

**BQA NCQF Qualification Template**

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Issue No.: 01

QUALIFICATION SPECIFICATION								SECTION A
<b>QUALIFICATION DEVELOPER</b>		Botswana University of Agriculture and Natural Resources						
<b>TITLE</b>		Master of Science in Animal Science (Breeding and Reproduction)				<b>NCQF LEVEL</b>	9	
<b>FIELD</b>	Agriculture and Nature Conservation	<b>SUB-FIELD</b>		Animal Science				
New qualification		√	Review of existing qualification					
<b>SUB-FRAMEWORK</b>		General Education			TVET		Higher Education	
		Certificate			Diploma		Bachelor	
<b>QUALIFICATION TYPE</b>		Bachelor Honours			Master	√	Doctor	
<b>CREDIT VALUE</b>						240 credits		
RATIONALE AND PURPOSE OF THE QUALIFICATION								
<p><b>Rationale</b></p> <p>Botswana has depended largely on livestock and natural resources before and post-independence. However, the Agriculture sector has experienced a steady decline in its contribution to GDP over the past years. The poor performance of the sector therefore represents a challenge to the fight against poverty. From a 42.7% share in GDP at independence in 1966, agriculture has fallen to 1.9% as at 2008 (Ministry of Finance and Development Planning, 2010). The beef industry is the only sub-sector of the agriculture sector that has constantly remained a significant contributor to the national Gross Domestic Product (GDP) while sheep and goats have the potential to diversify the livestock industry and enable resource-limited farmers and youth to venture into farming. Game farming and ranching have also been introduced harvesting from the natural resources sub-sector, thus making the demand for trained experts in these areas a priority.</p> <p>Cattle, sheep and goats are found throughout the country, especially in communal farming systems in higher proportion (88.5, 97.9 and 95.3% respectively; Statistics Botswana 2015). Efforts made to improve animal production have been adversely affected by factors such as low and erratic rainfall, endemic droughts, high summer temperatures, low soil fertility and high incidence of pests, diseases, environmental degradation and utilization of low producing breeds. Lack of improved appropriate and applied technologies, proper cost benefit analysis for adoption by farmers, poor research and extension linkages, limited expert human resources have also been cited as contributing to poor performance in the animal industries leading to poor food safety and security.</p> <p>Improvement of livestock industry productivity is vital to the economic diversification. In order to improve the livestock sector the Government of Botswana (GoB) has over the years developed a number of legislative instruments such as the National Development Plan (NDP 11), Vision 2036, National Policy on Agricultural Development (1991), National Strategy on Poverty Reduction (2003), Citizen Entrepreneurial Development Agency (CEDA, 2001), Livestock Management and Infrastructure Development (LIMID, 1997-2010),</p>								

Livestock Identification and Traceability System (LITS) including the Livestock Improvement Act of 2009, among others, however there is lack of a robust animal industry policy that would enable the implementation of such instruments and strategies. In addition, GoB through the Ministry of Agricultural Development and Food Security lacks the requisite human resources capital to drive the same, especially in terms of research and extension components. Regionally and internationally, a number of initiatives by GoB are worth recognizing in the policy development initiative such as the Millenium Development Goals (MDGs) and Sustainable Development Goals (SDGs) recognizing the importance of the agricultural sector in the SADC region where member states have pledged to allocate at least ten (10) percent of their national budgets to stimulate a six (6) percent annual growth in the sector.

The livestock industry of Botswana is moving away from the traditional practice of subsistence farming to that of commercial farming requiring the application of scientific knowledge of both the biological and economic principles (bio-economic principles) to drive it sustainably, efficiently and profitably. Breeding and reproduction are some of the important factors in animal production. Livestock industry can be sustainably realized if appropriate breeding programmes and practices are put in place both in the government institutions and the farming community. Most of the farmers in the communal land keep the local breeds which are considered to be less productive compared to the exotic breeds, however if breeding and reproduction is done in a well-informed and organized manner the production can be increased in the native breeds. This will, therefore, lead to improved livelihoods of the local community. Furthermore, the utilization of modern breeding technologies by both communal and commercial farmers will improve livestock production. There is indeed an opportunity to improve livestock production through breeding and reproduction. Therefore, there is a need for trained human resource in the area of breeding and reproduction.

It is therefore envisaged that investing in livestock management and technologies targeting rural farmers would improve productivity and efficiency. This calls for improvement in breeding practices to not only ensure efficiency but also to produce a healthy and wholesome product. Therefore, this qualification of study in animal science (breeding and reproduction) aims at encompassing all breeding and reproduction practices in the livestock production in the training of young animal scientists with the view of serving the livestock industry of Botswana and the region to create employment and wealth. Pillar One of National Vision 2036 promote sustainable economic development through export-led economy. In the 21<sup>st</sup> century wealth creation will be underpinned by knowledge based economy and hence expanding human capital is critical. However, with agricultural knowledge only, it is not enough as it is goods and services from primary production which are consumed. Therefore agro-business and entrepreneurship is important and animal agriculture as taught through the qualification has the ability to support micro and small enterprises and manufacturing that contribute to the economy (value addition).

Central to the government's policy on household nutrition is food security and poverty alleviation. This qualification is designed to contribute towards reducing poverty and food insecurity through training young people who will contribute to food production and also be innovators in food production and food scientists. Supporting policies to this central policy of poverty alleviation and food security are Ministry of Agricultural Development and Food Security's National Policy on Agricultural Development (NPAD) – 1991, National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) and the Strategy for Development of the Dairy Sector in Botswana (2013) among other initiative. The graduate from this qualification should function within this framework as either farmers, policy makers or innovators.

Sheep and goats population in Botswana is proportionally higher in the traditional sector, hence improving

the productivity of sheep and goat through breeding and improved reproduction has the opportunity to benefit many people. Sheep and goats also offer opportunity to empower the youth and women hence students with this qualification are expected to start their own small stock business or be advisors to small stock farmers. Challenges to this sector include diseases, nutrition, market and climate change and hence this qualification empowers students to think creatively to overcome these challenges.

Botswana beef is renowned for its ability to be exported to European Union (EU) countries but in recent times it has been challenged by diseases such as Foot and Mouth Disease, markets, narrow product base, fewer technologies and inefficient management. In particular cross border diseases are a recent threat to Botswana Beef and innovative strategies are needed to thaw this threat. Therefore students of this qualification shall be empowered to provide solutions to these problems as farmers, innovators/scientists or policy makers.

All the above deliberations justify that for animal agriculture to improve we need people who can come up with innovative breeding strategies and programmes, evaluate the current breeding strategies and improve them in order to breed the animals that can be able to reproduce and be productive in the midst of all the challenges such as climate change, diseases and parasites and minimal nutrition. Animal breeder is listed as one of top occupations in demand for Botswana by HRDC.

#### **Purpose**

The purpose of this qualification is to produce high quality graduates with the required advanced knowledge, skills and competence in Animal Breeding and Reproduction who can conduct research in all livestock species and wildlife, be policy advisors, be employable in higher learning and research institutions and can start their own livestock breeding businesses.

The graduate of this qualification will be able to:

- Synthesize breeding programmes
- Implement research projects that can inform the community on how livestock productivity be increased
- Analyze real production data using appropriate software
- Disseminate information through writing reports and conference presentations
- Evaluate livestock production status and come up with solutions
- Apply appropriate breeding strategies

#### **ENTRY REQUIREMENTS (including access and inclusion)**

NCQF Level 7 in Animal Science or related field or any equivalent qualification  
NCQF Level 8 in Animal Science or related field or any equivalent qualification  
RPL and CAT in accordance with National Policies

#### **QUALIFICATION SECTION B**

#### **SPECIFICATION**

#### **GRADUATE PROFILE (LEARNING OUTCOMES)**

#### **ASSESSMENT CRITERIA**

<p>Graduates of this qualification will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate advanced knowledge of Botswana, regional and international animal industry issues in livestock sector</li> </ol>	<ol style="list-style-type: none"> <li>1.1 Determine prevailing circumstances by conducting a situational analysis,</li> <li>1.2 Plan, implement and disseminate critical information required to inform the masses about current animal agriculture issues affecting them.</li> </ol>
<ol style="list-style-type: none"> <li>2. Analyze selection principles in the breeding industry</li> </ol>	<ol style="list-style-type: none"> <li>2.1 Identify selection objectives and criteria for different livestock industries</li> <li>2.2 Critically evaluate the current research objectives in cattle, sheep and goats</li> <li>2.3 Advise the breeding industry on the selection criteria relevant for specific selection objectives</li> </ol>
<ol style="list-style-type: none"> <li>3. Synthesize breeding programmes to address livestock production issues such as productivity, disease and parasites resistance</li> </ol>	<ol style="list-style-type: none"> <li>3.1 Determine the traits to be measured given the objectives of any livestock farming enterprise</li> <li>3.2 Decide on the criteria to be used to address the determined objectives</li> <li>3.3 Design breeding programmes that can produce animals which are resistant to parasites and diseases of concern in livestock production.</li> </ol>
<ol style="list-style-type: none"> <li>4. Demonstrate advanced knowledge of conservation issues and dissemination of animal production information to the relevant stakeholders</li> </ol>	<ol style="list-style-type: none"> <li>4.1 Design survey tools according standard procedures of FAO</li> <li>4.2 Conduct surveys to get information about the status of animal genetic resources</li> <li>4.3 Analyse the survey data</li> <li>4.4 Decide whether the breeds or species are endangered based on the results of the survey</li> </ol>

	4.5 Advise the policy makers on the ways to conserve the breeds or species
5. Demonstrate high level of mastery of immunogenetics on how genetics control immunity in livestock	<p>5.1 Critically review literature on immunogenetics and interpret the processes of immunity in any disease outbreak in the country</p> <p>5.2 Conceptualize research studies or experiments that investigate the immunity of animals against various diseases or parasites</p> <p>5.3 Implement experiments to investigate immunity mechanisms in livestock in research institutions</p>
6. Demonstrate high level of mastery of methodologies and models used in population and quantitative genetics applied to livestock improvement	<p>6.1 Record the production data at any livestock production set up</p> <p>6.2 Apply statistical analysis to both qualitative and quantitative data</p> <p>6.3 Use different equations and models in addressing population and quantitative data and justify the choice of the models and formula used</p>
7. Demonstrate advanced knowledge and competence in animal breeding strategies and the use of modern technologies in Animal breeding	<p>7.1 Decide the breeding strategy to utilize in a particular situation in order to improve livestock production</p> <p>7.2 Describe the importance of modern technologies in Animal Breeding to farmers in order to convince the farmers to use the modern technologies</p> <p>7.3 Select appropriate breeding strategy for different productions</p>

<p>8. Demonstrate high level of mastery of animal reproductive physiological processes to control and manipulate biological processes during animal breeding</p>	<p>8.1 Determine the hormones to be used for synchronizing heat in breeding any species</p> <p>8.2 Identify animals on heat during breeding season</p> <p>8.3 Apply the knowledge of parts of reproductive system to educate farmers and breeders</p>
<p>9. Demonstrate knowledge in management of livestock and in planning and designing livestock enterprises</p>	<p>9.1 Design a business plan</p> <p>9.2 Plan for and establish livestock production enterprise</p> <p>9.3 Evaluate all the factors that are needed in establishing a livestock breeding enterprise</p>
<p>10. Demonstrate advanced competence in designing research experiments, collecting and analyzing data with various data analysis softwares in any breeding set up</p>	<p>10.1 Design research proposal in any research institution or university</p> <p>10.2 Implement the research for any organization</p> <p>10.3 Analyse research data using appropriate softwares</p> <p>10.4 Disseminate the findings of the research to relevant audience</p>

11. Demonstrate advanced competence in writing publishable articles and dissemination of the research findings to relevant audience	11.1 Write a research article 11.2 Publish articles on regular basis if working in a research institution 11.3 Present research findings in local, regional and international conferences
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QUALIFICATION STRUCTURE				SECTION C
FUNDAMENTAL COMPONENT Subjects / Units / Modules /Courses	Title	Level		Credits
CORE COMPONENT Subjects / Units / Modules /Courses	Population and Quantitative Genetics for Breeders	9		15
	Therionogenology	9		15
	Methodologies for Quantitative Genetics for Breeders	9		15
	Animal Breeding Strategies	9		15
	Livestock Immunogenetics	9		15
	Biometry for Animal Scientists	9		15
	Proposal Development	9		30
	MSc Dissertation	9		90
	<b>Sub total</b>			<b>210</b>
ELECTIVE COMPONENT Subjects / Units / Modules /Courses	<b>Elective set 1</b>			15
	Applied Pig and Rabbit Management	9		
	Applied Sheep and Goat Management	9		
	<b>Elective set 2</b>			15
	Physiology and Endocrinology of Animal Reproduction	9		
	Comparative Systemic Physiology	9		
	<b>Sub total</b>			<b>30</b>
<b>Rules of combinations, Credit distribution(when applicable):</b>				
<b>Rule of combination = Fundamental (F) + Core + Elective</b> <b>= 0 + 210 + 30 = 240 (100%)</b>				

**All the courses are at level 9**  
**The student should choose one elective from each elective set.**



## **ASSESSMENT AND MODERATION ARRANGEMENTS**

### **ASSESSMENT**

Formative assessment

- Continuous assessment (50%)

Summative assessment

- MSc research dissertation (50%)
- The MSc dissertation shall be assessed according to ETP regulations

### **MODERATION**

#### **Internal moderation arrangements**

Moderation will be done to assess fairness, practicability, feasibility, validity and reliability of tests, examinations and dissertations

Internal moderators who are accredited by BQA as assessors and moderators will be engaged for the moderation

#### **Eternal moderation arrangements**

External Examiner moderation will be done according to moderation policy

## **RECOGNITION OF PRIOR LEARNING (if applicable)**

There shall be provision for Recognition of Prior (RPL) in accordance with institutional policies in line with National RPL Policy

## **PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)**

Upon completion of this qualification the graduate can pursue either

#### **Vertical articulation:**

Doctor of Philosophy (PhD) in Animal Science (NCQF Level 10).

#### **Horizontal articulation:**

MSc in Agricultural Economics, (NCQF Level 9)

MSc in Agricultural Education, (NCQF Level 9)

The graduate of this qualification can work as:

- Animal breeder
- Animal science lecturer
- Animal science researcher
- Animal production consultant.

## QUALIFICATION AWARD AND CERTIFICATION

### Award:

Upon successful of the qualification **(240 credits)** the candidate will be awarded this qualification.

### Certification:

A **Master of Science in Animal Science (Breeding and Reproduction)** will be awarded to a Candidate upon completion of the qualification in accordance with applicable policies. A certificate and transcript will be issued at award.

## REGIONAL AND INTERNATIONAL COMPARABILITY

- This qualification of MSc in Animal Science (Breeding and Reproduction) is similar to MSc Animal Breeding and Genetics offered at the University of Edinburgh in that they both have coursework and research work. They both have similar core courses. The Edinburgh total credits are 180 while ours are 240, also the duration of the study is 1 year while ours is 2 years. The exit outcomes and employment pathways are similar. NQF level, assessment weights and qualification rules for Edinburgh MSc are not provided in their qualification.
- Another University that have similar qualification as this one is Jimma University in Ethiopia. Their MSc qualification title is MSc in Animal Breeding and Genetics. Some of their compulsory courses, and employment path are similar to that of this qualification. However, their credit value is 37, this indicate that their way of allocating credits per course is not similar to that of NQF. Looking at the same study duration of 2 years in Jimma University we can say their qualification is comparable to MSc Animal Science (Breeding and Reproduction).
- No qualification in regional universities were found to be comparable to MSc Animal Science (Breeding and Reproduction) because most of them although they have similar names they were only research without course work e.g. MSc Agric. Animal Science Animal Breeding and Genetics in University of Pretoria.

## REVIEW PERIOD

The qualification will be reviewed every five years.