Madan Bhandari University of Science and Technology

Chitlang, Thaha Municipality Ward 9, Bagmati Province, Nepal

Curriculum

Graduate Programs in

Organic Agriculture

October 2023

Organic Agriculture Program

1. Introduction

The Master of Applied Science and PhD programs at MBUST are STEM-focused programs directed at developing sustainable technologies for value-added utilization of the agricultural resources. The programs will train students on how to apply cutting-edge research and technologies for sustainable development of Nepal's agricultural resources to generate environmental, economic, and social benefits to the Nepalese people. Some key features of the programs include:

- A distinctive focus that differentiates from, but complements the existing agriculture related graduate programs in Nepal.
- The focus on the sustainable development of agricultural products in accordance with the specific needs of Nepal.
- The industrial applications of agricultural technologies.
- Development of systematic and specialized knowledge for efficient utilization, conservation of agricultural resources and building capacity to contribute to research and innovation to support requirements of agro-based industries.

2. Academic Programs

The Graduate Programs are offered to the students from Nepal and overseas. After the completion of programs of Master of Applied Sciences or Ph.D. in Organic Agriculture, the graduates will possess specialized knowledge and skills for research, and professional practice.

3. Program aims

The program has been designed to provide graduates with:

- The solid foundation in fundamental agriculture science and technology.
- Understanding of Nepal's agriculture management practices and importance of the climate change, biodiversity, sustainable development, economic income, and social equity to the agriculture sector.
- The first-hand knowledge of the agriculture sector through field trips, internships, and collaborative projects on real-life problems. The students will also work in the state-of-the art laboratory facilities at the university.
- The latest research analysis and computer programming tools, such as AI and data analytics and modeling.
- The entrepreneurship, communications, and leadership trainings in the curriculum to develop professional skills.
- The skills to build partnerships among industry, community, academia, and government for an enriched educational experience.
- The exposure to frontier science and technology developments through interactions with leading scientists from around the world and opportunities to participate in international training programs.
- The expertise to strengthen the agriculture-based industries.

4. Learning outcomes

The graduates specialized with cognitive and technical skills in agriculture will independently demonstrate:

- The capacity for an independent research or experimentation on agriculture
- The ability to communicate, critically use of the source material, experimental results and publish in relevant peer-reviewed academic journals.
- The ability to diversify the use of agricultural resources and optimize the management of agriculture products for livelihood improvement.
- The capacity for technological advancement and innovation in the use of agricultural resources for the economic development in a sustainable and environmentally manner.
- The capacity to produce thesis and patent application meeting the international standards of science.

5. Eligibility for Admission

a. Master of Applied Sciences

- 4-year Bachelor's degree in science/engineering/technology fields from recognized universities with CGPA of 2.75 out of 4.0 (or international equivalent)

b. Ph.D.

- Master's degree in science/engineering/technology fields from recognized universities with CGPA of 3.0 out of 4.0 (or international equivalent)

6. Courses

A. Core Courses

S.N.	Course code	Course title	Credit
1	OA-CR-501	Soil Fertility and Soil Ecology in Organic Agriculture	4
2	OA-CR-502	Organic Agricultural Food Systems and Agroecology	4
3	OA-CR-550	Plant Protection in Organic Agricultural System	4
4	OA-CR-551	Animal Production in Organic Agriculture	4
5	GC-CR-501	Development Policy	4

B. Non-Credit Compulsory Courses

S.N.	Course code	Course title	Credit
1	GC-NC-502	Research Methodology and Data Mining	0

2	GC-NC-550	Entrepreneurship, Scientific Communication, Socioeconomic and Leadership	0
3	OA-NC-601	Technology Management	0

C. Technical Elective Courses

S.N.	Course Code	Course Title	Credit
1	OA-EL-561	Analysis and Management of Sustainable Organic Production Chain	4
2	OA-EL-562	Organic Fruit Production	4
3	OA-EL-563	Organic Production of Vegetables and Ornamentals	4
4	OA-EL-564	Bioinoculants in Organic Agriculture	4
5	OA-EL-565	Animal Nutrition, Fodder Production and Pasture Management	4
6	OA-EL-566	Post-Harvest Technology in Organic Agriculture	4
7	OA-EL-567	Marketing and Financial Management in Organic Agriculture Sector	4
8	OA-EL-568	Organic Certification	4
9	OA-EL-569	Spawn Production and Mushroom Cultivation	4
10	OA-El-570	Biological Control	4
11	OA-EL-571	Production Technology of Beverage (Tea &Coffee) and Spice Crops (Cardamom, Zinger, Turmeric) etc.	4

7. Course Structure

7.1. Master of Applied Science in Organic Agriculture

Duration of the Course: 2 years

Semester I				Semester II		
Course Code	**Course Title**	**Credit**		**Course Code**	**Course Title**	**Credit**
OA-CR-501	Soil Fertility and Soil Ecology in Organic Agriculture	4		OA-CR-550 Or OA-CR-551	Plant Protection in Organic Agricultural System Or Animal Production in Organic Agriculture	4
OA-CR-502	Organic Agricultural Food Systems and Agroecology	4		GC-NC-550	Entrepreneurship, Scientific Communication, Socioeconomic and Leadership	0
GC-CR-501	Development Policy	4		OA-EL-561~571	One course from the list related to thesis	4
GC-NC-502	Research Methodology and Data Mining	0		OA-TH-699	Thesis	
Semester III				**Semester IV**		
Course Code	**Course Title**	**Credit**		**Course Code**	**Course Title**	**Credit**
OA-NC-601	Technology Management	0				
OA-TH-699	Thesis			OA-TH-699	Thesis	
Total credit for Thesis = 30 credit Total credit for Master of Applied Science = 50 credit (16 credit core course + 4 credit Technical elective + 30 credit Thesis)						

7.2. Ph.D. in Organic Agriculture

Duration of the Course: 3 years

Semester I				**Semester II**		
Course Code	**Course Title**	**Credit**		**Course Code**	**Course Title**	**Credit**
OA-CR-501	Soil Fertility and Soil Ecology in Organic Agriculture	4		OA-CR-550 Or OA-CR-551	Plant Protection in Organic Agricultural System Or Animal Production in Organic Agriculture	4
OA-CR-502	Organic Agricultural Food Systems and Agroecology	4		GC-NC-550	Entrepreneurship, Scientific Communication, Socioeconomic and Leadership	0
GC-CR-501	Development Policy	4		OA-EL-561~571	One course from the list related to thesis	4
GC-NC-502	Research Methodology and Data Mining	0		OA-TH-999	Thesis	
Semester III				**Semester IV**		
Course Code	**Course Title**	**Credit**		**Course Code**	**Course Title**	**Credit**
OA-EL-561~571	One course from the list related to thesis	4		OA-TH-999	Thesis	
OA-TH-999	Thesis					

OA-NC-601	Technology Management	0				
Semester V				**Semester VI**		
Course Code	**Course Title**	**Credit**		**Course Code**	**Course Title**	**Credit**
OA-TH-999	Thesis			OA-TH-999	Thesis	
Total credit for Thesis = 51 credit Total credit for Ph.D. = 75 credit (16 credit core course + 8 credit Technical elective + 51 credit Thesis)						

If someone enrolls into Ph.D. program after completing Master of Applied Science, courses taken at the Master's level will be exempted. However, he/she may have to take additional technical elective courses.

8. Course Description

8.1.Core Courses

Course Code	Course Title	Description
OA-CR-501	Soil Fertility and Soil Ecology in Organic Agriculture	Interaction between plant, soil and soil organism, nutrient cycling, stability of agricultural and natural ecosystems, mycorrhizae and their effect on plant, root growth and biology of the rhizosphere, soil structure and fertility; soil erosion and conservation. crop rotation, intercropping; supplementary nutrients; mulching; composting; animal manure; green manure; nitrogen fixers; fertility builders; comfrey and liquid teas; wormeries, soil ecology and conservation, organic recycling and farm management
OA-CR-502	Organic Agricultural Food Systems and Agroecology	Ecology of sustainable food systems, environmental factors and complexities affecting agricultural crops and livestock, role of livestock animals in agroecosystems, cultural and community aspects of sustainable food systems, study of managed ecosystems and the application of ecological

		practices to achieve economically and environmentally sustainable agriculture production. Agroecology and climate change, future food systems, organic bio-intensive farming system (agricultural systems), integrated agricultural production system
OA-CR-550	Plant Protection in Organic Agriculture System	Crop protection in organic agriculture system. Interaction between plant, pathogen and beneficial microorganism showing biological control. Basic principles and history of plant protection in organic agriculture system. Concept and aim of biological management of crop diseases. Integrated organic plant protection. Available plant technologies and future opportunities
OA-CR-551	Animal Production in Organic Agriculture	Animal production in organic system, animal management principles, interaction of animal with plant and soil, cattle and buffalo, small ruminant (goats and sheep) and non-ruminant production (pig and poultry), apiculture, fish farming, grazing system on organic farms including the role of livestock in maintaining the sustainability of the soil-plant-animal system and safety measures
GC-CR-501	Development Policy	Public policies in developing countries, cases of education, health, trade, industry, energy, water, natural resource, sanitation, agriculture, labor, and social protection, policies related to market failures, government failures; and possible remedies

8.2.Non-Credit Courses

Course Code	**Course Title**	**Description**
GC-NC-502	Research Methodology and Data Mining	• Research methodology (critical literature review, formulation of research proposal, and develop research questions/hypothesis, thesis writing etc.)

		• Statistical methods and tools for data analysis (Design of experiments, analysis of variance, data regression, correlation analysis, etc.) • AI and data analytics (Computer coding and deep learning basics, clustering analysis, etc.)
GC-NC-550	Entrepreneurship, Scientific Communications, Socioeconomic and Leadership	• Entrepreneurship (business case and startup) • Leadership skills • Communications (technical writings and presentation skills) • Academic Writing
OA-NC-601	Technology Management	• Agriculture management systems and practices • Agriculture and climate change • Environmental management, circular economy, and carbon policy • Sustainable development issues and UN goals • Field trip to agricultural farms

8.3.Technical Elective Courses

Course Code	Course Title	Description
OA-EL-561	Analysis and Management of Sustainable Organic Production Chain	Pest and disease management: monocultures, biodiversity; plant health; crop rotation; variety selection; companion planting; cultural control; biological control; permissible biocides; life cycles and preferred habitats of beneficial insects and predators; apiculture; bio-fumigation; weed control: tillage; direct control; tools and machinery; value of weed as indicator plant (soil quality, characteristics, nutrient availability, dynamic nutrient accumulators; value chain of organic products, organic bio-intensive farming system
OA - EL-562	Organic Fruit Production	Planning an organic orchard, site preparation, soil polarization, crop rotation, cover crops, pest and disease management, plant health and vigor, biological control, fertilization, organic weed management, herbicides in

Course Code	Course Title	Description
		organic production, management of vertebrate pests: specifications for cultivation practices of high value and economically important fruit crops and nuts, major fruit crops having organic production potentiality
OA - EL-563	Organic Production of Vegetables and Ornamentals	Principles of organic crop production and its adoption practices, skill and knowledge of organic horticulture; relevance of ancient and traditional agricultural practices; importance of sound science; development and consequences of chemical use in non-organic crop production, biodynamics; agroforestry; permaculture; habitat diversity; beetle banks; environmental grants; relevant current legislation and codes of practice, available organic production technologies and opportunities, major vegetable crops for organic production
OA - EL-564	Bioinoculants in Organic Agriculture	Biofertilizers and biopesticides in sustainable agriculture, management of soil and crop diseases and remediation of polluted soil, integrating microbial management approaches to achieve desired level of crop yield through the use of biopesticides and other botanicals, local methods of biofertilizer preparation, characterization of bioinoculants suitable for the specific crop and soil environment. Mass production of effective bioinoculants
OA - EL-565	Animal Nutrition, Fodder Production and Pasture Management	Industrial and domestic animal nutrition, classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, formulation of diets; classification of fodder crops, chemical composition and nutritive value of fodder; cultivation practice of fodder; hay and silage making; conventional and non-conventional fodders; basic

Course Code	Course Title	Description
		principles of pasture management, systems of grazing and renovation of degraded pasture; silvi-pasture and its importance; insect as animal feed
OA - EL-566	Post-Harvest Technology in Organic Agriculture	Handling of fruits and vegetables at pre-harvest, harvest and post-harvest stages, post-harvest treatment of fruits and vegetables; causes of post-harvest losses and management practices: GAP protocol for sanitation of horticultural produce, approved chemicals for use in the organic post-harvest system, packaging and storage, transportation and marketing of major horticultural crops; preservatives; Jam, Jelly and Marmalade preparation, tomato ketchup preparation, drying, available post-harvest technologies in organic agriculture
OA - EL-567	Marketing and Financial Management in Organic Agriculture Sector	Understanding methods and markets for organic crops: modules; crop care, weather and crop insurance; harvest; quality check, health and safety; personal protective equipment (PPE); marketing and economics: retail outlets; packers; supermarkets; wholesalers; direct marketing; box schemes; farmers' markets; community-supported agriculture; cooperatives; net sales; farm shops; processing; consumer contact; presentation; business planning; machinery; equipment; facilities; labor, participatory marketing of organic products
OA - EL-568	Organic Certification	Purpose of certification, process of obtaining organic certification, certification and product labelling, regulatory mechanism for organic certification in India/Nepal/world (standard references), national standards for organic production in India/Nepal/world (standard references), inspection and certification

Course Code	Course Title	Description
		process, market, trade, export of organic produce and internal inspection, International Requirements for Organic Certification Bodies (IROCB), practices of informal organic certification system
OA - EL-569	Spawn Production and Mushroom Cultivation	Mushroom morphology, taxonomy, biodiversity, biogeography and ecology; methods of studying basic mycology including fieldwork, molecular lab etc; nutritional and health benefits; sanitation of mushroom house and instruments; pure culture and mother spawn, culture maintenance, production and selection of good quality spawn; raw materials for substrate preparation, spawning/spawn run, casing and case–run, cropping and harvesting, major insect pests and diseases, competitor moulds, post-harvest preservation and processing, management of spent substrates and waste disposal
OA-EL-570	Biological Control	History and Scope of Biological pest control; pest outbreaks and resurgence, role of natural enemies in pest population regulation, introduction to biological control, risks and benefits of biological control, non-target impacts assessment, augmentative biological control, inoculative and inundated biological control; conservation biological control, habitat diversity and modification of agricultural practices, roles of predators, parasitoids, pathogens, antagonists, competitors, intraguild predation, production and utilization of biological control agents, concerns and challenges of biological control
OA - EL-571	Production Technology of Beverage (Tea &Coffee) and Spice Crops	Principles-importance, scope and history of beverage (tea and coffee) and spices crops (cardamom, zinger & turmeric), organic production packages of beverages

Course Code	Course Title	Description
	(Cardamom, Zinger, Turmeric) etc.	and spices crops, IPM (Integrated pest management) and IDM (Integrated disease management) in beverages and spice crops, post-harvest handling, processing and export of beverages and spice crops