>The new product development process will improve the knowledge of product processing management, technical and sensory analysis, storage conditions, and existing personnel.</p> <p>Acquire theoretical knowledge of the factors influencing the fermentation process and acquire technology and technical</p>	<p>In the process of food production, to create new knowledge based on one's own knowledge, taking into account changes in the market, and then to develop industrial technology, management and marketing. empower innovation decisions</p> <p>Gain knowledge of regulated food products</p> <p>To gain knowledge about Mongolian milk and dairy products, their types, history, consumption of dairy products and development trends</p> <p>To be able to think ahead, to plan ahead, to develop tactics, to use scientific inter and trans services</p>	
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				<p>knowledge to produce a given bio-service product.</p> <p>To be able to develop new dairy products using a combination of traditional and modern technologies</p> <p>Be able to make marketing decisions based on the specifics of the market (culture, customs, social strata, age, gender, profession of the people who make up the market)</p>		
BIBM613	Food storage and packaging safety		Food security consists of the proper storage and transportation of food. Therefore, the ability to interpret storage and	Use modern technology to address storage and transportation	Provide knowledge to explain the competitiveness of products to be supplied to the market based on the	40+40+20

			transportation in terms of physical and chemical theory	conditions in relation to food safety. To be able to make decisions based on modern achievements of physical, chemical and biological sciences in creating conditions for storage and transportation	characteristics of storage and transportation	
BIBM615	Food control analysis		Acquire methodological knowledge to identify changes in food production, storage and transportation	Have the ability to analyze	Acquire knowledge of the selection of control analysis to suit the specifics of the product in the factory	40+40+20
BIBM615	Industrial internship		Learn how to apply the theoretical knowledge gained in the course. Deepen the theoretical knowledge that is lacking in solving problems during the internship. Practically understand that production and research are inextricably linked.	Solve problems facing food, agricultural cooperatives, farms and workshops using theoretical knowledge, Acquire that technology, management,	How to solve theoretical problems in the process of life, to be responsible in making decisions, to have self-confidence, Read new magazines and books to gain the new knowledge you need to solve the problem Understand and apply the process of thinking, such as	40+40+20

				human resources, markets, tools and equipment are one and the same organism. Acquire a logical connection between the knowledge acquired during the master's degree in decision making	analysis, synthesis of knowledge, and experience	
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2.2 A total of 2 subjects or 6 credits of the program are planned to be departmental and interdisciplinary, which is 20% of the total set of hours.

2.3 It is planned to select 10% of the total subjects of the program from other departments, branches, and foreign and domestic universities.

2.4 What percentage of the curriculum is planned to be taught online, remotely, and in other student-friendly forms? - Not yet

2.5 Requirements and opportunities for teachers to teach in this program - 80% of the total master's degree programs in Bioengineering and Business Management can be taught by NUM teachers, 20% by EU University teachers for the first 2-3 years and train their teachers during this period.



## B. TEACHER INFORMATION

Table 3. Sufficiency of teacher

Basic teacher name and title	Graduated school, degree, profession	Research interests, projects and programs implemented in the last 5 years	Lessons taught within the program	Scholarships, grants and advanced training abroad	By program and course topic literature
B. Batjargal	University of Nantes, France, Ph.D., Biochemistry	"Research on the biologically active compounds of Mongolian Traditional fermented dairy products" Mongolian foundation for science and technology baseline study leader. Leader of the joint project with China on "Study of biologically active compounds of plant and animal origin", 2013-2016,	BIBM 610 Food Biochemistry	2000-2001, UNESCO Scholarship - Osaka University, Japan 2003-2006, French Ministry of Foreign Affairs grant, State foundation scholarship 2011-2012 Sogan University, Korea	<b>Books and Textbooks:</b> B.Batjargal, T.Gan-Erdene, "Science of Mongolia", Volume 85, Ulaanbaatar, "Sogoo Nuur" printing factory, 2009, ISBN 978-99929-985-3-9 Mongolian translation of Douglas J. Futiyama's book "Evolution". 2012 Chapters 20 and 21. 8,5x.x. ISBN 978-99929-985-3-9 <b>Publication:</b> G.Oyundelger, J.Sukhdolgor, A.Bayanmunkh, L.Khurelbaatar, B.Batjargal, Study on the possibility of making a

					<p>beverage from cow's milk. Research paper of the Institute of Biology, Mongolian Academy of Sciences.2013. №29. Pp. 60-63.</p> <p>Hadji-Sfaxi, I., El-Ghaish, Sh., Ahmadova, A., Batdorj, B, Le Blay-Laliberté, G., Barbier, G., Haertlé., Chobert, J.M. Antimicrobial activity and safety of use of Enterococcus faecium PC4.1 isolated from Mongol yogurt. Food Control, 2011, 22 (12), p.2020-2027</p> <p>B. Munkhtsetseg, M. Margad-Erdene and B. Batjargal. Isolation of Lactic Acid Bacteria with High Biological Activity from Local Fermented Dairy Products. Mongolian Journal of Biological Sciences 2009 Vol. 7(1-2): 61-68</p> <p>Batdorj, B., Trinetta V., Dalgarrondo, M., Prévost, H., Dousset, X.,</p>
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					<p>Ivanova, I., Chobert, J.-M., Haertlé, T. Inhibition activity on food-borne pathogens by hydrogen peroxide producing <i>Lactobacillus delbrueckii</i> subsp. <i>lactis</i> T31, isolated from Mongolian Yoghurt. <i>J. Appl. Microbiol.</i> 2007, 103, 584 -593</p> <p>Batdorj, B., Dalgarrondo, M., Choiset, Y., Pedroche, J., Métro, F., Prévost, H., Chobert, J.-M., Haertlé, T. Purification and characterization of two bacteriocins produced by lactic acid bacteria isolated from Mongolian airag. <i>J. Appl. Microbiol.</i> 2006. 101, 837-848</p> <p>Gurban oglu Gulahmadov, S., Batdorj, B., Dalgarrondo, M., Chobert, J.-M., Alekper oglu Kuliev, A., Haertlé, T. Characterization of bacteriocin-like inhibitory substances (BLIS) from lactic acid bacteria</p>
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					<p>isolated from Azerbaijani cheeses Eur. Food Res. Technol. 2006, 224, 229-235</p> <p>Baldorj, R., Tumenjargal, D. and Batjargal, B. (2003) Biochemical and microbiological study of fermented mare's milk (airag) prepared by traditional Mongolian technology. In Nomadic cultural traditions: Mongolian National Dairy Products. The International Institute for the Study of Nomadic Civilizations, ISBN: 99929-5-789-1, pp. 70-77</p> <p>Batjargal, B., Nakajima, M., Yoshida, T. 2001. Investigation of growth acceleration factors by use of DO signal. Annual report of ICBioTech. 24: 481-491</p>
B. Ochirkhuyag	University of Nantes, France, Ph.D., associate	-MFST.2012-2015 natural bioactive compounds,	BIBM 600 Professional Introduction BIBM 601	1995-1999 French Ministry of Foreign Affairs grant,	Monograph-1 Patent: -1. Invention: -2, MNS: -14 Textbook: 3

	<p>professor, Biochemistry</p>	<p>-China Inner Mongolia Joint Project.</p>	<p>Problems of basic science of food science BIBM 615 Fermentation technology and dairy products BIBM 616 Traditional Mongolian dairy products</p>	<p>1999-2001 France, National Agricultural Institute, EU grant;  2006 Establishment and control of NITE, Microbial Fund, Thailand and Japan.</p>	<p>Biochemistry I- Protein, Biochemistry II- Carbohydrate, Biochemistry IV- Enzyme; Publication: 5.B. Oyunchimeg, N. Munkhjargal. L. Khurelbaatar, B. Ochirkhuyag. The problem of obtaining biologically active food supplements from beef liver. Proceedings of the “Khureltogoot Seminar 2010” scientific conference. 178-181, 2010. 6.B. Davaadorj.D Purevdoj, B. Ochirkhuyag. Biotechnology - current status and future goals. SHUTIS. Scientific Conference: High Technology and Economic Issues of Development, 2007, 26-32. 7.Ochirkhuyag B., Chobert J.M., Tumenjargal D., Haertlé T.: Fermented Mare milk-koumiss. Mongolia-Korea Joint</p>
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					<p>symposium on Microbiology, 2005, 10</p> <p>8.B. Ochirkhuyag, Sustained Organic Pollutants and Waste, POPs, 2003, 25-27.</p> <p>9.Ochirkhuyag B., Chobert J.M., Namsrai Ts., Haertlé T.: Study of mare milk and of its fermented product. Nomadic cultural tradition: Mongolian Dairy products. 2003, 77-79.</p> <p>10.Ch.Batjargal, T.Gan Erdene, Jose Cesar Rosa, Vitor Marsel Faca, Helen Julie Laure, Batmunkh O., Ochirhuyag B., Bayarjargal M., Regdel D., Clarice Izumi, Osvaldo de Freitas, Lewis J.Greene, Distribution of peptide size in casein hydrolysates prepared with fresh pancreas, Journal Brazilian Agriculture, 2001</p> <p>11.Ochirkhuyag B., Chobert J.M., Dalgarrondo M., Haertlé T.: Characterisation of</p>
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					<p>mare caseins. Identification of <math>\alpha</math>S1- and <math>\alpha</math>S2-caseins. 2000. Le Lait, 80, 223-235. 12.Chobert J.M., Ochirkhuyag B., Haertlé T.: Study of mare milk and of its fermented product. Milk protein conference. Norway. 30 March-2 April 2000. 13.Ochirkhuyag B., Chobert J.M., Dalgarrondo M., Choiset Y., Haertlé T.: Characterization of whey proteins from Mongolian yak, khainak, and bactrian camel. 1998. J. Food Biochem. 22, 105-124. 14.T.Gan-Erdene, M.Bayarjargal, B.Ochirhuyag, Ch.Batjargal, D.Regdel, B.Dorjpalam, O.Batmunkh, H.Laure, et. al., Characterization of peptides from pancreatic casein, Reports of the Institute of Chemistry and</p>
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					<p>Chemical technology, Ulaanbaatar, 1998, 85-89</p> <p>16. Ochirkhuyag B., Chobert J.M., Dalgalarondo M., Choiset Y., Haertlé T.: Characterization of caseins from Mongolian yak, khainak, and bactrian camel. 1997. <i>Le Lait</i>, 5, 601-613.</p> <p>17. Batmunkh O., Ochirkhuyag B., Dorjpalam B., Gan-Erdene T., Batjargal Ch., New preparations for medical treatment, Mongolian medicine, 1993., 1, 17-20.</p>
D. Tumenjargal	Masaryk University, Ph.D. Czech Republic	<p>Research interests:</p> <ul style="list-style-type: none"> <li>- Ecology of microorganisms (water and soil microbiology)</li> <li>- Food microbiology: Physiology of lactic acid bacteria and yeast</li> <li>- Biotechnology of microorganisms</li> </ul>	<p>BIBM 611 Microbiological safety of food bioproducts</p> <p>BIBM 612 Food control analysis</p>	<ul style="list-style-type: none"> <li>- Masaryk University, Czech Republic, 1990 - 1995</li> <li>“Study of Yeast Cytoskeleton”</li> <li>- International course: Environmental Biotechnology, NEERI, UNESCO, Nagpur, India, 1999</li> </ul>	<p>Yun Hee Park and Tumenjargal Davaasuren. Control of Yeast isolated from Korean soybean paste with low molecular weight chitosans. <i>J. Chitin Chitosan</i>: 9 (4), pp. 180-183, 2004, Scientific paper, Biology № 374: 3-8, ISBN 978-99962-998-0-3, published in the journal, Publication:</p>



		<p>Implemented projects and programs:</p> <ul style="list-style-type: none"> <li>- “Experimental research and monitoring of microbiological assessment of water pollution of Onon and Balj rivers” MEGD, BH Foundation project, 2013-2014</li> <li>- “Development of technology for production and use of nanofungicides” project, 2012 - 2015</li> <li>- Joint project of the IGBT Microbiology Laboratory of the Siberian Branch of the Russian Academy of Sciences, “Microflora of Extreme Aquatic Systems in</li> </ul>		<ul style="list-style-type: none"> <li>- Professor researcher, Department of Biotechnology, Ajou University, Korea, 2002 - 2003 “Molecular science and Technology”</li> <li>- “Quality Management of Culture Collection for Curators”, NITE, BIOTEC, Thailand Science Park, Thailand, 2006</li> </ul>	<p>Yun Hee Park, Yi Fan Hong and Tumenjargal Davaasuren, 2005. Comparision Of The Inhibitory Activity Of Chitosan On Lactic Acid Bacteria And Yeasts. Advances in Chitin Science. Vol. YIII, 338-341, ISSN 83-89867-25-7. pp. 338-341, Institute of Plant Protection, Poznan, Poland</p> <p>D.Narantuya, L.Khishigmaa, G.Khishigsuren, D.Tumenjargal 2011. Antibioqram and heavy metal resistance of phatogenic bacteria isolated from Kharaa river water. Asia Research Network, KFAS, Vol 8, No. 1, ISSN No: 1738-625X. p.35-36.</p> <p>M.Ariunaa, D.Demberelnyamba, G.Sarantsetseg, Sh.Udenbor, D.Tumenjargal, B.Munkhtsetseg. 2012.</p>
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		<p>Mongolia and Lake Baikal: Geochemical Functions, Roles and Diversity”, Science and Technology, 2010 - 2012</p> <p>- “Study the life activity of some pathogenic microorganisms and E. coli isolated from Kharaa River”, ARC grant, 2010 - 2011</p> <p>“Ecological study of some types of forest-steppe trees, shrubs and seedlings” Mongolian foundation for Science and Technology Project, 2006-2008</p>			<p>On the introduction of advanced infection control technologies. Mongolian Journal of Infectious Diseases №2 (45), pp.30-34,</p> <p>1. Barkhutova DD, Tsyrenova DD, Namsaraev BB, Davaasuren Tumenzhargal, 2010. Geochemical activity of microbial communities in thermal springs in Mongolia. // Bulletin of the Irkutsk State University. Earth Science Series. Volume 3. No. 2, pp. 19-29.,</p> <p>2. Shargaeva OV, Abidueva E.Yu., Tumenzhargal D. 2010. Physicochemical indicators and the number of cellulolytic bacteria in soda-salt lakes of Buryatia and Mongolia // Bulletin of the Buryat State University. Issue 3. Chemistry and Physics S. 3 - 5.,</p>
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					<p>3. Namsaraev B.B., Barkhutova D.D., Lavrentyeva E.V., Abidueva E.Yu., Buyantueva, L.B., Dambaev V.B., Tsyrenova D.D., Temenzhargal D., Oyunchimeg P., 2012. Biosphere role and biotechnological potential of microbial communities of water and terrestrial systems of the Mongolian plateau. // Research paper, ISBN 978-99962-998-0-3, Biology № 374: 3-8.</p> <p>4. Tsyrenova DD, Barkhutova DD, Namsaraev BB, Tmenzhargal D, 2012. Microbial diversity of thermal springs in Mongolia. Research Paper, ISBN 978-99962-998-0-3, Biology № 374: 9-16.</p>
J. Khulan Associate professor /Ph.D./	Georg-August-Universität Göttingen, Germany	- "One Health Innovation Fellowship for Zoonotic Disease	BIBM 619 Industrial Internship Leader	DFG scholarship covered Germany	Textbook: J. Khulan "General genetics" basic learning

		Research in Mongolia” program. Member of the management team 2013-2018 - “Succession of ancient Mongolian nomads” (archeology, molecular genetics research) 2014-2016		University of London, United Kingdom (UCL)	J. Khulan “Theory and policy of genetics and molecular genetics” Publication: 14
B. Ugtakhjargal	Master, Marketing and Business Administration	“Energy Resource LLC Supply and Catering Service Tender Project” MMC-CMS, USS LLC, MCS group, 2011 “Canadian Embassy Cleaning and Service Tender Project” ULAAN / JANITORIAL / 2011-12, USS LLC, MCS group, 2011	BIBM 618 Value Added Product Marketing	Korean university of international study, Seoul, БНСУ, ММХ болон Robins School of Business University of Richmond Youth business International, YBM	
N. Batdelger	Tokyo University of Agriculture Ph.D.		BIBM 602 Food and Agriculture Business Management		

European union			BIBM 613 Food Processing Innovation  BIBM 614 Develop new products  BIBM 615 Food storage and packaging		
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Table 7. Part-time / contract and other teacher information

EU teachers:

- Teachers of Food Engineering, French Agrocampus - Consortium of Western French Agricultural Engineering Universities
- Teachers of Food and Agricultural Business Management, Wageningen University,
- Teachers of Food and Agricultural Marketing, University of St. Compostenela, Santiago, Spain.

2.6 Learning environment requirements:

- Library and book supply: How many basic and doctoral textbooks published in the last 10 years are available in the library of the National University of Mongolia, how many in Mongolian language, and other teaching, research materials, reports, and online sources names and e-learning supply and adequacy research.

	Author	Book name	Published year	Book number in the NUM library
1	D. Purev	Biochemistry	2002	32
2	Ts. Namsrai	Biochemistry	1999	23
3	J. Bayarmaa	Ecology chemistry	2002	24
4	Yo. Dulmaa	Biology chemistry	2013	5
5	J. Baljinyam et.al	Food production process equipment	2009	30
6	D. Jambal	Organic chemistry Stereochemistry	2009	39
7	Ts. Oyunsuren	Molecular genetics	2003	29
8	J. Khulan	General genetics	2010	44
9	D. Tsermaa	Soil microbiology	2000	11
10	L. Damdinsuren	Milk, dairy microbiology	2004	8
11	B. Davaadorj	General microbiology	2010	5
12	L. Galt	Microbiology	2009	31
13	Ts. Namsrai	Биохими-IV Апофермент, Кофермент Biochemistry-IV Apo ferment, Coferment	2005	19
14	D. Enebish	Metabolic biochemistry	2000	5
15	D. Enebish	Metabolic biochemistry	2012	20
16	D. Enebish	Basics of hormonal biochemistry	2012	20

17	D. Urtnasan	Vitamin biochemistry, technology	2008	15
18	B. Erdenebaatar	Basics of endocrinology	2000	30
19	D. Purev	Basics of Biotechnology	2011	44
20	Ya. Ganbold	Biotechnology	2002	15
21	Kh. Altantsetseg	Plant biotechnology	2005	7
22	N. Oyuntsetseg	General organic chemistry	2003	31
23	D. Purev	Enzymology	2012	36
24	D. Enebish	Basics of general enzymology	2012	20
25	Ts. Namsrai B. Ochirkhuyag	Biochemistry I, Protein, Protein chemistry	2002	19
26	L. Galt	Study of Plant disease	2012	15
27	J. Sukhdolgor	Plant chemistry and biochemistry / practical manual /	2013	5
28	B. Bayart	Immunology	1999	10
29	Kulberg. A.Ya.	Molecular immunology	1985	4

- Research on the supply and adequacy of e-learning courses under the program - Annex.
- Training facilities and material conditions: Supply and availability of classrooms, laboratories, equipment and facilities required for training in the specialty, opportunities to operate TA, RA, SA-appendix.

#### 2.7 Quality Assurance:

- Locally accredited / intended to be accredited, name of accreditation body
- Foreign accredited / expected date of accreditation, name of accrediting organization
- The department has monitored the program, the staff has identified the mechanism for evaluating the program in cooperation with the school CHA, and the methodology for assessing student and alumni satisfaction has been planned.

#### 2.8. Cooperation and communication

- Comparative analysis and experience of similar programs from world-renowned universities (at least 3 from the list of the world's best universities published by the Ministry of Education, Culture and Science) in curriculum development.

The following table summarizes a comparative study of similar curricula from world-renowned universities in developing curricula.

NUM, School of Sciences, School of Natural Sciences	Compared University		
	University of Georgia, USA	Cornell University, USA	Ghent University, Belgium
	<a href="https://online.uga.edu/online-offerings/graduate/master-in-food-technology">https://online.uga.edu/online-offerings/graduate/master-in-food-technology</a>	<a href="https://foodscience.cals.cornell.edu/sites/foodscience.cals.cornell.edu/files/shared/MPS-Food-Science.pdf">https://foodscience.cals.cornell.edu/sites/foodscience.cals.cornell.edu/files/shared/MPS-Food-Science.pdf</a>	<a href="http://www.studiegids.ugent.be/2015/EN/FACULTY/I/NVT/IEFONU/IEFONU.html">http://www.studiegids.ugent.be/2015/EN/FACULTY/I/NVT/IEFONU/IEFONU.html</a>
Course code, name, unit			
MNGT721 Leadership 2			
MNGT703 Business communication and managerial skills 2			
BIBM 600 Professional Introduction, 1		FDSC 5000 MPS Project (1-3)	
BIBM 601, Problems of basic science of food science, 3	FDST 7020E - Integration of Multidisciplinary Topics in Foods (3)	FDSC 4210 Food Engineering Principles (3)	Product technology courses (4)
BIBM 602 Food and agricultural business management strategy, 3			Management in the Bio-economy (5)
BIBM 610 Food product biochemistry, 2	FDST 7030E - Food Biochemical Reactions (3)	FDSC 4170 Food Chemistry II (3)	Food Chemistry and Analysis (7)
BIBM 611 Microbiological safety of food bioproducts, 2	FDST 7110E - Principles of HACCP and Microbial Spoilage for Food Professionals (2)	FDSC 3960 Food Safety Assurance (2)	HACCP- Concepts and Quality Assurance (4)



BIBM 612 Food control analysis	FDST 7060E - Microbial Hazards in Food: Assessment and Control (3)		Quality Management and Risk Analysis (2)
BIBM 613 Food processing innovation, 2	FDST 7090E - Innovations in Food Processing (3)	FDSC 4000 Current Topics in Food Science and Technology (1)	Food processing (7)
BIBM 614 Food technology design, 2	FDST 7250E - Food Product Development (3 )	FDSC 4010 Concepts of Product Development (2)	Plant Based Food Products and Ingredients (4)
BIBM 615 Food packaging and storage, 2	FDST 7080E - Contemporary Advances and Issues in Food Packaging Technology (3)	FDSC 4230 Physical Principles of Food Preservation and Manufacturing (3)	Food Packaging and Transportation (4)
BIBM 616 Fermentation technology and dairy products, 2	FDST 7120E - Food Fermentation Technology (1)	FDSC 6040 Chemistry of Dairy Products (2)	Milk & Dairy Technology (4)
BIOC 712 Mongolian traditional dairy products,2	FDST 7070E - Functional Foods (3)		
BIBM 617 Cooperatives and small and medium enterprise business management, 2			Design and Management of Storage and Distribution Structures (5)
BIBM 618 Food production marketing, 2	FDST 7180E - Marketing of Value-Added Foods (3)		• Food Marketing and Consumer Behaviour (4)
BIBM 620 Professional internship, 4	FDSC 5000 MPS Project (3)		

## 2.9 Management Information System

- At least 75% of the total number of professional and specialized courses taught in master's and doctoral programs has been developed.

A department in which at least 75% of the teachers supervising the master's and dissertation research work / doctoral dissertation are working / the program is developed and submitted to the Sub-Committee and General Committee of the program and the department is responsible for creating, improving, reporting, publishing and maintaining the program database. The program and composition include the name and contact information of the person in charge of the school. (This responsibility is the responsibility of the relevant committees and the secretaries of the committees are responsible for this work. The database contains the above information and is stored in hard copy and electronically in accordance with the regulations of the NUM official documents)

No	Specifications	Requirements
1	Name of the component school	School of Industrial technology
2	Advanced program name	"Food chain business management"
3	Advanced program type	<input type="checkbox"/> Professional master <input type="checkbox"/> Research master <input type="checkbox"/> Doctor
4	Basis	<p><i>All countries pay attention to the fact that domestic food production is the basis for ensuring food independence of Mongolians from foreign countries and ensuring the healthy and safe existence of the population. Our country needs to focus on processing nutritious and quality food rather than food shortages. The entire FOOD CHAIN system, from the proper management of agriculture, which prepares the main raw materials for food and public catering, to the delivery of consumers, requires scientific knowledge, knowledge of the industry, and skilled management and industry managers. This is because skilled human resources are essential for the development of any sector, and currently there is no unified policy and planning in our country, as evidenced by the policy and planning of the Government and the line ministries.</i></p> <ul style="list-style-type: none"> <li>• <i>The Government's policy reflects the need to develop agricultural production in our country as follows. These include:</i> <ul style="list-style-type: none"> <li>o <i>About 85.0 percent of 331 soums have an economy based on agricultural production.</i></li> <li>o <i>Mongolia's Sustainable Development Concept 2030 "Sustainable Economic Development" Group's Industrial Policy Objective 2 Introduces advanced technology in food production, improves competitiveness, meets the needs of key food products through domestic production, and provides citizens with healthy and safe food conditions.</i></li> </ul> </li> </ul> <p><i>Therefore, there is an advanced methodology to train scientific and skilled managers in the field of agriculture, food and catering after graduation and to study without leaving the workplace.</i></p> <p><i>The program will be a pioneer in the introduction of the training, and the program as a whole is aimed at training a complex of specialists with knowledge of food processing, technology, business and financial management.</i></p>
5	Organization	<input type="checkbox"/> at the school <input type="checkbox"/> cooperate with other school  <div style="text-align: right;"> <i>Percentage each school</i>            _____ NUM,            50 _____ %             _____ %         </div>

		_____ %
6	Cooperating schools	NUM
7	Funding	<input type="checkbox"/> Tuition fees <input type="checkbox"/> Financial support of the Mongolian University of Science and Technology <input type="checkbox"/> Investment of Mongolian domestic companies <input type="checkbox"/> Foreign university / research institution <input type="checkbox"/> A company with foreign investment <input type="checkbox"/> Other _____
8	Program organization	<input type="checkbox"/> Full time <i>If training in cooperation with a foreign university / research institution _____ months in Mongolia and _____ months abroad</i> <input type="checkbox"/> Part time <i>Classroom training _____ months, e-learning _____ months</i> <i>If training in cooperation with a foreign university / research institution _____ months in Mongolia and _____ months abroad</i> <i>Classroom training _____ months, distance learning _____ 100% _____ months, industrial internship _____ 2 (internship) _____ months</i>
9	Plan structure	Training _80 ___% _ Research _20 ___% _ Social services _____% _ Teach a lesson _____% _
10	Infrastructure required for the program	<input type="checkbox"/> Research laboratory _____ _____ _____ _____ <ul style="list-style-type: none"> <li>○ Owned by the MUST, ○ It needs to be established at the MUST,</li> <li>○ Available at local research institutes, ○ Available at research institutes abroad,</li> <li>○ Бүгдэд</li> </ul> _____ _____ _____ <input type="checkbox"/> Special software _____ Unknown at this time _____

		_____
		_____
1 1	Curriculum	<p>Total number of credits to collect ____ 34 ____</p> <p>Class requirement credit _____ 34</p> <p>(Breadth classes) credit _____ -</p> <p>Number of research articles (in Mongolian) _____</p> <p>Number of research articles (in English) _____</p> <p>Number of lessons taught _____ 14</p> <p>Others</p> <p>_____</p> <p>_____</p> <p>_____</p>
1 2	Resources and capacity of teachers and researchers	<p><input type="checkbox"/> Lecturer and researcher: NUM, MUST</p> <p><input type="checkbox"/> Whether to hire outside teachers and researchers to conduct the training</p>
1 3	Tuition fee	<p><input type="checkbox"/> Paid _____ MNT</p> <p><i>Please attach a justification</i></p> <p><input type="checkbox"/> Scholarship _____ MNT</p> <p><i>Please attach the scholarship criteria</i></p> <p><input type="checkbox"/> Free of charge. Financing organization</p> <p>_____</p>
1 4	Estimates of costs required for professors, teachers and researchers to conduct advanced training	<p>Professor's salary (Mongolia) _____</p> <p>MNT</p> <p>Abroad professor's salary (Mongolia)</p> <p>_____ MNT</p> <p>Research support _____ MNT</p> <p><i>Provide detailed information on what research, how long, and how often</i></p> <p>Publication support _____ MNT</p> <p>Support for participation in conferences</p> <p>_____ MNT</p> <p>Others</p> <p>_____</p> <p>_____</p> <p><i>Include classrooms and work environments.</i></p>
1 5	Research areas that can be implemented under the program and current projects and programs	<p>Areas of research</p> <p>Current projects and programs</p> <p>Projects and programs that can be implemented individually or in cooperation with foreign and domestic organizations in the future</p> <p>_____</p>

