



Status of postgraduate training in the livestock sector in southern Africa and priorities for ILRI's support

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in the livestock sector in southern Africa
and priorities for ILRI's support

A study commissioned by the International Livestock Research
Institute (ILRI)

Sikhalazo Dube (PhD)
Department of Livestock and Pasture Sciences
University of Fort Hare, Alice 5700, Republic of South Africa

sdube@ufh.ac.za; sikhalazo@hotmail.com

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Acronyms

ACP	Africa, Caribbean, Pacific
AHI	Avian and Human Influenza
AIDS	Acquired Immune Deficiency Syndrome
ARC	Agricultural Research Council
ASF	African Swine fever
BSE	Bovine Sporary form Encephalopathy
CaSt	Capacity Strengthening
CBPP	Contagious Bovine Pleuropneumonia
DELPHE	Development Partnerships in Higher Education
DOA	Department of Agriculture
DRC	Democratic Republic of Congo
EMU	Eduardo Mondlane University
EPA	Economic Partnership Agreement
EU	European Union
FANR	Food, Agriculture and Natural Resources
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
GIS	Geographic Information Systems
HIV	Human Immunodeficiency Virus
ICM	Integrated Committee of Ministries
IFAD	International Fund for Agricultural Development
ILRI	International Livestock Research Institute
IPCC	Intergovernmental Panel on Climate Change
LLP	Livestock and Livestock Products
MOU	Memorandum of Understanding
MTP	Medium Term Plan
NARS	National Agricultural Research Systems

ND	Newcastle Disease
NES	National Extension Systems
NUFFIC	Netherlands Organizations for International Cooperation in Higher Education
NWU	North West University
PATTEC	Pan African Tsetse and Trypanosomiasis Eradication Campaign
PWC	PriceWaterhouse Coopers
R&D	Research and Development
SACCT	Southern African Commission for the Control of TADs
SADC	Southern Africa Development Community
SPS	Sanitary and Phytosanitary
SSA	Sub-Saharan Africa
SUN	Stellenbosch University
SWEP	Student Work Experience Placement
TAD	Transboundary Animal Diseases
TLU	Total Livestock Unit
UCT	University of Cape Town
UFH	University of Fort Hare
UKZN	University of KwaZulu Natal
UL	University of Limpopo (Turfloop campus)
UNDP	United Nations Development Program
UNISA	University of South Africa
UNIZULU	University of Zululand
UNIVEN	University of Venda
UNIMA–BUNDA	University of Malawi (Bunda College of Agriculture)
UNZA	University of Zambia
UOM	University of Mauritius
UOFS	University of Free State
UP	University of Pretoria
UZ	University of Zimbabwe

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Sikhalazo Dube

Preface

Research-based capacity strengthening is one of the priority activities of the International Livestock Research Institute (ILRI). The mission of ILRI's Capacity Strengthening Unit (CaSt) is to strengthen the capacity of the livestock research and development community to contribute to the overall mandate of ILRI in achieving livestock-mediated poverty alleviation. The purpose of CaSt is to strengthen the capacity of ILRI's partners to apply their skills and resources to accomplish their goals, satisfy stakeholders' needs and improve performance and impact.

One of the five objectives of ILRI's Capacity Strengthening Strategy is to facilitate building sustainable capacity of institutes to build capacity. This could only be achieved through building the capacity of the agricultural higher learning institutes and by facilitating the effective integration of research-based learning outputs (tools, methods and approaches) into the curricula of the learning institutes.

ILRI is primarily a research institute and not a university. Thus, in terms of building the capacity of the educational institutes, ILRI would like to complement the ongoing national and regional initiatives using the principle of subsidiarity. ILRI would like to add value to the efforts of the higher learning institutes in sub-Saharan Africa and South Asia based on ILRI's comparative and competitive advantage in research and capacity strengthening. Given the limited resources, to be effective and efficient, ILRI should identify its niche and priorities to generate the maximum benefit. It is also important to seek regional consensus on the priority areas for collaboration.

In order to establish the priorities for collaborative capacity strengthening activities of the learning institutes in the areas of animal production and veterinary services, ILRI commissioned five studies covering the following subregions: Eastern and Central Africa (ASARECA region); Southern Africa (SADC region), West Africa (CORAF region); South Asia; and Southeast Asia. This report summarizes the findings of the gap analysis study for the Southern Africa (SADC) region. ILRI will make every effort to share and validate these findings and use this information in designing and implementing capacity strengthening activities in this region.

This task would not have been completed without the support and dedicated commitment of a number of individuals. We would like to appreciate and acknowledge the contribution made by Sikhhalazo Dube in conducting this study and preparing this report. A number of individuals provided inputs and responded to the survey questionnaires. The staff of the Knowledge Management and Information Services (KMIS) unit of ILRI assisted in editing, layout and cover design of the report. The contribution of these individuals and the support of the Senior Management of ILRI and the staff of CaSt in completing this study is gratefully acknowledged and appreciated.

The overall purpose of this study was to identify areas for collaborative action to build the capacity of learning institutes in the region. Given the different stages of development of the various universities, it may also be necessary to initiate some carefully selected national level activities to complement the regional undertakings. ILRI will make every effort to facilitate and support the national and regional initiatives in strengthening the capacities of the universities especially the postgraduate research and training in the region.

P Anandajayasekeram
Manager
Capacity Strengthening Unit
ILRI

Executive summary

1 Introduction

Challenges in the livestock sector, particularly in the smallholder sector, call for regionally coordinated efforts in training and research. Coordination of activities will go a long way in enhancing the quality of support to livestock farmers. A study was conducted to find out the current status of postgraduate training programs in SADC. The specific objective of the study was to identify gaps in postgraduate training in animal production and veterinary sciences and to identify the roles and priorities of ILRI in bridging these gaps. The emphasis on postgraduate training is vital considering that this is often the level at which knowledge and technologies are developed and disseminated.

A combination of desktop studies to synthesise secondary information in order to identify emerging challenges confronting postgraduate training in animal production and veterinary science, consequently, the livestock sector in the southern African region, and a questionnaire to key informants in universities with postgraduate training in animal production and/or veterinary sciences was undertaken to achieve the objectives of the study.

2 Key findings

2.1 Current profile of livestock training in the SADC region

It was clear from the study that, in SADC, major postgraduate training in animal production and veterinary sciences is conducted in South Africa, Zambia, Zimbabwe and Tanzania. Most of the postgraduate training is in the fields of animal nutrition, breeding, physiology and poultry production. Meat science, rangeland ecology, wildlife management, aquaculture and equine nutrition training are mainly restricted to South Africa. Mauritius, Mozambique, Zambia and Zimbabwe have limited areas of specialization in animal production and veterinary science programs.

2.2 Collaboration and linkages

Inter departmental collaboration, whilst practiced in most universities, is weak and restricted to science-based disciplines. There is little collaboration with social sciences, except in Malawi and South Africa where there is collaboration with departments of development studies and rural development, respectively. In Zimbabwe, the department of animal science collaborates with the Institute of Environmental Studies in highlighting the importance of livestock and environment interaction.

There is generally weak inter-university collaboration, where collaboration exists; it is mainly in co-supervision of students, joint research and teaching, external examination, curriculum reviews and sharing of research facilities. North–south collaboration is mainly in the form of staff exchange, curriculum review, and conception of postgraduate programs, joint research, sandwich study activities and co-supervision of postgraduate students.

There is good collaboration between universities and NARS in all countries. The major type of collaboration in all countries is joint research, human resources and sharing laboratory facilities. Collaboration helps NARS staff to enroll for postgraduate degrees at universities. In countries like South Africa, Zambia and Zimbabwe, co-supervision and external examination are done by NARS staff. The extent of collaboration is greater in South Africa, Mozambique and Zambia. Establishing MOUs has been suggested as a way of improving collaboration between universities and NARS.

Collaboration between universities and NES is poor. Participation of both university and NES staff in project and policy workshops is the main type of collaborating in most of the countries. Formalization of

collaboration through MOUs, and including NES staff in faculty advisory boards would help in improving collaboration.

Universities in all countries contribute to farmer training. The main contribution is through conducting short training courses, often for trainers, in a range of subjects which include poultry, pig, goat and dairy production.

2.3 Strengths, weaknesses and gaps

Countries with veterinary science have strong capacity in animal health issues, with their universities training in most animal health subjects. On-farm research is strong in Malawi, Zimbabwe and Tanzania, probably due to the extensive small-scale agriculture sector. South Africa is strong in most of the core livestock production specializations; poultry production, parasitology and parasitic diseases. South Africa and Mauritius have strong feed evaluation programs.

Most programs in SADC are weak in the area of GIS training and its application. GIS is increasingly becoming important in livestock production e.g. disease surveillance and animal mobility. Other weaknesses include lack of specialized teaching, research and laboratory staff. In many instances postgraduate curriculum is either old or lacks emphasis of increasingly important subjects such as on-farm research techniques, biosecurity and traceability of animals.

Major constraints to postgraduate training include inadequate and old laboratory equipment, shortage of teaching and technical staff. Lack of bursaries was identified as a constraint that leads to poor enrolment and low through put rates. In Malawi, prospective students prefer to study overseas, while in South Africa most students are not fully prepared for postgraduate studies, lacking analytical skills vital at this level of study.

The postgraduate curriculum in most SADC countries does not fully cover the requirements of the industry. More than 80% of the universities in the nine countries studied identified the following gaps in their curriculum; negotiation and conflict resolution skills; leadership and decision making; innovation systems perspective and implication to research and development. Intellectual property right policy; facilitation skills; monitoring, evaluation and impact assessment; poverty, vulnerability and risk analysis; gender analysis; disease surveillance and preparedness, and biosafety were also identified as gaps in the curricula by most universities.

2.4 Capacity strengthening needs and recommendations

The International Livestock Research Institute (ILRI) has an important role in tackling the challenges faced by tertiary institutions involved in postgraduate training in livestock production. With its extended history and technical savvy in livestock research, sourcing of funds and training, ILRI can play a significant role in the development of joint research projects, revamping of curriculum, training of staff, establishment of MOUs and facilitating inter-university linkages. All interviewed institutions in Southern Africa were familiar with ILRI and what it does.

Conclusion, recommendations and limitations

This study highlighted a number of interesting challenges facing the animal production and veterinary science postgraduate training program in SADC. Clearly from the study, most of the challenges can be alleviated by proper collaboration. ILRI can play a significant role in the creation of a platform and playing a facilitation role in getting institutes involved in livestock production to develop beneficial and secure collaborations. It is hoped that in an effort to improve training in the livestock sector, through cutting edge research, soft skills will be incorporated in curriculum if graduates are to make major strides in assisting today's discerning farmers. It is further hoped that partnerships will be developed between

ILRI and institutions in the SADC region in efforts to improve the quality of training in postgraduate training. The following areas will require immediate attention:

Strengthening collaboration

ILRI has a strong history and capacity in the development and maintenance of networks and MOUs. It is suggested that workshops are held with stakeholders, facilitated by ILRI, to guide in the development of MOUs and networks. An initial workshop can be held followed by need-based, focused, and follow-up workshops and meetings involving interested institutes around common themes, e.g. animal breeding and alternative feed resources.

Lack of skilled staff to train postgraduates

In this study an attempt was made to identify and document the challenges in postgraduate training. It was clear from the responses that skills possessed by trainers were, in most disciplines, inadequate. This would inevitably hamper the need to revamp or develop new curriculum to meet the perceived or real challenges identified in the livestock sector. There is, therefore, an immediate need to take stock of existing skills, their strengths, and identify key gaps. The purpose of this will be to develop programs or activities to bridge the gaps. This will have a potential benefit of empowering trainers with a '3rd eye', a new/renewed way of looking at training for the livestock sector in the region.

Poor research infrastructure

Poor funding levels and reduced funding sources were identified by many institutions as major challenges in the acquisition and maintenance of equipment and other infrastructure required for research and training at postgraduate level. The reality is that funding in many SADC countries for training has diminished, and continues to do so. The solution to challenges of infrastructure will lie in the ability of universities to collaborate within themselves, with NARS, and with other universities and institutions around the world. The development of strong, MOU-based collaboration will go a long way in mitigating challenges of capacity both at infrastructure and human level. It was clear that the capacities of universities in the area of infrastructure varied vastly; some universities and NARS have high tech equipment, farms etc. which can benefit institutes without such facilities.

1 Introduction

This report describes and analyses results from secondary data and a questionnaire survey administered to universities in the SADC region to identify gaps in postgraduate training in animal production and veterinary science and to identify the roles and priorities of ILRI in bridging this gap. A total of 18 universities were contacted and, out of these, 16 responded. A total of 21 questionnaires were completed and returned.

Keywords

SADC, postgraduate training, animal production, veterinary science, ILRI

1.1 Background

The International Livestock Research Institute (ILRI) is one of 15 future harvest centres that conduct food and environmental research to help alleviate poverty and increase food security while protecting the natural resource base. Building on three decades of experience, ILRI works at the crossroads of livestock and poverty by bringing high-quality science and capacity building to bear on poverty reduction and sustainable development. Capacity is the engine for enhancing the output and performance of individuals and organizations. As part of its research-based outreach and capacity strengthening, ILRI assists its partners by offering opportunities for long- and short-term training for researchers and development practitioners. The Capacity Strengthening unit (CaSt) is designed to build and strengthen the scientific knowledge and capabilities of ILRI's partners in developing countries.

The overall mission of the CaSt unit is to strengthen the capacity of the livestock research and development (R&D) community to contribute to the mission of ILRI to achieve livestock-mediated poverty alleviation. The purpose is to strengthen the capacity of ILRI's partners to apply their skills and resources to accomplish their goals, satisfy stakeholders' needs and improve performance and impact.

Within the broader framework of ILRI's strategy to 2010 and proposed Medium Term Plan (MTP), the five strategic objectives to be pursued by the CaSt unit are:

- Effective integration of capacity strengthening activities into project planning, implementation and evaluation.
- Building sustainable capacity of institutes to build capacity (major shift in focus).
- Test and implement innovative and cost-effective training approaches and delivery mechanisms and develop and disseminate research-based training materials.
- Building skills of individuals and groups.
- Developing a functional and need-based monitoring and evaluation system to communicate with partners and to assess the performance and impact of CaSt.

ILRI recognizes that the long-term solution to address the continuous and dynamic nature of capacity strengthening needs is to develop sustainable capacity within the relevant organizations which are mandated to build capacity of the various stakeholder groups engaged in the livestock innovation system. This could be only achieved through building the capacity of the universities and by facilitating the effective integration of research-based learning outputs (tools, methods, approaches and results) into the curricula of learning institutes. ILRI strongly believes that universities must play a pivotal role in providing the human resources for the agricultural led broad based economic growth needed to achieve the Millennium Development Goals in SSA.

However, in terms of building capacity of the educational institutes, ILRI would like to complement the ongoing regional and national initiatives using the principle of subsidiary. ILRI would like to add value to the efforts of the higher learning institutions in SSA based on ILRI's comparative and competitive advantage. Therefore, it is important to clearly identify the niche in which ILRI could effectively

contribute to the efforts of the tertiary educational institutes especially in postgraduate training.

1.2 Purpose and objectives

The overall purpose of this study is to strengthen the postgraduate training and research capacity of tertiary educational institutes in the livestock sector within SSA. The specific objective was to identify gaps in the postgraduate training in animal production and veterinary sciences and to identify the roles and priorities of ILRI in bridging this gap.

Both available secondary data and primary data collected from key informants were used to prepare this report. A standard questionnaire was used to collect the primary data from universities. Detailed terms of reference of the study are provided in appendix 1.

1.3 Methodology

Desktop study

A desktop study was conducted to synthesise secondary information in order to identify emerging challenges confronting the livestock sector in the Southern African region. An internet web search was undertaken to review the current status of postgraduate training in the livestock sector in the SADC region.

Questionnaire

A key informant survey was conducted to solicit information from institutions of higher learning on research and training in the fields of animal production and veterinary sciences in SADC. Questionnaires were used to obtain information on collaboration, linkages between different institutions, critical constraints and challenges facing agricultural higher learning institutions, gaps in the existing curricula to address the emerging needs and challenges of the livestock sector and the roles and priorities of ILRI in bridging the capacity gaps. A total of 18 universities were contacted, and out of these, 16 responded. A total of 21 questionnaires were completed and returned. After some telephonic contact, questionnaires were emailed to deans, deputy deans or heads of department to solicit for responses.

1.4 Outline of the report

Chapter 1 of this report introduces the study, giving a detailed background. It highlights the key objectives of the study. Chapter 2 deals with the role of livestock in the economy of SADC highlighting the multipurpose nature of livestock keeping in rural communities in the region and the challenges faced by the sector. This is done in preparation for the identification of the role of postgraduate training in animal production and veterinary science in preparing graduates in alleviating some of the challenges. Chapter 3 is an analysis of the key issues, strengths, weaknesses and gaps in postgraduate training in the field of animal production and veterinary science in SADC. Chapter 4 identifies areas for capacity strengthening in animal production and veterinary sciences postgraduate training. The potential role that ILRI can play in bridging the gaps in postgraduate training is also described in this chapter. Chapter 5 highlights key conclusions, recommendations and limitation of the study.

2 Current profile of livestock training in the SADC region

2.1 Importance of the livestock sector in SADC

Agriculture remains a key driving force for economic development in the SADC region. The inhabitants of the region rely on agriculture as the main source of livelihoods. Sixty one percent, or 150 million of the region's total population of 247 million depend on agriculture for food, income, employment and investment opportunities (Chilonda and Minde 2001). The majority of the people dependent on agriculture reside in the rural areas. Livestock production fulfils a variety of essential functions in the economy of poor households: food, for example, household consumption of milk, meat and eggs; social e.g. dowry, ceremonies and social status; economic e.g. monetarization, capitalization, savings and social insurance (Sikhondze 2008); and agronomic functions like natural improvement of soils (FANR 2008).

Livestock, especially cattle, remain the principal source of non-human energy for poor farmers especially for activities like ploughing, transporting goods and drawing water. They also constitute an asset for investment and insurance against crop failure. Livestock species, such as small ruminants, pigs and poultry help to alleviate poverty and confer status to the vulnerable groups like women and children.

Agriculture accounts for close to 40% of SADC's gross domestic product (GDP) with a wide variation among countries. Beef and milk are one of the major contributors to this revenue. Agriculture is the single largest employer in most SADC countries, engaging up to 75% of the population. The sector is crucial in providing linkages in the economy, linking upstream and downstream industries. Agriculture supplies raw materials for agro-based industries such as meat processing and tanning. Livestock's contribution to agricultural gross domestic product is, on average, about 30 to 40% in most countries in the SADC region and over 50% in some countries (SADC/UNDP/FAO 2001). The SADC region is endowed with a rich livestock population which in 2005 was estimated at 64 million head of cattle, 74 million goats and sheep, 6 million pigs and roughly 320 million poultry (ILRI 2007).

For many SADC countries, the livestock sector offers substantial potential to increase food security, improve livelihoods, enhance overall agricultural productivity and economic growth, and decrease reliance on imports. In Zimbabwe, as is the case in other SADC countries with significant communal farming community reliant on crop cultivation, livestock is a major source of draught power and manure (FANR 2008).

2.2 Emerging challenges confronting the livestock sector in SADC

The livestock industry in southern Africa has been a stalwart of economic development, but new conditions of trade, market access and disease dynamics, particularly of Foot-and-Mouth Disease (FMD), mean major efforts to tackle these challenges are required.

Animal health and productivity challenges

Recurrent animal diseases, including transboundary animal diseases (TADs), constitute the greatest threat to the livestock industry in SADC region. Prevalent zoonotic diseases include brucellosis, tuberculosis, and Foot and Mouth Disease. Transboundary animal diseases comprising rinderpest, contagious bovine pleuropneumonia (CBPP), FMD, African swine fever (ASF), newcastle disease (ND), avian and human influenza (AHI), rift valley fever and lumpy skin disease have serious socioeconomic impacts with regard to trade in livestock and livestock products (LLPs). Outbreaks of FMD and CBPP occurred in Tanzania and Namibia in 2007 while Mauritius experienced outbreaks of ASF. In the case of Namibia, the outbreak of FMD was in a small part of a constituency in the Caprivi Region in the northeast of the country. Botswana also experienced an outbreak of FMD in 2007 (ICM 2008). These

diseases hamper intra- and inter-regional trade in live cattle and beef and they deprive affected countries access to lucrative export markets. The FMD situation in Zimbabwe has led to the suspension of beef exports to the lucrative European Union (EU) market. The prevalence of these diseases varies with each country. The most common diseases are Foot and Mouth Disease, rift valley fever, contagious bovine pleuropneumonia, east coast fever, lumpy skin disease, trypanosomiasis and some poultry diseases (FAO 1999; SADC Review 2007). Efforts to control TADs include two projects currently underway in Angola, Malawi, Mozambique, United Republic of Tanzania, Zambia and Zimbabwe that are aimed at reducing incidences of transboundary animal diseases such as FMD and CBPP. Another upcoming project that aims at strengthening institutions such as veterinary services and veterinary laboratories will be implemented to enhance disease identification, surveillance and control. It will also come up with a proposal to set up a Southern African Commission for the Control of TADs (SACCT).

In Tanzania, infestations by the tsetse fly, a vector of trypanosomiasis, have rendered 60% of the total rangeland unsuitable for livestock production (Keenja 2004). Integrated Committee of Ministers (2008) noted that in 2007, a total of ten SADC states reported outbreaks of trypanosomiasis resulting in the deaths of about 900 head of cattle. Most of the outbreaks occurred in the United Republic of Tanzania. Furthermore there was an outbreak of rift valley fever in the United Republic of Tanzania which affected cattle, goats and sheep leading to a total loss of 46,000 animals and 140 human lives (ICM 2008). Regional control of trypanosomiasis is coordinated through the Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC). Some countries, however, fail to spray compromising surrounding countries that would have sprayed against tsetse fly. The management and control of pests and diseases increase the costs of production and hence reduce the incomes. Diseases have a negative impact on the productivity of livestock, and the livestock subsector in general. Outbreak of diseases like FMD, Bovine Sporadic form Encephalopathy (BSE), Contagious Bovine Pleuropneumonia (CBPP), and African Swine Fever (ASF) pose a serious threat to international livestock and livestock products trade, especially when a country is considered a high risk zone.

Inadequate veterinary public health, laboratory diagnostic and inspectorate services, and high costs of drugs add to the complexity of disease prevention and control in most of SADC countries.

There is still a challenge of low calving rates in communal areas, which may be due to diseases and decrease in forage quality and quantity. Mortality rates for small-stock, especially after birth, are high largely because of poor housing facilities, nutrition (drought) and diseases.

Economic and policy challenges

Depressed prices for primary commodities in global markets and constraints to access traditional markets constitute a continuing challenge to the livestock sector. The share of traditional exports in global markets has been shrinking, largely due to increased competition from other suppliers, subsidized exports and non-tariff barriers on traditional exports (Arya 2008). However, of late the European Union (EU) has promised full market access of beef to the African, Caribbean and Pacific (ACP) countries, though with some stringent barriers under the EU's Sanitary and Phytosanitary (SPS), and Food Safety regulations. Not all SADC countries are under the SADC–Economic Partnership Agreement (EPA). The configuration consists of Botswana, Lesotho, Namibia, South Africa, Swaziland, Mozambique, Angola and Tanzania. The dairy industry is still concentrated in the commercial sector because of financial constraints and expert management requirements. It will take time for dairy to contribute significantly in the economy of smallholder farmers.

In most of the SADC countries, there is limited financial assistance for communal farmers to increase or diversify their livestock production enterprises.

In most of the countries, cattle marketing facilities are few or non-existent, and there is dearth of

information in communal areas where most of the rural poor reside. This poses a serious setback in the whole livestock production enterprise. Higher feed costs and inadequate supply of day old chicks, hinders commercial production in broilers and layers in communal areas in most of the SADC countries.

Rangeland degradation

Overgrazing is one of the problems experienced in communal areas of most of the SADC countries and has a negative impact on livestock production (IFAD 2003). Soil erosion and bush encroachment result in reduced carrying capacity of grazing lands. SADC countries are prone to recurrent droughts. A general trend of overstocking in many SADC countries results in large livestock losses, especially in smaller countries like Lesotho and Swaziland. There is also lack of harmonized policy and strategy among the SADC countries for disease control, improve marketing and production.

Climate change

Climate studies are increasingly indicating that Southern Africa is one of the regions negatively affected by the climate change phenomenon. It is projected that the region is likely to continue experiencing increased frequencies and extremes of weather and climatic conditions such as floods, droughts, and tropical cyclone activity, as well as negative impacts on agricultural productivity, the environment, biodiversity and the water resource supply base, among others (ICM 2008). Climate change usually results in flooding during the rainy season and drought during the dry season in the following SADC member states: Angola (northern and southern regions), Lesotho, Madagascar (northeastern and central regions), Malawi (southern), Mozambique (Zambezi basin), Namibia (north-central and northeast), Swaziland, Zambia (southern and central provinces) and Zimbabwe. Madagascar (northern and eastern regions) and Mozambique (Nampula Province) were recently further devastated by tropical cyclones which caused extensive flooding, infrastructural and agricultural damage. Rainfall has become unpredictable in recent years resulting in food deficits in countries such as Malawi, Zambia and Zimbabwe. According to the Intergovernmental Panel on Climate Change (IPCC), agricultural production in many African countries and regions is projected to be severely compromised by climate variability and change. Climate change results in increased morbidity and mortality of livestock due to changes in the pest and disease regime. Drought will result in decreased vegetation biomass production with the end result of reduced livestock production. The combination of increases in carbon dioxide concentrations, in conjunction with changes in rainfall and temperature are likely to have significant impacts on grasslands and rangelands, with production increases in humid areas, but decreases in arid and semiarid areas which cover the greater part of southern Africa.

Capacity and human diseases

Inadequate extension services and inadequate human capacity contribute to challenges confronting growth of the livestock sector. There is considerable lack of skill in the processing of livestock products in areas that needs to be strengthened.

The prevalence of HIV and AIDS is high in the region. This is affecting economic activities in the livestock sector, especially in communal areas where there is need for labour to look after the animals. The death of the active population due to diseases like AIDS makes it difficult for the elderly and children to care for the livestock. Studies indicate that SADC with about 4% of the world population carries about 40% of HIV cases, and most of the infected people are within the most productive age groups, i.e. ages between 15 and 59 years (UNAIDS 2008).

2.3 Review of different animal production and veterinary science programs offered in SADC universities

Whilst only countries with postgraduate training were considered in detail in the study (Table 1), a brief outline of undergraduate training programs in SADC is provided.

Table 1. *Universities in SADC region offering postgraduate studies in animal production and veterinary science, 2008*

Country	University	Animal science	Veterinary science
South Africa	University of KwaZulu-Natal	Yes	No
	University of the Free State	Yes	No
	University of Fort Hare	Yes	No
	University of Pretoria	Yes	Yes
	Stellenbosch University	Yes	No
	Tshwane University of Technology	Yes	No
	University of South Africa	Yes	No
	University of Zululand	Yes	No
	University of Limpopo	Yes	No
	University of Venda	Yes	No
	University of North West	Yes	No
Zambia	University of Zambia	Yes	Yes
Botswana	University of Botswana	Yes	No
DRC	Lubumbashi University	Yes	Yes
Malawi	Bunda Agriculture University Malawi	Yes	Yes
Tanzania	Sokoine University of Agriculture	Yes	Yes
	St Augustine University of Tanzania	Yes	No
Angola	Agostinho Neto University	Yes	Yes
Mauritius	University of Mauritius	Yes	Yes
Mozambique	Eduardo Mondlane University	Yes	Yes
Zimbabwe	University of Zimbabwe	Yes	Yes

Review of undergraduate programs

The extent of undergraduate training in livestock production varies widely among SADC countries. The variation seems to be related to population and economy size. South Africa has the highest number of universities offering undergraduate training in livestock production, while most of the smaller states have a single university. Zimbabwe and Angola have two or more universities offering undergraduate studies in livestock production.

In South Africa, degrees in animal science vary from Bachelor of Agriculture, Bachelor of Science in Animal Science, Bachelor of Science in Agriculture specializing in Animal and Pasture Science, or Animal Science and Genetics. Bachelor of Agriculture is mainly offered as an option in most of the previously black institutions as the enrolment requirements are not rigorous compared to those for Bachelor of Science option. The bulk of students enrolled in livestock courses, therefore, do not qualify for postgraduate studies in animal production. Discontinuing the Bachelor of Agriculture degree is envisaged to lead to financial problems for the departments as it would mean less numbers of registered

students thus reduced subsidy from the National Department of Education. Low numbers of postgraduate students has been stated as a constraint to postgraduate training program.

The final years of Bachelor of Science degrees concentrate on applied subjects like animal nutrition, physiology and animal breeding. At the University of Pretoria, there is also an option of wildlife management. The University of Pretoria is the only university in South Africa offering undergraduate degree in veterinary science. The weakness of the program is that it produces more of generalists than specialists. Subsidy from the state for veterinary studies is not enough to cover the cost of the faculty and over the years the university has cross-subsidized activities of the faculty from funds earned by other less expensive faculties. On the other hand the University of the northwest Mafikeng campus offers Bachelor of Science in Animal Health and a Diploma in Animal Health.

Challenges in undergraduate training, especially in formerly black institutions is essentially lack of infrastructure, especially laboratories to conduct practicals. Most laboratory equipment is non-functional or outdated; not matching what is used in industry. This leads to under-prepared students for postgraduate training or industry. Students enrolled in these institutions are often from poor backgrounds and some fail to finish their undergraduate degrees if they have no bursaries or scholarships. Some institutions like the University of KwaZulu Natal, University of Free State and Stellenbosch University are strong in specialization like non-ruminant nutrition and animal breeding. Former black universities do not have a full complement of senior members of staff in many specialties. This poses a limitation in efficient conducting of the undergraduate program

Some smaller SADC state universities have no undergraduate specializations, for example the University of Lesotho, where students graduate with a Bachelor of Agriculture honours.

Six universities offer undergraduate degrees in livestock production in Zimbabwe, namely University of Zimbabwe, Midlands State University, Zimbabwe Open University, Africa University, Lupane State University and Bindura State University. University of Zimbabwe is the oldest one and has a grounded animal science program because of the duration in which the program has existed. The strength of the program is its practical component, which is catered for through the Saturday morning practical visits to surrounding commercial farms and the two–three months farm attachments during the long vacation after finishing the first year. The agro-industrial attachment after the end of second year equips the student with skills required at work places. The undergraduate program is strong in the animal nutrition specialty, as the institution offer short courses in feed formulation. Other modules offered in the final year of study include animal health, livestock improvement, animal production, range management and ecology, beef and small ruminant production, pig and poultry production and dairy production. The program is weak in the range management, range ecology and wildlife management disciplines. The research project during the last semester of final year provides students with research and project management skills. At the present moment economic challenges have left the university understaffed and most of practical content affected.

The veterinary science program enrolls a limited number of students to preserve quality of graduates. To expose the students to work environment, it is mandatory for students to spend a minimum of 13 weeks of certified extra-mural/vocational work attached to an approved veterinary surgeon or institution. In addition, students have to submit records of diseases or clinical cases encountered during their vocational work. Most of the courses have assessment methods like oral examination, continuous assessment and practical examination contributing much in the evaluation of student performance. Courses in final years include clinical medicine, general surgery, anaesthesia and radiology, veterinary immunity, veterinary microbiology, veterinary pathology, veterinary parasitology, veterinary pharmacology and toxicology. These courses are taken as specialization in the honours program. Funding for practicals is the main problem, and the shortage of staff due to the economic situation prevailing in Zimbabwe.

Zimbabwe Open University offers distance education and the animal science degree is a specialization under the Bachelor of Agriculture Management. The animal science modules covered include animal breeding, animal nutrition, dairy science and animal production. It draws most of its students from the working population which has previous qualification as diplomas from agricultural colleges. The apparent challenge includes lack of adequate practicals, since the university does not have its own labs and technical staff. In addition, since the animal science program is a general program which has a strong influence on management that makes it difficult for the graduates to enrol for postgraduate degrees in some Zimbabwean universities. Lack of specialization makes it difficult for researchers or the department to get funding, since funders are specific to certain research or study fields. The university, however, provides training opportunity for the working individuals to further their studies.

Bindura State University was founded as a teacher training university and it offers Bachelor of Science in Agriculture with Education, and specialization includes animal science, crop science among others. The curriculum is not designed to produce strong animal scientists who can enrol for postgraduate studies. This is due to few animal production courses being offered; for example there is only one breeding and physiology course; there are more of pasture science courses though. There are challenges in conducting practicals, because there are no laboratories and funding has dwindled. There is also one practical course which is not enough exposure for students. Nonetheless, since the initial vision of the university was training agricultural teachers and extension officers, the university is excelling on that mandate.

The Midlands State University is more biased towards nutrition because a lot of modules from first to final year are nutritional modules; there are few modules on pasture science. Graduates from this university would be more interested in pursuing nutrition specialization in their postgraduate studies. Its strength is a full year student internship in industry during the 3rd year of study. Africa University is a relatively new private institution facing challenges of infrastructure and laboratory equipment.

The Botswana College of Agriculture, University of Namibia, University of Swaziland, National University of Lesotho, University of Mauritius, Eduardo Mondlane University, Bunda College of Agriculture in Malawi, University of Zambia, and Sokoine University in Tanzania also offer an animal science option and they are the only institutions in their respective countries. The Botswana College of Agriculture has many courses in animal science which include animal nutrition, microbiology and animal health. It offers optional specialization in ruminant and non-ruminant nutrition through modules selected. Game farming and ranching, livestock product processing and sheep and goat production are some of the core courses of the ruminant nutrition stream. Pig and rabbit production, ostrich production, aquaculture and beekeeping are some of the non-ruminant nutrition courses.

Bunda College of Agriculture has a strong undergraduate program with many courses which include nutrition, physiology and breeding. The institute is involved in research in the following areas crops: livestock, fisheries, natural resources, food processing and storage (Nienke et al. 2004).

University of Lesotho, which recently introduced postgraduate training in agriculture, offers a general degree of Bachelor of Science in Agriculture, with animal science courses being components of the degree. Most are, therefore, poorly prepared for postgraduate training. Research conducted is mainly in the marketing of agricultural products such as grains, livestock and horticulture. Lack of human resources and lack of research culture limits the scope of the research at the institute.

University of Mauritius also offers a generalized degree with animal science components being part of Bachelor of Science honours in agri-science and technology. Animal science modules include animal science and production, animal production principles and techniques. This might explain the limited specialization in their masters program, with only the tropical animal production option being offered. A positive part of the program is student participation in the Student Work Experience Placement (SWEP) program designed to assist them to acquire complementary skills and to understand and experience the exigencies of the world of work.

The University of Madagascar has split into the University of Toamasina and University of Antananarivo. The latter offers undergraduate degrees with specialization in livestock production as a component of the general degree in agriculture. University of Agostinho Neto in Angola and University of Lubumbashi in the Democratic Republic of Congo offer undergraduate and postgraduate degrees in animal science.

Review of postgraduate programs offered

Extensive postgraduate training in both animal production and veterinary science up to doctoral level is done in South Africa, Zambia, Zimbabwe and Tanzania (Table 2). Malawi and Mauritius do not train veterinary scientist, with Mozambique still to establish postgraduate courses in the two fields. South Africa has many areas of specialization, because of the large number of competing universities which have to establish their niche (Table 3). The field of animal nutrition, breeding and physiology are covered in many SADC universities. Poultry production is also covered in most countries because of its relevancy in small-scale farming, and probably because of easy establishment of poultry facilities. Meat science, rangeland ecology, wildlife management, aquaculture and equine nutrition training are mainly restricted to South Africa. This might also be due to the number of universities and the challenges faced by the livestock sector in the country. Mauritius, Mozambique, Zambia and Zimbabwe have limited areas of specialization.

Table 2. *Postgraduate programs offered (×) in SADC institutes*

Program	Malawi	Mauritius	Mozambique	South Africa	Zambia	Zimbabwe	Tanzania
Animal production	×	×	×	×	×	×	×
Veterinary science				×	×	×	×
MSc animal science	×	×		×	×	×	×
PhD animal science	×	×		×	×	×	×
MSc veterinary				×	×	×	×
PhD veterinary				×	×	×	×

Review of short courses offered

The most prominent short course in five SADC countries is poultry production, which includes both broiler and layers production. The course is mainly administered to small-scale or communal farmers and extension officers in most countries. Beneficiaries of land restitution in South Africa are often trained in poultry production. In South Africa, pig production, an enterprise with potential of alleviating poverty in communal areas, is also offered as a short course in mainly former black universities such as the University of Venda and Northwest University.

Beef cattle management course covering aspects of feed formulation, raising animals on a feedlot system and breeding strategies is offered in Malawi, Zimbabwe and South Africa. Regular feed formulation courses are also offered in Zimbabwe and Malawi. Small stock production courses, including goat milk production, are offered to farmers and extension officers at the University of Pretoria and Bunda College of Agriculture. At the University of Free State, sheep breeding aspects such as artificial insemination are taught to small-scale and commercial farmers. North West University's location in a dry area and the associated dominant small stock production enterprise necessitates training farmers on sheep and goat production aspects.

Short courses on artificial insemination are offered at few universities, mainly at the University of Zimbabwe and the University of Free State. This might be due to high costs involved in administering such a course. A limited number of universities, mainly in South Africa offer a short course in dairy production. The dairy production enterprise is characterized by large investments in pastures and setting

up milking parlors; hence it becomes prohibitive for institutions and the targeted groups to be trained, as there are no assurances that the skills gained would be utilized. Dairy production courses are offered at the University of Fort Hare and the North West University.

Table 3. Key specialties (x) in animal production and veterinary sciences in SADC institutes

Specialization	Malawi	Mauritius	Mozambique	South Africa	Zambia	Zimbabwe	Tanzania
Veterinary pharmacology							x
Veterinary microbiology					x		x
Anatomy							x
Veterinary pathology					x		x
Veterinary parasitology					x		x
Physiology							x
Toxicology							x
Veterinary medicine							x
Surgery							x
Reproduction							x
Tropical animal production							x
Preventative veterinary medicine			x				x
Public health/zoonosis			x		x		
Poultry medicine					x		
Biomedical laboratory diagnosis			x				
Veterinary science				xx			
Veterinary industrial pharmacology				x			
Veterinary tropical diseases				x			
Animal nutrition				x	x	x	
Animal breeding and genetics	x	x		x	x	x	
Animal production physiology	x			x	x		
Meat science				x			
Ecology rangeland				x			
Animal production management	x			x			
Wildlife management				x			
Tropical animal production		x					
Pasture, veld management		x		x			
Poultry production	x	x	x	x	x	x	
Animal health	x		x				
Pig Production	x			x			
Small stock	x			x			
Equine nutrition				x			
Aquaculture				x			
Dairy science				x		x	

Specialized courses such as wildlife management at the University of Pretoria, and honey production at Eduardo Mondlane University in Mozambique show that short courses offered depend on the inherent

capacity of those institutions. Other short courses offered include animal draught power, animal health and Geographic Information Systems (GIS) in Mozambique, Zambia and South Africa respectively.

2.4 Collaboration and linkages

2.4.1 Intra-university collaboration

Intra-departmental collaboration exists at all surveyed universities in SADC (Table 4). In most countries, animal production departments collaborate mainly with other agriculture departments such as soil science, agricultural economics, plant production and agricultural engineering. The statistics department is mainly consulted during design of experiments and analysis of data. Little collaboration exists with social science disciplines except in Malawi and South Africa where collaboration was identified with departments of development studies and rural development, respectively. At the University of Zimbabwe, the department of animal science collaborates with the Institute of Environmental Studies in highlighting the importance of livestock and environment interaction.

Table 4. *Intra-university collaboration (x) in SADC institutes*

Collaborator	Malawi	Mauritius	Mozambique	South Africa	Zambia	Zimbabwe	Tanzania
Soil science						x	x
Agribusiness, economics and extension	x			x			x
Faculty of Medicine			x	x			
Zoology				x			
Genetics				x			
Statistics				x		x	
Biochemistry				x			
Botany				x			
Rural development				x			
Aquaculture				x			
Plant production	x			x	x		
Chemistry				x			
Animal health				x			
Microbiology				x			
Food science				x			
Faculty of Veterinary science				x			
Faculty of Engineering		x				x	
Development studies	x						
Institute of environmental studies						x	

2.4.2 Collaboration with national research systems

There is good collaboration between universities and NARS in all countries. The major type of collaboration is joint research, human resource and sharing of laboratory facilities. Collaboration helps NARS staff in enrolling for postgraduate degrees in the universities. In countries like South Africa, Zambia and Zimbabwe, NARS staff are involved in co-supervision and external examination of students. The extent of collaboration is greater in South Africa, Mozambique and Zambia. Establishment of MOUs was suggested as a way of improving collaboration between universities and NARS.

2.4.3 Collaboration with national extension system

There was no collaboration identified between the NES and the university in Mauritius. Collaboration between NES and universities in Malawi, Mozambique, Zambia and Zimbabwe was described as poor, restricted mainly to joint participation in project and policy workshops. Some university indicated that NES sometimes host students' practicals, field visits, attachment and help in on-farm research. Much of the collaboration between NES and universities is done in South Africa, with less collaboration in Tanzania and Malawi. Formalization of collaboration through MOU, and including NES staff as faculty advisory board members would help in improving collaboration in most of the countries.

2.5 Involvement of institutes in farmer training

All universities surveyed contribute, one way or another, to farmer training. The main contribution is through conducting short training courses in a range of subjects which include poultry, pig, goat and dairy production (Table 5). Training can be through training of trainers or through participatory research as done in Malawi, Mauritius, South Africa and Zimbabwe. South Africa and Mozambique contribute to farmer training more than other countries.

Table 5. Contribution (x) to farmer training by SADC institutes

Type of contribution	Malawi	Mauritius	Mozambique	South Africa	Zambia	Zimbabwe	Tanzania
Training of trainers	x			x	x		
Training through research with farmers	x	x		x		x	
Farmer advisory services		x	x	x		x	x
Short training courses		x	x	x	x	x	x

2.5.1 Collaboration with other institutes (regional and international)

Universities in SADC countries are engaged within country and internationally (Table 6). South Africa, with the largest number of universities, has a strong within country collaboration. This collaboration mainly involves co-supervision of student, joint research and teaching, external examination, curriculum reviews and use of research facilities. In research and training, many developing countries in the southern hemisphere face similar problems. Collaborating with developed southern hemisphere countries helps in sharing experiences from relatively similar environments and how best to address these problems. North–South collaboration helps to address challenges of differing conditions and resources. The South–South collaboration by Malawi, South Africa and Zambia are mainly within Africa, and involve curriculum development. Mauritius, Tanzania and Zimbabwe are mainly involved in North–South collaboration. South Africa, Zambia and Mozambique are also heavily involved in the North–South collaboration. North–South collaboration is mainly in the form of staff exchange, curriculum review, and conception of postgraduate programs, joint research, sandwich study activities and co-supervision of postgraduate students. Most of the North–South collaborations are donor driven i.e. the donor e.g. the EU, DeLPHE and NUFFIC requiring that a SADC university identify a European or regional partner prior to granting of funding.

2.5.2 Effectiveness of collaboration

In many instances, it was observed that the collaborations were project based; a group of individuals with similar research interests getting together to share resources and co-supervise students. These arrangements are often supported by letters of agreement as opposed to broad MOUs. Whilst such arrangements are important, they lack the depth required to tap into resources of institutes beyond the departments or collaborating units.

Table 6. *SADC universities' collaboration with other institutes*

University	Department	Collaborating departments	Collaborating university
UNIMA– BUNDA	Animal science	Crop science, home economics and human nutrition, development studies	UZ, UNZA,
UOM	Animal science	Agricultural engineering,	University of Queensland
EMU	Veterinary science	Faculty of Medicine	UP, Norwegian School of Veterinary Science, Universidade Tecnica de Lisboa
NWU	Animal science	Chemistry, animal health, crop science, agricultural economics	
UL	Animal science	Biochemistry, aquaculture, statistics, Plant production, agricultural economics	UKZN, UP, UOFS
UNISA	Animal science	Animal health	
UNIZULU	Animal science	Biochemistry, botany, rural development	University of Sweden, UKZN, UCT, NWU, SUN
UNIVEN	Animal science	Statistics	UKZN, UP, UL
UOFS	Animal science	Medical Faculty	CUT
UP	Animal science	Veterinary Science	EMU, Makerere University, Wageningen University, Antwerp Inst for Tropical Medicine, Iowa State University
UP	Para-clinical sciences	Agriculture	Wageningen University, Utrecht University, University of Perugia
UP	Veterinary Tropical Diseases	Animal production, centre for veterinary wildlife studies, biological and agricultural sciences	Institute of Tropical medicine, Utrecht University, University of California Davis
UFH	Animal science	Agriculture economics, agronomy	SUN, UNIVEN, UP
SUN	Animal science	Microbiology, food science, genetics	
UKZN	Animal science	Biochemistry, chemistry, agricultural economics, food security	UNIZULU
UNZA	Animal science	Crop science	Makerere University, Africa University, University of Nairobi,
UNZA	Veterinary science	School of Medicine, Biology	University of Oslo, University of Copenhagen, University of Gent
UZ	Animal science	Mathematics and statistics, Institute of Environmental Studies, soil science and agricultural engineering	Bristol University

Where government provides financial support to universities, there is a requirement for institutes to assist NARS and NES. There were a number of regional initiatives such as the tsetse control program which assisted in cementing some of the regional linkages. Many donors, for example DELPHE, require the involvement of a European and regional partner when supporting projects. In general, collaborations in-country and with other partners were found to be weak.

3 Strengths, weaknesses and gaps

3.1 Critical constraints faced by institutes in implementing programs

Major constraints in most of the countries include inadequate and old laboratory equipment, shortage of teaching and technical staff, lack of bursaries which leads to poor enrolment and low through put rates (Table 7). In Malawi, prospective postgraduate students prefer to study overseas, while in South Africa most students are not fully prepared for postgraduate studies, largely due to the residual effects of the poor Bantu Education System. Many bright South African students prefer to work rather than pursue postgraduate training.

Table 7. Critical constraints (x) faced by SADC institutes in offering postgraduate training

Constraint	Malawi	Mauritius	Mozambique	South Africa	Zambia	Zimbabwe	Tanzania
Less time to fulfil teaching, research and community outreach industries				x		x	x
Inadequate and old laboratory equipment	x	x		x	x	x	
Shortage of teaching and technical staff	x	x	x	x			x
Lack of bursaries		x		x	x		
Few students interested in postgraduate studies		x		x			

Critical constraints in most SADC countries range from finance, personnel and infrastructure. Most of the laboratories have limited equipment to effectively conduct experiments, in some cases, the equipment is too old, compromising the quality of results.

3.2 Gaps in capacities and existing curricula

The postgraduate curriculum does not fully cover the requirements of the industry in many SADC countries. More than 80% of the universities in the eight countries studied identified the following gaps in their curriculum: Negotiation and conflict resolution skills; leadership and decision making; innovation systems perspective and implication to research and development. The design, implementation and assessment of networks and partnerships is fairly covered in the curriculum of most SADC country universities, save for most South African universities. Intellectual property right policy; facilitation skills; monitoring, evaluation and impact assessment; poverty, vulnerability and risk analysis; gender analysis; disease surveillance and preparedness, and safety are some of the gaps in the curricula.

Curriculum gaps such as scientific writing skills, sustainable use of animal genetic resources and effective communication are only found at the University of Malawi, University of Zambia and University of Zimbabwe (Table 8). Furthermore, many curricula do not cover important subjects under the broad themes like service delivery, marketing and policy.

Table 8. Identified gaps (x) in postgraduate curricula at SADC institutes

Gap	University					
	EMU	SUA	UNZA	UZ	UM	UNIMA
Negotiations and conflict resolution skills	x	x	x	x		x
Design, implementation and assessment of networks and partnerships			x	x	x	
Participatory research methods	x		x			
Leadership and decision making	x	x	x	x	x	x
Strategic planning	x		x	x	x	x
Intellectual property right policy		x	x	x	x	x
Facilitation skills		x	x	x	x	x
Monitoring, evaluation and impact assessment	x		x	x	x	x
Planning and priority setting	x		x	x	x	x
Climate change, implications and adaptation strategies		x	x		x	x
Poverty, vulnerability and risk analysis		x	x	x	x	
Value chain analysis, market orientations and implications to R&D			x	x		
Innovation systems perspective and implication to R&D		x	x	x	x	x
Interaction of crop–livestock–water	x	x	x			x
Gender analysis		x	x	x	x	x
Sustainable use of animal genetic resources			x			
Management of gene bank			x		x	x
Convincing proposal writing	x		x	x		x
Scientific writing			x			x
Effective communication			x	x		x
Bioinformatics			x	x	x	x
Disease surveillance and preparedness	x		x	x	x	x
<i>Ex situ</i> conservation of animal genetic resources		x	x			
Biosafety		x	x	x	x	x

Review of importance of training offered and not offered

Countries with veterinary science programs have strong capacity in animal health, with their universities training in most subjects in animal health. On-farm research is strong in Malawi, Zimbabwe and Tanzania, probably due to the extensive small-scale agriculture production. South Africa is strong in most of the core livestock production. South Africa is strong in poultry production, parasitology and parasitic diseases. South Africa and Mauritius have strong feed evaluation programs.

Countries such as Mauritius, Zambia and Zimbabwe have a limited application of GIS which is increasingly becoming important in solving agricultural problems. Other weaknesses in South Africa, Malawi and Mauritius include lack of research funding, poor research facilities and lack of specialized teaching, research and laboratory staff. The postgraduate curriculum is either old or lacks important concepts such as on-farm research techniques.

In addition to gaps in curricula identified in Table 8, some of the areas that require a closer look for possible inclusion in postgraduate training are livestock–crop–environment interactions, and use of animal genetic resources. Institutional and policy issues that need to be addressed by training programs

include the link between the national goals and how the livestock policy is formulated to achieve those goals; effect of present and past policies on livestock production; biosafety policy and procedures. Value chain analysis in livestock production has to be included in training as value addition in manufactured products determines the profitability of the enterprise. Processing of animal products must not only cover meat, but include other products such as milk and skin. Key animal health issues that need to be addressed by the training programs include disease surveillance and preparedness. Climate change and livestock monitoring and evaluation are some other issues which need to be included in the curricula. These issues are current and increasingly becoming more important in animal production, therefore, food security for most of southern Africa.

4 Capacity strengthening needs and recommendations

4.1 Review of specific areas that need to be strengthened and possible role of ILRI in bridging gaps

The International Livestock Research Institute (ILRI) has an important role in tackling the challenges faced by tertiary institutions involved in postgraduate training in livestock production. With its extended history and technical savvy in livestock research, sourcing of funds and training, ILRI can play a significant role in the development, revamping and bridging some of the identified challenges. All interviewed institutions in Southern Africa were familiar with ILRI and what it does.

It was clear from most of the responses that universities understand that ILRI is not a donor agency but an international research institution dependent for funding from donors, working through partners. A detailed synthesis of the possible role that ILRI can play in postgraduate training in the SADC region is provided below:

The key challenges, constraints and gaps identified by most of the institutions fall into the following broad categories and the potential roles of ILRI are identified for each of the categories:

1. Lack of or ageing of laboratory and farm infrastructure: In this regard ILRI can, through partnering with some of the institutions or relevant NARS and developing joint projects, assist in securing resources for recapitalization of some of the laboratories. ILRI can further assist by providing opportunities for students to conduct research at its facilities or in projects ILRI implements. It is clear that ILRI and participating institutions will have to earmark resources for such involvement. The development of strong collaboration among NARS and universities has the potential to create physical space for research (farms) and training of postgraduate students. This is important even at undergraduate level if potential postgraduates are to be adequately prepared for high level learning.
2. Lack of adequately trained staff to handle postgraduate training and high staff turnover: Addressing the quality of research facilities and equipments (1 above) has the potential to assist in the improvement of the quality of research and teaching staff, reducing the rates of turnover to some extent. ILRI in partnership with most of the animal science and veterinary science schools can assist staff with platforms for post doctoral training, enhancing their skills and improving their preparedness for postgraduate supervising and dissemination of research findings. These can be achieved through strengthening the graduate fellowship program. Critical areas include training laboratory technicians on new technologies. In order to speed up the process of information dissemination and technology uptake, ILRI can be heavily involved in training of trainers, which might include extension, NGO and university staff. These agents will in turn train farmers and other groups involved in agricultural production. National institutions can come into the plate and adequately remunerate staff at universities if retaining good quality professionals is the goal.
3. Unavailability of funds for research and student support: Joint development of proposal and making potential funding facilities and organization known is a key role that ILRI, because of its international outlook, can assist most of the institutions. This may involve the creation of an active network of professionals in these institutions, for example, the ILRI-SADC champions initiative is a step in the right direction. ILRI can serve as a platform through which institution can share experiences and establish contacts.
4. Weak collaboration and unstructured networking: This is an area that is very important in an environment where resources are limiting. Universities can share resources with each other or with NARS and the private sector. These resources include human, financial and infrastructure. But for this to happen strong collaboration is required supported by mutual benefits and trust, reduced or elimination of unnecessary bureaucracy with relevant and binding checks and balances. MOU can play an important role in this regard. Because of the way ILRI works, through partnership, it has considerable experience in the formulation and strengthening of MOU. ILRI can, therefore, play a key supporting role in the development of either bi-lateral or multi-lateral MOUs among institutions, proving the necessary third party neutrality and check and balances. In the case of South Africa it was disheartening to note that there is a lot of collaboration with

overseas universities but very little with SADC or African institutions. This is the general trend with other universities as well. Whilst this collaboration is good it cannot be sustainable— one we would like to see in a situation where more regional collaboration is developed. This is important if the institutions are to increase their postgraduate student numbers. Costs of teaching and research will be reduced if most of the activities happened within short distances (regionally).

5. Uncertainty of the quality of curriculum: This area is largely best discussed/debated at national level, with curriculum needing to reflect the aspiration of the nation in the sector. However one is aware of the globalization of most livestock activities and the need for training to include global trends and needs. ILRI has the eagle's eye view in this regard, and its expertise can be called upon to assist/participate in curriculum reviews.

4.2 Suggestions on strengthening partnerships

Most of the curriculum is deficient in soft skills which are becoming important as the beneficiaries of technologies are increasingly becoming literate and discerning, and also demanding full participation in activities aimed at changing/improving their lives. ILRI can partner in the re-skilling of university postgraduate staff in areas identified as lacking in curriculum such as leadership and decision making; negotiation and conflict resolution skills, design, implementation and assessment of networks and partnerships; monitoring, evaluation and impact assessment; poverty, vulnerability, risk analysis; value chain analysis, market orientations and implications to research and development; innovation systems perspective and implication to research and development; gender analysis; bioinformatics; disease surveillance and preparedness, and biosafety. Sabbatical visits by the university staff to ILRI was identified as helpful in building capacity of the universities.

ILRI can also be instrumental in creating a platform for identifying appropriate regional research and collaboration needs in an effort to strengthen postgraduate training. Joint training programs would also be the best way to bridge the capacity gap in tertiary institutions. Co-supervision and joint research projects between ILRI and universities would also strengthen the postgraduate training program.

In Mozambique, since the postgraduate program in the university is still in its infancy, ILRI can strengthen it by evaluating the content or curriculum of the whole program to ascertain whether it meets the expectations of the livestock sector in Mozambique and internationally.

5 Conclusion, recommendations and limitations

This study, on the current status of postgraduate training in the SADC, whilst brief, brought out a number of interesting challenges facing the animal production and veterinary science in the region, consequently the livestock sector. Some of the issues, like poor funding for tuition and research, are perennial. Clearly from the study, most of the challenges can be alleviated by proper collaboration. ILRI can play a significant role of providing a platform and facilitation required in getting institution involved in livestock production to develop beneficial and secure collaboration. It is hoped that in an effort to improve training in the livestock sector through cutting edge research, soft skills will be incorporated in curriculum if graduates are to make major strides in assisting the discerning farmers we have today. It is further hoped that partnerships will be developed between ILRI and institutions in the SADC region in efforts to improve the quality of training in postgraduate training in the livestock sector.

In reviewing postgraduate programs, the central question to be asked should be; 'What kind of human product is required from tertiary institutions to meet the challenges of livestock sector today and in the future?'

Key areas identified as major challenges and gaps were: weak collaboration among country and regional institutions; lack of skilled staff to train postgraduates; poor infrastructure for research (aging equipment); weak and often unchanging curricula. These gaps lead postgraduate training programs to fail to produce relevantly skilled personnel for industry and the livestock sector in general, particularly the smallholder sector.

5.1 Strengthening collaboration

ILRI has a strong history and capacity in the development and maintenance of networks and MOUs. It is suggested that workshops are held with stakeholders, facilitated by ILRI, to guide in the development of MOUs and networks. An initial workshop can be held followed by need-based, focused, and follow-up workshops and meeting involving interested institutions around common themes e.g. animal breeding and alternative feed resources.

5.2 Lack of skilled staff to train postgraduates

In this study, an inventory was made of the challenges in postgraduate training. It was clear from the responses that skills possessed by trainers were, to some extent and in some disciplines, inadequate, leading to a situation where the need to revamp or develop new curriculum to meet the perceived or real challenges identified in the livestock sector is hampered. There is, therefore, an immediate need to take stock of the existing skills and the strengths of those skills, identifying key gaps. The purpose of this will be to develop programs or activities to bridge the gaps. This will have a potential benefit of empowering trainers with a '3rd eye', a new/renewed way of looking at training for the livestock sector in the region.

An exercise of this nature will inevitably lead to the renewal of curriculum at a number of universities in the region. ILRI can, therefore, be the agent that spearheads an exercise of this nature in partnership with the livestock improvement component of SADC. This can be an exercise carried out within a 6 months period. One would like to see NARS and private livestock industries participating and playing a key role in an exercise involving curriculum review. The NARS and the private sector provide, rather, should provide, strong feedback to postgraduate training programs.

5.3 Poor research infrastructure

Poor funding levels and reduced funding sources were, to a large extent, identified by many interviewed institutions as major challenges in the acquisition and maintenance of equipment and other infrastructure

required for research and training at postgraduate level. The reality is that funding in many SADC countries for training has diminished, and continues to do so. The solution to challenges of infrastructure will lie in the ability of universities to collaborate within themselves, with NARS, and with other universities and institutions around the world. The development of strong, MOUs based collaboration will go a long way in mitigating challenges of capacity both at infrastructure and human level. It was clear that the capacities of universities in the area of infrastructure varied vastly; some universities and NARS have high tech equipment, farms etc. which can benefit institutions without. Collaboration, as is already happening in some cases, can benefit postgraduate training programs in the region.

5.4 Limitations of the study

Time was a major limitation. The study will have been better informed by consulting industry and students, both undergraduate and postgraduates. The study, however, still brought out a number of key issues for discussion. It was difficult to get responses from some of the key countries in the region. Some of the universities were at break during the study period and in Angola there were elections underway during the time while there were communication challenges in DRC. A key stakeholder workshop would have contributed significantly to the breadth and depth of the study

5.5 Significance of the study

The results of the study are very important in that they identify some of the cross cutting challenges such as funding which leads to a whole host of other major constraints such as type of course that can be offered, number of students that can be recruited for postgraduate training, quality and level of qualification of technical and teaching staff. Furthermore, the study highlights the need for better coordinated collaboration in the region. Clearly there is a lot of work that needs to be done to improve postgraduate training in the field of animal production and veterinary sciences.

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Appendix 1 Terms of reference for the study

The broader terms of reference for the study are to:

1. Review and document the role of livestock in the regional economy and the emerging challenges confronting the livestock sector
2. Review and document the current status of postgraduate training in the livestock sector in the region (including an inventory of institutes).
3. Discuss the collaboration and linkage between tertiary educational institutes and research, extension systems and their strengths and weaknesses
4. Identify the critical constraints and challenges facing the agriculture higher learning institutions in the region
5. Identify the missing elements and capacity gaps in the existing curricula (especially at the postgraduate level) to address the emerging needs and challenges of the livestock sector
6. Identify the role and priorities of ILRI in bridging the capacity gaps identified and
7. To make recommendations/suggestions to move forward.

Appendix 2 Survey questionnaire

Current status of postgraduate training in animal production, veterinary science, strengths, gaps and priority areas for support

(Questionnaire for collecting information from key informants: This information should be collected for each university in the region)

A) Information about the key informant (person completing this questionnaire)

Name: _____

Position: _____

Contact details:

Mailing address: _____ Phone: _____

_____ E-mail: _____

_____ Fax No. _____

B) Information about the university

Name: _____

Address: _____

Web site: _____

C) Programs offered

C.1 Does your university offer postgraduate training in

a. Animal production Yes No

b. Veterinary science Yes No

C.2 If yes, at what level

a. Animal production MSc PhD Others (Specify)_

b. Veterinary science MSc PhD Others (Specify)_

C.3 In which year did your university start this program? Please specify the year.

MSc _____ PhD _____

C.4 Please specify the areas of specializations offered:

MSc

PhD

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

D) Critical constraints:

Please list the critical constraints that your university is facing in implementing the postgraduate program.

E) Collaboration with other departments/universities/institutes in implementing the postgraduate program.

E.1 Does your department/faculty collaborate with other departments in your university in implementing the postgraduate training program?

Yes No

E.2 If yes, please provide the following information.

Department/faculty	Nature of collaboration
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E.3 Does your department/faculty collaborate with other universities in implementing the postgraduate program?

Yes No

E.4 If yes, please provide the following information.

Name of university and country	Nature of collaboration
--------------------------------	-------------------------

F) Collaboration with research and extension institutes

F.1 Does your university collaborate with your national research system?

Yes No

F.2 If yes, please list the nature of this collaboration.

F.3 How would you rate this collaboration?

Very good Good Weak/Poor

F.4 If yes, please list the nature of this collaboration (Please list the type of action to be taken).

F.5 Does your university collaborate with your national extension system?

Yes No

F.6 If yes, please list the nature of this collaboration.

F.7 How would you rate this collaboration?

Very good Good Weak/poor

F.8 If yes, please list the nature of this collaboration (Please list the type of action to be taken).

G. Program strengths/weaknesses/gaps

G1. In which specific areas do you think that your university has a strong academic program? Please list.

G2. Do you see any weaknesses in your current postgraduate program?

Yes No

If yes, please specify.

G3. Please indicate whether your current postgraduate training program offers training in the following areas? If not indicate how important to include them in the curriculum.

Skill areas	If no, degree of importance	
	Yes/No	(EI = Extremely important, MI = Moderately important, NI = Not important)
1. Participatory research methods		
2. Leadership and decision making		
3. Strategic planning		
4. Intellectual property right policy		
5. Negotiation and conflict resolution skills		
6. Facilitation skills		
7. Design, implementation and assessment of networks and partnerships		
8. Monitoring, evaluation and impact assessment		
9. Planning and priority setting		
10. Climate change: Implications and adaptation strategies		
11. Poverty, vulnerability and risk analysis		

-
12. Value chain analysis, market orientations and implications to R&D
 13. Innovation systems perspective and implication to R&D
 14. Interaction of crop–livestock–water
 15. Gender analysis.
 16. Sustainable use of animal genetic resources
 17. Management of gene bank
 18. Convincing proposal writing
 19. Scientific writing
 20. Effective communication
 21. Bioinformatics
 22. Disease surveillance and preparedness
 23. *Ex situ* conservation of animal genetic resources
 24. Biosafety
 25. Others (please specify)
-

G4. Do you think that your current postgraduate program is adequately addressing the current and emerging challenge of the livestock sector?

Yes No

G5. If yes, which current and emerging issues that were not being addressed 5 years ago are currently being addressed?

- a. _____

- b. _____

- c. _____

- d. _____

G6. If no, please indicate the areas that needs improvement.

Policy/institution (specify)

Animal production (specify)

Service delivery (specify)

Processing (specify)

Animal health (specify)

Marketing/value addition/trade (specify)

Others (specify)

H. Involvements in farmer training

H1. Does your university currently involve in training the farmers?

Yes No

H2. Yes, list the different ways in which the university contributes to farmer training?

I. ILRI's potential role in supporting the postgraduate training.

11. Are you familiar with the International Livestock Research Institute?

Yes No

12. How can ILRI assist your university in strengthening the postgraduate training program in animal production and veterinary science? (Please use the gaps and weaknesses identified in section G to answer this).

J. Any other comments

Thank you very much for completing this questionnaire. Your response will assist us in identifying the strategic support needed and the role of ILRI in supporting the tertiary educational institutes in SSA.

Appendix 3 List of individuals and institutions contacted

Respondent	Position	Department/Faculty	University
Dr SD Mulugeta	HOD	Animal Science	North West University
Prof JW Ngambi	HOD	Animal Science	University of Limpopo
Dr JJ Baloyi	Senior lecturer	Agriculture, Animal Health and Human Ecology	UNISA
Dr K Mbatha	SNR Lecturer	Agriculture	University of Zululand
Dr O Acheampong-Boateng	HOD	Animal Science	University of Venda
Prof JPC Greyling	HOD	Animal Science	University of Free State
Prof EC Webb	HOD	Animal Science	University of Pretoria
Prof J Coetzee	HOD	Veterinary Tropical Diseases	University of Pretoria
Prof CJ Botha	HOD	Paraclinical Sciences	University of Pretoria
Dr IV Nsahlai	Act. HOD	Animal and Poultry Science	University of Kwazulu Natal
Prof CW Cruywagen	HOD	Animal science	Stellenbosch University
Prof M Chimonyo	HOD	Livestock and Pasture Sciences	University of Fort Hare
Prof PN Wambura	Dean	Faculty of Veterinary Medicine	Sokoine University of Agriculture
Mr B Masunda	HOD	Animal Science	University of Zimbabwe
Dr DAA Correia	Dean	Faculty of Veterinary Sciences	Eduardo Mondlane University
Dr MZJ Elias	Deputy Dean	Faculty of Veterinary Sciences	Eduardo Mondlane University
Dr Françoise Driver	Ass Professor	Faculty of Agriculture	University of Mauritius
Dr T Gondwe	HOD	Animal Science	Bunda college of Agriculture
Dr AS Mweene	Dean	Faculty of Veterinary Science	University of Zambia
Judith Lungu	Dean	Animal Science	University of Zambia
Prof PN Wambura	Dean	Veterinary Medicine	Sokoine University of Agriculture, Tanzania



www.ilri.org headquarters box 30709 Nairobi 00100, Kenya phone +254 20 422 3000 fax +254 20 422 3001
email ilri-kenya@cgiar.org

principal site box 5689, Addis Ababa, Ethiopia phone +251 11 617 2000 fax +251 11 617 2001
email ilri-ethiopia@cgiar.org

ILRI via USA direct phone +1 650 833 6660 fax +1 650 833 6661