SECTION A:	QUALIFICATION DETAILS																	
QUALIFICATION DEVELOPER (S)	Botswana University of Agriculture and Natural Resources																	
TITLE	Master of Science in Soil Science													NCQF LEVEL				
FIELD	Agriculture and Nature Conservation		SUB-FIELD		Soil Science									CREDIT VALUE		260		
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 performance of the arable agricultural sector is generally not satisfactory. Besides the bad weather, production systems constraints have been cited as challenging during the review of NDP 10. To improve productivity of the sector, agriculture has be identified as one of the main drivers of NDP 11. To achieve this, it is important to have qualified personnel who can go into farming themselves and those that can provide top class extension services to increase production. The soil is the center of humanity food production. A healthy soil will support all flora and fauna in a sustainable manner. There is need for soil scientists with advanced knowledge and a high level of mastery, innovation, autonomy, scholarly and professional integrity in the use of soil to achieve optimal production levels to support the economy.

The HRDC (2015, 2019) agriculture sector report has identified soil science as one of the top ten professions in the sector that is required and recommended training of 20 soil scientists per annum. Soil scientists are required for research, extension and managerial positions in the Ministry of Agricultural Development and Food Security,

and other related ministries as well as in non-governmental organizations. The recent National Development Plans and NAMPAADD (2002) have also identified the lack of qualified personnel in specialized disciplines, as one of the bottlenecks to the implementation of agricultural policies and development projects (HRDC, 2015, 2019).

A country-wide needs assessment survey with the relevant stakeholders in agriculture (Ministry of Agriculture, Ministry of Higher Education, Farmer Associations, Government Parastatals, NGOs, Current and Former Students) was conducted in May, June and July of 2006. An overwhelming majority (97%) of the respondents indicated that they require graduates in soil science in their organizations at Masters level.

PURPOSE:

The purpose of the qualification is therefore, to provide graduates with advanced knowledge, skills, and applied competences to:

- Conduct research related to soil and its sustainable management.
- Develop and implement strategies for managing soil for sustainable crop production.
- Solve complex problems independently, systematically, and creatively in familiar and unfamiliar contexts facing the crop and livestock sectors in Botswana.
- Communicate effectively to a diverse group of people using appropriate technological media.

ENTRY REQUIREMENTS (including access and inclusion)

The minimum admission requirement for Master of Science in Soil Science is:

- Bachelor's degree NCQF Level 7 in the same or a cognate field of study.

- Applicants who do not meet the above requirements may be considered through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) Policies in line with the national RPL and CAT Policies

(Note: Please use Arial 11 font for completing the template)

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
LO1. Demonstrate advanced knowledge of the influence of soil chemical properties on water and nutrient uptake, soil microbes and crop yields.	1.1. Carry out soil survey to determine specific land use. 1.2. Perform soil, water, and microbial analysis of soil samples of selected sites. 1.3. Interpret soil analytical data for fertilizer recommendation in crop production. 1.4. Report and communicate the results of soil tests and surveys to stakeholders.
LO 2. Apply and develop new skills in the field of soil science to design, undertake and write up research.	2.1. Prepare a research proposal. 2.2. Formulate and test hypotheses. 2.3. Select and utilize research instruments that are relevant in research problems in crop and soil science and related fields. 2.4 Undertake field and laboratory work during actual research or investigation relevant to the research project. 2.5. Report the findings of the investigation. 2.6. Formulate recommendations that emanate from the findings.
LO 3. Apply the appropriate research methods or techniques in solving complex or simple problems being investigated.	3.1. Identify and analyse different scientific procedures about the problem being researched in Soil Science. 3.2. Select appropriate methods and tools for analysing research data. 3.3. Compile and present scholarly research work.
LO 4. Demonstrate an understanding of literature relevant to the research problem.	4.1. Interpret and analyze literature from different authors on the topic being researched.

	4.2. Draw conclusions from different readings and indicate anomalies. 4.3. Create a theoretical conceptual framework provided by the literature review. 4.4. Compile a complete bibliography or list of cited references.
LO 5. Demonstrate the ability to write a thesis or dissertation that is linguistically, technical, and scientifically correct.	5.1. Produce a dissertation or thesis that is linguistically correct and of an acceptable standard. 5.2. Produce a dissertation that is technically and scientifically correct and acceptable to the examiners

(Note: Please use Arial 11 font for completing the template)

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Relevant NCQF Level***			***Total Credits*** ***(Per** Subject/ Course/ Module/ Units)*
		Level [9]	***Level [ ]***	***Level [ ]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*					
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Soil Ecology	9			15
	Plant Nutrition	9			15
	Experimental Design	9			15
	Soil Chemistry	9			15
	Soil morphology, genesis and classification	9			15
	Soil physics	9			15
	Proposal Development	9			15
	Research & Thesis Preparation	9			125
ELECTIVE/ OPTIONAL COMPONENT	**Group 1 electives**				
	Plant biotechnology	8			15

Subjects/Courses/ Modules/Units	Ecophysiology of crop plants or	8			15
	Cropping systems	8			15
	Group 2 electives				
	Insect taxonomy and systematics or	8			15
	Pulse and Oilseed Crops Production or	8			15
	Landscaping	8			15

(Note: Please use Arial 11 font for completing the template)

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Level 8	30 credits
Level 9	230 credits
TOTAL CREDITS	***260***

Rules of Combination:

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

- Candidates will have to complete 230 credits from the core subjects and 30 credits from the electives.
- There are two groups of electives provided.
- Candidates are expected to select 1 subject from group 1 and another from group 2.
- The total number of credits to be completed will add up to 260 credits.

(Note: Please use Arial 11 font for completing the template)

ASSESSMENT ARRANGEMENTS
Formative and summative assessments will be used. Formative assessment It will include will contribute 50% of the final grade. Integrated assessment procedures will ensure that the purpose of the qualification is achieved. Summative assessment There shall be a dissertation to be submitted at the end of the research. The dissertation shall contribute 50% of the final grade. Assessment of the dissertation will be in accordance with respective ETP's regulations and procedures. Assessors must be BQA registered and accredited.
MODERATION ARRANGEMENTS
Pre-moderation is done by relevant internal structures. Quality assurance of the assessment instruments is conducted prior to administration. There will also be external moderation. Moderators must be BQA registered and accredited.
RECOGNITION OF PRIOR LEARNING
There shall be an award of the qualification using Institutional RPL Policy in line with the National RPL Policy.
CREDIT ACCUMULATION AND TRANSFER
There shall be access and award of credits of the qualification using Institutional Credit Accumulation and Transfer (CAT) Policy in line with the National CAT Policy**.**
PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)
Horizontal Progression • Master's Degree in Agronomy • Master's Degree in Agriculture • Master's Degree in Crop Science

• Master's Degree in Biological Science

• Master's Degree in Environmental Science

Vertical Progression

Holders of the qualification meet the requirement for vertical progression and admission to:

• Doctoral Degree in Soil Science

• Doctoral Degree in Agronomy

• Doctoral Degree in Agriculture

• Doctoral Degree in Crop Science

• Doctoral Degree in Biological Science

• Doctoral Degree in Environmental Science

Employment Pathways

Holders of the qualification can work as:

• Private consultant in matters related to soil science and crop production.

• Soil researcher.

• Soil laboratory manager.

• Agrochemical shop owner.

• Farm manager.

• Soil science lecturer.

• Agricultural policy analyst.

QUALIFICATION AWARD AND CERTIFICATION

For a candidate to graduate with a Master of Science in Soil Science, they should have:

- Satisfactorily completed all courses.
- Presented research proposal before a panel of judges.
- Passed the dissertation.
- Attained a minimum 260 credits.

CERTIFICATION:

The graduate will be awarded a Master's degree in Soil Science on completion

REGIONAL AND INTERNATIONAL COMPARABILITY

Benchmarking for the Master of Science in Soil Science was done with regional and international universities. Nationally, there are no universities offering this qualification. Comparisons were done using the qualification name, the credit load, the duration of study, the qualification structure entry requirements, main exit pathways, assessment strategies, qualification rules and minimum standards of the award of the qualification and employment pathways, with the following universities: Sokoine University of Agriculture (Master of Science in Soil Science and Land Management), University of Pretoria (Master of Science in Soil Science), North Carolina State University (Master of Science in Soil Science) and Wageningen University and Research (Master of Science Soil Science and Soil Chemical Quality). All universities except, the University of Pretoria offered both course work and research. Most of the universities did not display fields needed to complete the comparability matrix template. All universities selected are ranked high on the world scale and were selected because of their long history of best practices in academia. One of the commonalities among all institutions is the existence of courses in proposal writing and thesis or dissertation.

REVIEW PERIOD

Every five (5) years

(Note: Please use Arial 11 font for completing the template)