QUALIFICATION SPECIFICATION							SECTION A
QUALIFICATION DEVELOPER	**Botswana University of Agriculture and Natural Resources**						
TITLE	Bachelor of Science in Food Science and Technology				**NCQF LEVEL**	7	
FIELD	Agriculture and Nature Conservation		**SUB-FIELD**	Food Science and Technology			
New qualification	✔		Review of existing qualification				
SUB-FRAMEWORK	General Education		TVET		Higher Education	✔	
QUALIFICATION TYPE	Certificate		Diploma		Bachelor	✔	
	Bachelor Honours		Master		Doctor		
CREDIT VALUE					520		

RATIONALE AND PURPOSE OF THE QUALIFICATION

Rationale

Efforts made in Botswana and the whole region to improve crop and animal production are severely hampered by factors such as low and erratic rainfall, endemic droughts, high summer temperatures, low soil fertility and high incidence of pests, diseases and weeds. Lack of technology adoption by farmers, poor research-extension linkages and limited human resources have also been cited as contributing to poor performance in food safety and security.

Government of Botswana has adopted the agricultural development initiative known as the National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) which will, inter alia:

(i) Address improvement in food security at both household and national level.
(ii) Promote the establishment of agro-industries.
(iii) Create additional employment in the country, especially in rural areas.

Botswana has a well-established and relatively successful drought relief management programme, which enabled her to safeguard the welfare of vulnerable population groups during the droughts of 1982-87 and 1991-92. The district-level capacity to monitor food emergencies through a timely and comprehensive Food Security and Nutrition Monitoring (FSNM) system was cited as one of the contributing factors for Botswana's success in mitigating the effects of droughts. For successful implementation of the FSNM system, having a critical mass of people trained in food and nutrition from various sectors, including the university and other academic institutions, is imperative (I. Masih et al., 2014).

An FAO/WHO survey stated that in Africa, including Botswana, food safety control laboratories are the weakest in fighting food borne diseases due to lack of manpower and financial resources for the development and maintenance of equipment. Our survey also showed an overall shortage of trained personnel to support laboratory services and recommended that African countries consider local

mobilization for graduate and postgraduate training in Food Science and Technology. The Government of Botswana long considered assuring food safety and quality in the small and medium-size food enterprises (on the economic and social importance of small and medium food enterprises (SMEs) in Africa. This included definitions of SMEs and the application of appropriate quality assurance schemes in food SMEs, including the benefits of GAP/GHP/GMP, HACCP and ISO quality management standards (FAO/WHO regional conference on food safety in Africa, 2005)

There are many value addition opportunities in the Botswana agricultural sector in which the BSc Food Science and Technology graduates could be involved. As economic growth in developing countries including Botswana improve, incomes rise, and diets of people improve. The demand for meats, vegetables, fruits, dairy products, vegetable oils, processed foods, beverages, and other goods will increase as consumers diversify their diets away from grains and other staple foods. In the beef industry, Botswana Meat Commission exports prime beef cuts to the EU leaving non-prime meat cuts which can be processed into value-added products for local and export markets within Africa and beyond. For the local market, the potential still exists in the development of products based on traditional recipes such as *seswaa* and *serobe*, among others. The ostrich industry also offers a lot of opportunities as only about 50% of meat from the ostrich is of export quality, the rest could be processed into value-added ostrich meat products which provide a healthier alternative compared to beef. In plant products, potential exists for exploitation of indigenous plant resources especially fruits and vegetables. With Government support in irrigated crop production, there is a need to develop plant products as a means of value addition to accommodate surplus produce and reduce reliance on imported processed food products. In addition, Botswana is endowed with a variety of traditional food plants which grow annually despite erratic rainfall (G. M. Legwaila et al., 2011).

In Botswana, the Food Control Unit is under Community Health Services Division in the Ministry of Health. Its mission is to promote the health of people living in Botswana by ensuring the availability of a safe and nutritious food supply, reducing the incidence of food-borne diseases, and assisting the food industry. Food security at the National level has been met through domestic production and imports. However, domestic production has always been low. For example, according to the NDP 9 document, production of cereals (maize and sorghum), which provide 50% of energy requirements, met only 10% of the national cereal requirement and the balance has been met through imports. Graduates of the proposed BSc in Food Science and Technology (BSc FST) would play an active role in stimulating food production, preservation and post-harvest management, value addition, hygiene, safety, and security. The Government of Botswana has continued to allocate a significant amount of fund for agricultural development and food security (Tertiary Education Statistics, 2018).

Purpose

The purpose of this qualification is to:

1. Provide qualifiers with knowledge and skills in Food Science and Technology and satisfy the needs of society for sustainable food quality, safety, and security.
2. Produce graduates who will be responsible for the production, storage, distribution, marketing of food and beverages from agricultural raw materials.

ENTRY REQUIREMENTS (including access and inclusion)
• The minimum entry requirement is NCQF Level IV or other equivalent with passes in relevant subjects. • Any relevant vocational qualification at NCQF Levels 5 or 6 in Forestry and related fields may render the candidate eligible for exemptions or credit transfer in accordance with applicable policies. • Applicants that do not meet the above criteria but possess relevant industry experience will be considered through recognition of prior learning (RPL).

QUALIFICATION SPECIFICATION **SECTION B**	
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
Holders of this qualification should be able to: 1. Demonstrate the ability to describe food science and technology principles to meet the needs of the society	• Proficient in the use of vocabulary terms in food science and technology • Develop an understanding of physical, chemical, microbiological, and biological characteristics of foods • Describe the composition, structure and characteristics of foods including their raw materials and possible changes that may arise during their processing.
2. Choose technologies in the development of animal and plant-based food products	• Generate concepts of new product ideas, make prototypes, and develop novel food products to meet the commercial needs of consumers • Plan and execute a food product development project • Select appropriate ingredients and raw materials for a food product development venture • Use appropriate technology and point out effective procedures in resource management

3. Conduct laboratory analysis and determine the physical, chemical, and microbiological characteristics of food	• Proficient in methods of food analysis (chemical, physical, microbiological), evaluate and select optimal methodology • Prepare relevant reagents that can be used for laboratory analysis • Skillful in the use of food science and technology laboratory equipment • Apply laboratory safety requirements and be cognizant with the regulations • Competent in data analysis and report writing and drive conclusion
4. Conduct sensory evaluation of food products	• Develop a relevant document (questionnaire) that can be used for a specific sensory evaluation project • Establish a set up for sensory evaluation experiments • Provide training for a sensory panel • Analyze and report data from sensory evaluation experiments and derive conclusions
5. Ensure safety and quality of food along the food production and distribution chain	• Apply basic methodology to determine the shelf life of food products • Proficient in National and International food safety regulations and apply them • Suggest appropriate processing methods and distribution channels for specific food products • Design packaging methods and materials
6. Develop and maintain small and medium scale food enterprises	• Develop a project concept/proposal to establish A small-scale food enterprise • Efficiently present proposals/ concepts to funding authorities/agencies • Plan and execute food enterprises effectively

7. Participate in educational activities to expand knowledge of professional practice and enhance own competencies and performance	• Teach food science and technology and related fields • Develop modules and teaching/educational materials • Develop teaching, learning and assessment methods
8. Conduct research in the are of food science and technology	• Develop a research proposal and defend it • Execute experiments and collect data • Analyze data, derive conclusions, and write reports
9. Organize, implement and manage food production and delivery through the provision of leadership and technical support	• Demonstrate the understanding on leadership principle • Plan, design, implement and manage production processes in food industries • Make decisions regarding resource management

QUALIFICATION STRUCTURE **SECTION C**

	Title	**Level**	**Credits**
FUNDAMENTAL COMPONENT Modules	Mathematics	5	12
	General and Inorganic Chemistry	5	12
	Physics	5	12
	Biology of Cells	5	12
	Physical and Organic Chemistry	5	12
	Biodiversity	5	12
	Communication and Academic Literacy Skills	6	12
	Computer Skills Fundamentals	6	8
	Scientific Writing and Presentation Skills	7	12
	Sub Total		**104**

CORE COMPONENT Modules	Fundamentals of Thermodynamics	06	8
	Biometry I	06	8
	Biochemistry	06	8
	Introduction to Agricultural Economics	06	8
	Introduction to Food Science and Technology	07	12
	Food Chemistry	07	12
	Sanitation and Waste Management	07	12
	Introduction to Fluid Mechanics	06	12
	General Microbiology	05	8
	Field Practical Training	07	12
	Food Analysis	07	12
	Biometry II	07	8
	Food Microbiology	07	12
	Food Engineering	07	12
	Food and Human Nutrition	07	12
	Livestock Product Processing	07	12
	Food Quality and Safety	07	12
	Dairy Science and Technology	07	12
	Livestock Production Systems	07	12
	Principles of Crop Production	07	12
	Fruit and Vegetable Processing	07	12
	Production Economics	07	12
	Agricultural and Food Marketing	07	12
	Field Practical Training	07	12
	Project	07	8
	Food Preservation and Storage	07	12
	Cereal Science and Technology	07	12
	Sensory Evaluation	07	8
	Edible Oils and Fats Technology	07	12
	Beverage Science and Technology	07	8
	Project	07	8
	Food Packaging	07	12
	Food Biotechnology	07	12
	Food Product Development and Evaluation	07	12
	Small Business Entrepreneurship	07	12
	Sub Total		**380**
Elective Component Modules			
	Learners can select 3 Modules offered in the University as GEC/Elective (12 credits each)		
	GEC/Elective (at level 300 – Semester 5)	07	12

	GEC/Elective (at level 300 – Semester 6)	07	12
	GEC/Elective (at level 400 – Semester 7)	07	12
	Sub Total		**36**

Rules of combinations, Credit distribution (where applicable):

1. The learner is required to take all the Fundamental and Core Modules.
2. For Electives, the learner is required to select one University wide Module during Semesters 5, 6 and 7.

This qualification has 520 credits and requires four years to complete. The credit distribution is as follows:

Level		Total Credits
Fundamental:	5	72
	6	20
	7	12
Core:	5	8
	6	44
	7	328
Electives:	7	36
TOTAL		**520**

ASSESMENT AND MODERATION ARRANGEMENTS

ASSESSMENT ARRANGEMENTS

All assessments, formative and summative, leading/contributing to the award of credits or qualification will be based on learning outcomes and/or sub-outcomes.

Formative assessment

The contribution of formative assessment to the final grade is 50%.

Summative assessment

The contribution of summative assessment to the final grade is 50%.

Research Project: Leaners will undertake a research project as partial fulfillment of the award of the qualification.

MODERATION ARRANGEMENTS

The purpose of the moderation is to ensure that assessment and marking across all Modules is fair, valid, and reliable. It also ensures that the assessment tool is aligned to the learning outcomes, that it is set at appropriate level of study and, that the process of marking is consistent.

Internal and external moderators to be engaged will be BQA accredited subject specialists in relevant fields with relevant industry experience and academic qualifications.

Both internal and external moderation shall be done in accordance with applicable policies and regulations.

RECOGNITION OF PRIOR LEARNING (if applicable)

Learners with appropriate experience and informal or non-formal training who wish to be assessed, may arrange to be assessed without having to attend further education or training (RPL). The assessor will decide on the most appropriate assessment procedures after discussion with the learner.

A prospective learner may be considered for entry on the basis of RPL, prior employment in the relevant field or the acquisition of a non-award qualification in a relevant field. Learners who which to apply for RPL must provide evidence in terms of completed qualifications along with other relevant documentation.

Learners who possess skills acquired through life or work experience and non-formal education will be assessed and awarded credit or exemptions where applicable. Credit for previous learning may be obtained through the processes of articulation, credit transfer and RPL or a combination of these processes.

Learners may submit evidence of prior learning and current competences and or/or undergo appropriate form of RPL assessment for the award for the credits towards the qualification. The RPL assessment will focus on ways of evaluating a learner's lifelong experiences (formal and non-formal) against a set of pre-determined criteria as detailed in the PRL Policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning progression Pathways

This qualification is intended to provide learners with both horizontal and vertical articulation possibilities.

1. Vertical progression

- Master of Science in Food Science,
- Master of Science in Food Chemistry,
- Master of Science in Food Microbiology,
- Master of Science in Food Technology,
- Master of Science in Postharvest Technology,
- Master of Science in Food Engineering,
- Master of Science in Chemical engineering
- Master of Science in Nutrition and Public Health,
- Master of Science in Agriculture

2. Horizontal progression

- Bachelor of Science degree in Chemical and physical Sciences,
- Bachelor of Science degree in Biological Sciences

3. Employment/Job progression

BSc graduates work as an expert in the food and allied sectors:

- Agro-industries (meat, fish, egg, dairy products, grains, oil seeds, fruit and vegetables, sugar and confections, honey, beverages, wild edible foods, etc.).
- Postharvest handling, quality management and reduction of loss of agricultural produce.
- Food product formulations and development to meet the ever-increasing life style changes.
- Improvement of traditional food processing technologies.
- Food analysis to safeguard quality and safety.
- Food nutrition and health
- Food security and poverty reduction
- Entrepreneurship in the food sectors
- Food packaging development distribution and marketing of foods.
- Hospitality industry

QUALIFICATION AWARD AND CERTIFICATION

Minimum standard of achievement for the award of the qualification

A candidate is required to achieve total credits of 520 inclusive of fundamental, core and elective components to be awarded the qualification. All the learning outcomes should be met for award of the qualification.

Certification

The learner meeting prescribed requirements will be awarded the qualification in accordance with standards prescribed for the award of the qualification and applicable policies.

REGIONAL AND INTERNATIONAL COMPARABILITY

Similarities

The qualification is comparable to qualifications offered at University of Durban (Bachelor of Applied Science in Food Science and Technology), University of Pretoria (BSc Agric Food Science and Technology), Monash University (Bachelor of Food Science and Technology), University of Nebraska-Lincoln (Food science and technology) and University of Reading (BSc Food Science) in terms **Main Exit Outcomes, modules offered (fundamental core and electives), assessment strategies and education and employment pathways.**

Differences

A difference is observed in terms of the total credit hours required for graduation. In the current qualification the total credit required is 520 while the credit requirements at University of Durban, University of Pretoria, Monash University, University of Nebraska-Lincoln and University of Reading (BSc Food Science) respectively are, 588, 372, 144, 120 and 120. However, it must be noted that this discrepancy is because of the methods employed to compute credit hours by the different Universities.

REVIEW PERIOD
The qualification will be reviewed every five (5) years.