SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	Botswana University of Agriculture and Natural Resources																	
TITLE	Master of Science in Agricultural Mechanization													***NCQF LEVEL***	9			
FIELD	Agriculture and Nature Conservation			***SUB-FIELD***	Agricultural Mechanization									***CREDIT VALUE***	240			
New Qualification							√	*Review of Existing Qualification*										
SUB-FRAMEWORK	*General Education*							*TVET*						*Higher Education*	√			
QUALIFICATION TYPE	*Certificate*	*I*		*II*		*III*		*IV*		*V*		*Diploma*		*Bachelor*				
	Bachelor Honours			*Post Graduate Certificate*								*Post Graduate Diploma*						
	Masters							√	*Doctorate/ PhD*									

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

The National Agricultural Master Plan for Arable Agriculture and Dairy Development (NAMPAADD, 2002) report identified the shortage of skilled human resources at all levels (including specialized disciplines) as being a key bottleneck to the development of the agricultural sector. The National Development Plans 8, 9, 10 and 11 and the NAMPAADD (2002) and ISPAAD (2008) programmes identified the lack of qualified personnel as one of the bottlenecks to the implementation of agricultural policies and development projects in Botswana. These plans have also identified tillage practices among other areas as essential for improving crop production.

It is clear that a prerequisite for rendering agricultural production economically viable is the introduction of agricultural mechanization technical skills combined with improved farm management practices. The Bachelor of Science (Agricultural Mechanization) programme was established in 2006 at BUAN to respond to some persistent calls for specialized training to enhance effective implementation of development policies and programmes. The Master of Science (Agricultural Mechanization) qualification is to better equip the holders of BSc degree to serve as specialists in Agricultural Mechanization.

The recent Agricultural Sector Human Resources Development Plan (HDRC, 2019) report has identified skills in high demand at MSc level as being 20 Agricultural engineers, and significant numbers of Farm Machinery specialists and Mechatronic engineers, among others. There is thus a growing need for personnel equipped

with advanced knowledge, skills and competences in agricultural production and other allied industries to help increase yields and products obtained by farmers and entrepreneurs.

The Needs Assessment Survey carried out by the Department of Agricultural and Biosystems Engineering (of BUAN) in June-August 2018 across Botswana showed that the Agricultural Mechanization skill was among the most favored by stakeholders (50%) (AEL, 2018).

This demand can be met, in planned phases, through Master of science in Agricultural Mechanization training.

PURPOSE:

The purpose of the qualification is to develop human resources with in-depth knowledge and skills in Agricultural Mechanization. The Master of Science in Agricultural Mechanization is specifically to equip graduates with relevant knowledge, skills and competence to:

- Demonstrate understanding of Machine Elements Design
- Apply in-depth knowledge in Turbo Machinery
- Demonstrate understanding of Soil Tillage and Traction
- Demonstrate professional management skills in Agricultural Mechanization
- Demonstrate ability to conduct scientific research experiments in Agricultural Mechanization
- Demonstrate understanding Agricultural Mechanization information and emerging issues.

ENTRY REQUIREMENTS (including access and inclusion)

The qualifying learners that will be admitted into the qualification must possess at least one of the following prior learning qualifications:

Bachelor's Degree (NCQF Level 7) in a related field

There is provision for entry through RPL and CAT in line with institutional and national policies.

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SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Demonstrate in-depth knowledge in Machine Elements Design	1.1 Apply basic concepts of strength of materials to Machine Elements Design 1.2 Estimate the nature and magnitude of static and dynamic loads in machines 1.3 Design machine elements for Agricultural Mechanization works
2. Apply in-depth knowledge in Turbo Machinery	2.1 Characterize fans, pumps and compressors 2.2 Review the selection criteria for fans, pumps and compressors 2.3 Select fans, pumps and compressors for Agricultural Mechanization works
3. Demonstrate in-depth knowledge in Soil Tillage and Traction	3.1 Analyse engineering problems relating to soil engaging implements under different soil types and conditions. 3.2 Select suitable tillage tools for different soil types and conditions. 3.3 Match tractor capacity with soil tillage tools operating with different soil types and conditions.
4. Employ professional management skills in Agricultural Mechanization	4.1 Practice ethical and professional practices and make informed judgments 4.2 Perform functions effectively in team to achieve collective decision making in Agricultural Mechanization 4.3 Create a collaborative and inclusive environment at the workplace

5. Demonstrate ability to conduct scientific research experiments in Agricultural Mechanization	5.1 Develop and conduct Agricultural Mechanization experimentation 5.2 Analyse and interpret data 5.3 Use Agricultural Mechanization judgment to draw conclusions
6. Illustrate ability to explain Agricultural Mechanization information and emerging issues.	6.1 Appraise Agricultural Mechanization data 6.2 Interpolate Agricultural Mechanization information adequately to users 6.3 Prescribe grounded solutions to Agricultural Mechanization emerging issues

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SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total (Per** Subject/ Course/ Module/ Units)*
		Level [ ]	***Level [ ]***	***Level [ ]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Engineering Statistics	9			15
	Data Acquisition and Control	9			15
				Total	**30**
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Machine Elements Design	9			15
	Turbo Machinery	9			15
	Soil Tillage and Traction	9			15
	Research and Dissertation	9			120
				Total	**165**
ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*	Set 1				
	a. Simulation and Modelling OR b. Systems Engineering in Agriculture OR c. Occupational Safety and Health in Agriculture	9			15
	Set 2				
	a. Postharvest Handling and Storage OR b. Solar Energy Utilization	9			15

	Set 3				
	a. Precision Farming OR b. Geographical Information Systems OR c. Remote Sensing	9			15
				Total	**45**

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SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Fundamental Component – Level 9	30
Core Component – Level 9	165
Elective Component – Level 9	45
TOTAL CREDITS	**240**

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

A student shall take courses of specified credits as shown in the components:

- **Fundamental Component: 30** credits
- **Core Component: 165** credits
- **Elective Component: 45** credits

All modules are at Level 9.

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ASSESSMENT ARRANGEMENTS

Formative assessment

Formative assessment is 70%.

Summative assessment

Summative assessment is 30%.

Research Project: Students will undertake a research project as partial fulfilment of the award of the qualification.

Assessment will be carried out by BQA Accredited Assessors. This will be in accordance with Institutional and National Policies.

MODERATION ARRANGEMENTS

Internal and External moderation will be carried out by BQA Accredited Moderators. This will be in accordance with Institutional and National Policies.

RECOGNITION OF PRIOR LEARNING

Due to restrictions by engineering professional accreditation bodies such as Washington Accord, Engineering Council of South Africa (ECSA) and Botswana Engineers Registration Board, RPL in this qualification is restricted.

CREDIT ACCUMULATION AND TRANSFER

Students seeking to transfer from another recognized institution may be credited with up to a maximum of one-third of the total number of credits required for the qualification.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning progression Pathways

Horizontal:

i. Master of Science in Agricultural Engineering
ii. Master of Science in Mechanical Engineering
iii. Master of Science in Advanced Mechanical Engineering
iv. Master of Science in Mechatronics

Vertical:

i. Doctor of Philosophy (PhD) in Agricultural Mechanization
ii. Doctor of Philosophy (PhD) in Agricultural Engineering
iii. Doctor of Philosophy (PhD) in Mechanical Engineering
iv Doctor of Philosophy (PhD) in Advanced Mechanical Engineering
v Doctor of Philosophy (PhD) in Mechatronics

Employment Pathways

i. Researchers at agricultural research centres, higher education institutions and farming conglomerates
ii. Consultants at Government ministries, farming conglomerates and higher education institutions
iii Professional managers at Government ministries, farming conglomerates and self-employment enterprises

QUALIFICATION AWARD AND CERTIFICATION

- Candidates meeting minimum 240 credits requirement will be awarded the Master of Science in Agricultural Mechanization
- There will be issuance of a certificate and transcript at award.

REGIONAL AND INTERNATIONAL COMPARABILITY

The MSc (Agricultural Mechanization) qualification at BUAN matches with that of Ho Technical University (Ghana) and University of Puerto Rico-Mayaguez (USA) in terms of NQF level, credit value and duration. All three ETPs are at NQF Level 9 with a credit value of 240 credits spanning two years.

The structure of the MSc (Agricultural Mechanization) qualification is identical across Ho Technical University and University of Puerto Rico-Mayaguez in terms of Fundamental, Core and Elective courses. The University of Zambia, however, comprises a slightly varying structure by incorporating two different courses each under Core (viz. Irrigation Engineering, Rural Infrastructure) and Elective (viz. Commodity Logistics & Transportation, Rural Water Supply) courses.

Overall, the MSc (Agricultural Mechanization) qualification compares favourably with regional and international ETPs in terms of NQF level, structure, credit loading and duration.
REVIEW PERIOD
5 years

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