

## Current status, challenges and strategies employed to raise the population of small ruminants in Botswana: A review

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### Abstract

Sheep and goats (small ruminants) were the first two animals to be domesticated by humans mainly for meat, milk and byproducts. Asia holds the world's largest goat population (52%), followed by Africa (39%), Europe (5%), Americas (4%), and Oceania (<1%). This review article highlighted the current status of small ruminants in Botswana, challenges and efforts being made to increase national flock population. The latest statistics estimate the population of small ruminants in Botswana to be about 2 065 705 (i.e., 1 769 811 goats and 295 894 sheep). Two production systems exist and these are traditional and commercial. The traditional sector held 95% and 88% of goats and sheep, respectively. Generally, productivity as measured by off-take and mortality rates was low in the traditional sector compared to the commercial sector. However, birth rates were high in the traditional sector than in the commercial sector. The major challenges in small ruminants production in decreasing order were production, marketing and infrastructure, technical and financial oriented. Interventions relating to animal health, cultivation of fodder crops and strategic feeding practices, water development, establishment of processing plants countrywide, as well as, intensified farmer education and training could help raise the national flock numbers and improve productivity leading to export of meat to the secured markets in Africa, Middle East and Europe.

**Keywords:** Challenges, commercial and traditional sectors, meat, productivity, sheep and goats.

## Situation actuelle, défis et stratégies employées pour élever la population de petits ruminants au Botswana : une revue



### Résumé

Les moutons et les chèvres (petits ruminants) ont été les deux premiers animaux à être domestiqués par l'homme principalement pour la viande, le lait et les sous-produits. L'Asie détient la plus grande population caprine au monde (52 %), suivie de l'Afrique (39 %), de l'Europe (5 %), des Amériques (4 %) et de l'Océanie (< 1 %). Cet article de synthèse a mis en évidence la situation actuelle des petits ruminants au Botswana, les défis et les efforts déployés pour augmenter la population du troupeau national. Les dernières statistiques estiment la population de petits ruminants au Botswana à environ 2 065 705 (c'est-à-dire 1 769 811 chèvres et 295 894 moutons). Deux systèmes de production existent et ceux-ci sont traditionnels et commerciaux. Le secteur traditionnel détenait respectivement 95 % et 88 % des chèvres et des moutons. En général, la productivité mesurée par les taux de prélèvement

*et de mortalité était faible dans le secteur traditionnel par rapport au secteur commercial. Cependant, les taux de natalité étaient plus élevés dans le secteur traditionnel que dans le secteur commercial. Les principaux défis de la production de petits ruminants par ordre décroissant étaient la production, la commercialisation et les infrastructures, techniques et financières. Les interventions relatives à la santé animale, à la culture de plantes fourragères et aux pratiques d'alimentation stratégiques, au développement de l'eau, à l'établissement d'usines de transformation dans tout le pays, ainsi qu'à l'intensification de l'éducation et de la formation des agriculteurs pourraient contribuer à augmenter le nombre de troupeaux nationaux et à améliorer la productivité conduisant à l'exportation de viande vers les marchés sécurisés en Afrique, au Moyen-Orient et en Europe.*

**Mots-clés :** Enjeux, filières commerciales et traditionnelles, viande, productivité, ovins et caprins

### **Introduction**

About 60-80% of rural households in most African countries keep livestock as mobile and liquid assets, source of income, and for household food security and nutrition (African Development Bank, 2015). African agriculture is dominated by smallholdings and donors generally target their agricultural support at the smallholder sector (Gassner *et al.*, 2019). According to AU-IBAR (2015), livestock is key to the livelihoods of the rural dwellers in Africa and plays a significant role in food and nutrition security and economy through intra-African and global trade. It is estimated that the livestock sector in Africa contributes 30-80% of the agricultural gross domestic product (GDP), and has the sustainable potential to deliver both the agricultural led growth and the socio-economic transformation as envisioned in the African Union (AU) Malabo Declaration on Accelerated Africa Agriculture Growth and Transformation for shared prosperity and improved livelihoods. Sheep and goats were the first two animals to be domesticated by humans mainly for meat, milk and dairy products, fleece and skin (Mazinani and Rude, 2020). According to Naderi *et al.* (2008), goats were domesticated in the mountains of Asia Minor and the Middle East between 6,000 and 7,000 B.C., primarily from stock of Bezoar goats. Domesticated sheep are

believed to have originated from the European mouflon that came from the Fertile Crescent 3,000 B.C. Monau *et al.* (2020) stated that goats play an important role in ensuring food security and economic livelihood to smallholder farmers in the rural areas (Rodica *et al.*, 2013). Globally, goat rearing is becoming increasingly important for the national economies as a factor of economic development, especially for the rural areas. According to Miller and Lu (2019), goats are found in nearly all countries as they are no longer associated only with low income producers or dry areas. The attractive price for goat products, especially milk has contributed to increased investments in goat rearing, which in turn has led to increased global goat population over time. Livestock production is the main agricultural activity in semi-arid Botswana with seasonal rainfall occurring from October to March. On annual basis, rainfall is low, unreliable, highly variable and unevenly distributed. The national average precipitation is between 250 mm and 550 mm (Statistics Botswana, 2018). It is estimated that 70-72% of Botswana's land surface is used for livestock production. The OIE (2019) reported that Botswana's agricultural potential is limited, in part, due to the Kalahari Desert that occupies about 70% of the country. The ISNAR (1990) also noted that low, seasonally variable and erratic rainfall, and a general shortage of

surface and groundwater favour extensive animal production rather than crop production. Similarly, Koloka and Moreki (2010) observed that the harsh climatic conditions of Botswana support livestock production, wildlife and dry land cropping in some areas.

About 70% of the rural households in Botswana derive their livelihoods from agriculture, through subsistence farming (Statistics Botswana, 2012). The main livestock species in Botswana are cattle, sheep and goats. Although livestock rearing is dominated by men (Statistics Botswana, 2016) more women own small ruminants than cattle as small ruminants are smaller and easier to manage than cattle and other large stock. Small ruminant production is the second largest livestock activity after cattle production (Moreki *et al.*, 2020). Livestock, especially cattle are the backbone of agriculture in Botswana and accounts for approximately 80-85% of the agricultural output (AfDB/OECD, 2003; Moreki *et al.*, 2010; GAIN Report, 2015). The contribution of agriculture sector to the GDP declined from 42.7% at independence in 1966 (Ministry of Finance and Development Planning, 2010) to 2.1% in 2020 (Statistics Botswana, 2021a).

Despite the introduction of various government support programmes to raise agricultural production and productivity in Botswana, small ruminant populations have generally declined over time while the demand for live animals and animal products remains high (Moreki *et al.*, 2020). This paper endeavours to highlight current status of small ruminants' production in Botswana, challenges faced by the sub-sector and efforts being made to increase national flock.

#### ***Global sheep and goat production***

Globally, over one billion people keep livestock and 60% of rural households do so. The livestock sector is a major source of income of the poor particularly of women in

developing countries (von Braun, 2010). The global goat population is estimated to be over one billion. In 2017, Asia had the largest world's goat population (52%), followed by Africa (39%), Europe (5%), Americas (4%), and Oceania (<1%) (Miller and Lu, 2019). Recently, Mataveia *et al.* (2021) estimated the population of goats in Africa to be 423 million, representing 41% of the global population. In Southern Africa, goat population is estimated to be over 35 million animals, most of which are kept in small-scale traditional production systems in communal areas. According to Mazinani and Rude (2020), about 9 million tonnes of sheep meat is produced globally per year and the developing countries are at the top of the list. Sheep meat consumption is fourth after pork, poultry and beef. Global demand for small ruminant products is increasing and to achieve this demand, scientific, educational and practical infrastructures are required.

According to RumosaGwaze *et al.* (2009), approximately 64% of goats in sub-Saharan Africa (SSA) are in rural arid (38%) and semi-arid (26%) agro-ecological zones. It is estimated that 300 million smallholders in SSA depend on small ruminants for food and income (FAO, 2018a). Small ruminants provide nutritious milk and meat, wool and skins (Papas and Papachristodoulou, 1975; World Bank, 1983; FAO, 2018a). Furthermore, small ruminants are hardy and their small size and value compared to cattle makes them a less risky and more versatile investment (FAO, 2018a).

#### ***Small ruminant production in Botswana***

Livestock production in Botswana is usually categorized into commercial and traditional sectors. In the commercial sector livestock are generally kept in fenced grazing areas or farms, whereas in the traditional sector livestock are raised on communally grazed areas. According to Macala *et al.* (1989), livestock in the traditional sector depend on natural

pastures for feed during both the wet and dry seasons. Supplementary feeding is not a common practice in the traditional sector compared to the commercial livestock sector. In the opinion of Barnes *et al.* (2008), small-scale traditional livestock keeping is inherently efficient and provides important household income in Botswana. Mataveia *et al.* (2021) stated that the traditional production systems are characterised by informal, lowly-skilled labour, small animal populations and limited resources. The characteristic features of traditional sector in Botswana are lower off-take rates and higher mortality rates, indicating low productivity. Men in Botswana are the main actors in livestock production and own more cattle and small ruminants than their female counterparts (Malopeet *et al.*, 2015; FAO, 2018b). Contrary to this, Binge (2019) found that majority of small ruminant farmers in the Boteti Sub-district of Botswana were women at 57.3% while men were 43.7%.

Small ruminants are more widely owned than cattle and provide an important source of milk and meat (World Bank, 1977, African Development Bank, 1994). The populations of cattle, goats and sheep in Botswana are estimated to be 2 554 364, 1 769 811 and 295 894, respectively (Table 1). The traditional sector holds more livestock than the commercial sector. Malope *et al.* (2015) reported that in 2015 the traditional sector held 95% goats and 88% sheep compared to the commercial sector with 5% goats and 12% sheep. Table 1 shows that goats come second in number after cattle. Previous study by Aganga and Mosimanyana (2001) in Gaborone Agricultural Region reported that sheep farming is not popular compared to goat rearing. Similarly, Monkhei and Aganga (2005) reported that sheep production is not a very popular enterprise in Botswana compared to cattle and goat production. This could probably be ascribable to the fact that sheep are less drought tolerant compared to goats.

**Table 1: Cattle, goat and sheep populations in Botswana**

Species	Traditional	Commercial	Total
Cattle	2 260 262	294 102	2 554 364
Goat	1 736 011	33 800	1 769 811
Sheep	283 095	12 819	295 894

Source: Statistics Botswana (2021b)

An analysis of the livestock sector in Botswana revealed that off-take and death rates in the commercial sector are better than in the traditional sector while in terms of birth rates the traditional sector performs better (Malope *et al.*, 2015). Livestock farming provides employment opportunities, important socio-economic and cultural roles in the lives of rural communities in Botswana (Sharma, 2014). Centre for Applied Research (CAR) (2005) stated that although the small ruminants sub-sector has grown significantly in size, productivity has hardly increased since 1980, indicating poor performance of the

sub-sector. The study by Aganga and Aganga (2015) in Botswana reported that small ruminants are raised mainly for domestic consumption of meat and milk, hides and for other social activities including payment of dowry, as well as, for generation of income. It is, however, uncommon in Botswana to use small ruminants to pay dowry. It is worth noting that small ruminants' meat is popularly consumed in wedding celebrations. In another study in Gaborone Region, Aganga and Mosimanyana (2001) found that sheep and goats are kept mostly for meat, milk, skins and manure. In addition, Nsoso *et al.*

(2004a) reported that small ruminants provide income, employment and food security to the resource-poor farmers in Botswana. These findings indicate that small ruminants play important role in the livelihood of Batswana (Botswana citizens), especially the rural dwellers.

In an endeavour to boost agricultural production, Government introduced support programmes such as Integrated Support Programme for Arable Agriculture Development (ISPAAD), Special Assistance to Kgalagadi District and Areas with Similar Agro-Climatic Conditions (also referred to as Special ISPAAD), Livestock Management and Infrastructure Development (LIMID), Poverty Eradication Programme (PEP) and Woman Empowerment Scheme. These programmes support among others small ruminant production and are intended to eradicate poverty and improve livelihoods of Batswana, especially those that live in the rural areas. However, these initiatives have not significantly increased production as anticipated. The LIMID promotes food security through provision of support in the livestock industry, i.e., cattle and small ruminants (Bank of Botswana, 2017).

In September 2017, Rural Development Council took a decision to resuscitate Lobu sheep and goat farm, which previously produced and supplied improved small ruminants genetics to farmers in Kgalagadi district. Lobu farm was established by

Botswana government in partnership with European Development Fund in 1978 in southern Kgalagadi to produce and supply high quality small ruminants genetic stock at subsidized prices to farmers in Kgalagadi district and the rest of the country to enable them to improve their stock. The farm was also used to train farmers in small ruminants' husbandry management. In the 2018 State of the Nation Address (SONA), The President of the Republic of Botswana, His Excellency Dr. Mokgweetsi E.K. Masisi announced that Government of Botswana has taken a deliberate decision to resuscitate Lobu farm to enhance the supply of improved small ruminants genetics to farmers across the country (SONA, 2018). The resuscitation of Lobu small ruminants farm to make it a model of excellence in both sheep and goat production started in 2018.

The farm produces high quality stud breeds and commercial sheep and goats which are sold to farmers through auction sales. Goat breeds kept on the farm are Boer goat, Saanen and Savannah, whereas sheep breeds include Dorper, Meatmaster, Karakul (white and black) and Damara. The farm also provides training to livestock farmers with more emphasis on small ruminant production. Between 2018 and May 2020, 1171 (620 females and 551 males) farmers were trained on various aspects of small ruminants management (Table 2). About 53% of the trainees were females compared to 47% for males.

**Table 2: Number of farmers trained at Lobu farm (2018 to 2020)**

Period	Number of participants		
	Females	Males	Total
February – March 2018	70	29	99
April 2018 – March 2019	391	358	749
April – November 2019	128	129	257
December 2019 – February 2020	31	45	66
<b>Total</b>	<b>620</b>	<b>551</b>	<b>1171</b>

Source: Department of Animal Production Report (2020)

**Table 3: Challenges to improved small ruminant production**

Challenges	References/Authors
<b>Production/management</b>	
Lack of improved breeds	Bahtia <i>et al.</i> (2013)
Livestock diseases (and parasites)	Nsoso and Madimabe (2003); Aganga <i>et al.</i> (2005); Nsoso and Madimabe (2003); Centre for Applied Research (2005); Bahtia <i>et al.</i> (2013); Malope <i>et al.</i> (2015); Gobena (2016); MFED (2016); Albridge <i>et al.</i> (2019); PEMconsult (2019); Moreki <i>et al.</i> (2020)
Genetic factors and uncontrolled breeding	Anteh (1989); Gobena (2016); Monau <i>et al.</i> (2017)
Drought and/or natural disasters	Mosalagae and Mogosi (2013); Malope <i>et al.</i> (2015); Binge <i>et al.</i> (2019); Moreki <i>et al.</i> (2020)
Climate change	MFED (2016)
Underutilised agricultural land	Bahtia <i>et al.</i> (2013); Mosalagae and Mogosi (2013); Binge <i>et al.</i> (2019)
Limited/shortage of grazing land	Mosalagae and Mogosi (2013); Ben <i>et al.</i> (2018); Binge <i>et al.</i> (2019); PEMconsult (2019); Moreki <i>et al.</i> (2020)
Stock theft	
High feed costs/inputs	Bahtia <i>et al.</i> (2013); PEMconsult (2019); Moreki <i>et al.</i> (2020)
Inadequate drinking water for livestock	Mosalagae and Mogosi (2013); Gobena (2016); Binge <i>et al.</i> (2019); Monau <i>et al.</i> (2020)
Predation	Hayelom (2003); Aganga <i>et al.</i> (2005); Mosalagae and Mogosi (2013); van Niekerk <i>et al.</i> (2013); Gobena (2016); Albridge <i>et al.</i> (2019); Binge <i>et al.</i> (2019)
Poor access to drugs	Bahtia <i>et al.</i> (2013)
Shortage of skilled manpower	Nsoso and Madimabe (2003); PEMconsult (2019)
Poor livestock management and husbandry practices	Seleka (2005); Monau <i>et al.</i> (2020); Moreki <i>et al.</i> (2020)
Lack of animal feeds	Nsoso and Madimabe (2003)
<b>Technical</b>	
Inadequate extension service	Binge <i>et al.</i> (2019); Moreki <i>et al.</i> (2020)
Inappropriate technologies	African Development Bank (1994)
Lack of knowledge and skills	African Development Bank (1994); Tselassele <i>et al.</i> (2018)
<b>Marketing and Infrastructure</b>	
Inadequate transport	Bahtia <i>et al.</i> (2013); Binge <i>et al.</i> (2019)
Lack of market access	Nsoso and Madimabe (2003); Moreki <i>et al.</i> (2020)
Lack of marketing information	Binge <i>et al.</i> (2019); Nsoso <i>et al.</i> (2004b)
Low prices	Binge <i>et al.</i> (2019)
Lack of developed market	Centre for Applied Research (2005)
Uncoordinated market system	Kgosikoma and Batisani (2014)
Lack of developed marketing system	ISNAR (1990)
Lack of formalized marketing channels	Nsoso <i>et al.</i> (2004b)
Insufficient infrastructure	MFED (2016); Binge <i>et al.</i> (2019); PEMconsult (2019)
<b>Financial</b>	
Poor access to credit/capital facility	African Development Bank (1994)
Lack of capital	Nsoso and Madimabe (2003); PEMconsult (2019)
Delayed payment by government agencies	Moreki <i>et al.</i> (2010); Binge <i>et al.</i> (2019)

The small ruminants sub-sector has adopted the Botswana Economic Advisory Council model for cattle production of having a nucleus flock for supply of good quality breeding animals to farmers (Botswana Excellence Strategy, 2008). According to SONA (2020), the Lobu farm concept will be replicated at Impala Rural Training Centre in Francistown to avail improved genetics in the northern part of the country. The long-term objectives are to improve small ruminants productivity and commercialise operations, strengthen centres of excellence at strategic areas for farmers to benchmark and support upstream infrastructure development while markets are being secured locally and internationally through existing trade agreements (SONA, 2019). Market for small ruminants' meat has been secured in Africa, Middle East and Europe, and this should lead to increased investments in the sub-sector.

#### ***Challenges facing small ruminant production***

Although recent official livestock statistics by Statistics Botswana indicate an increase in livestock populations (i.e., cattle, goats and sheep), generally the population of small ruminants has declined over time. This decrease could be attributed to a myriad of challenges which may be broadly grouped into four categories: production, technical, finance, as well as, market and infrastructure. The challenges of small ruminants farming reported by many authors in Botswana and internationally are summarised in Table 3.

It is clear from Table 3 that production challenges which include *inter alia* diseases and parasites (animal health), nutrition, breeding, high cost of inputs and climate change impede the development of the small ruminants sub-sector in Botswana. Similarly, Fikru and Gebeyew (2015) in Degehabur Zone in Eastern Ethiopia reported major constraints in small

ruminant production system in decreasing order to be diseases and parasites, drought, feed and grazing land shortage, as well as, water shortage. The outbreaks of Foot and Mouth Disease (FMD) which is endemic in Ngamiland and Chobe districts of Botswana result in restriction of movement of live animals and animal products out of the affected areas. The recent FMD outbreak occurred in Ngamiland in June/July 2018 (FAO/EuFMD, 2018). The study by Sharma and Busang (2013) in Southern Botswana found that gastrointestinal helminthic, *Eimeria* species and *Cryptosporidium parvum* infections are widely distributed in small ruminants and bovine calves. These contribute to high mortalities in lambs and kids if control measures are not implemented. In addition, parasites such as *Stomoxys calcitrans* (known as *lethobo* in Ngamiland) and ticks cause economic losses in livestock; hence the need to control them. The Covid-19 pandemic which restricts human movement during lockdowns affects animal health management leading to low productivity. In addition, the importation and distribution, as well as, the sale of veterinary requisites have been disrupted.

Effective extension support entails adequate and timely access by farmers to relevant advice. Extension service facilitates the adoption and adaptation of technology to the local conditions (Anderson and Feder, 2003). Moreki *et al.* (2020) cited inadequacy of extension service as one of the major challenges in small ruminant production in Botswana. The authors also identified other factors that contribute to poor performance of small ruminants to be drought, inadequacy and high cost of feeds, shortage of grazing land and stock theft. The prevalence of diseases and parasites points to farmers' low adoption of animal health technologies due to inadequacy of extension service (technical support) by the government and

non-government extension services. In addition, the ratio of extension agent to farmer is high given the development of support programmes (e.g., LIMID, Special ISPAAD and PEP) without increasing extension agents and has affected extension service delivery. African Development Bank (1994) estimated the ratio of extension agent to farmers to be 1: 220 but this ratio is now on the upper side. However, this ratio is lower than the FAO's recommendation of 1 extension agent to 400 farmers. Moreki *et al.* (2020) attributed poor extension service delivery to the high ratio of extension agent to farmers and lack of regular training for small ruminants extension agents.

Previous studies (Anteh, 1989; Gobena, 2016; Monau *et al.*, 2017) identified genetic factors and uncontrolled breeding to be challenges in small ruminants rearing. The main goat breeds in Botswana are Tswana and Boer goat while Tswana and Dorper are the common sheep breeds. Boer goat and Dorper are improved meat type breeds while Tswana is unselected indigenous breed. The performance of indigenous breeds is inferior to that of commercial breeds such as Boer goat, Kalahari Red, Meatmaster and Dorper. The finding by Nsoso *et al.* (2004a) that Tswana breeds predominate agrees with Bahta *et al.* (2013) who reported lack of improved breeds to be a production challenge. In the traditional sector which holds the majority of small ruminants (95% goats and 88% sheep), breeding is majorly indiscriminate indicating that inbreeding is a likely common phenomenon.

Recent studies by Binge *et al.* (2019) and Moreki *et al.* (2020) in Botswana reported inadequate extension service to be one of the major challenges impeding development of small ruminants industry in Botswana. In the United States, Albridge *et al.* (2019) also reported education and training to be a challenge in goat farming.

The inadequacy of extension service leads to farmers to use inappropriate technologies which would not enhance production and productivity. Failure by the extension service to transfer appropriate technologies to farmers will lead to the small ruminants sub-sector not achieving optimal performance, thus failing to export meat to the already secured markets. Farmers' lack of knowledge and skills as reported by African Development Bank (1994) and Tselaesele *et al.* (2018) could be attributed mainly to inadequacy of extension service and to some extent farmers' unwillingness to adopt new technologies. The reduction in mortality rates and improvements in off-take and birth rates can only be achieved provided farmers are technically supported by quality extension service.

Botswana frequently experiences drought leading to shortage of grazing and drinking water for livestock, thus resulting in elevated livestock mortality, as well as, a decline in meat exports to lucrative markets in the European Union. According to Statistics Botswana (2018), the whole country experienced drought in 1981-1987, 1991-1999, 2001-2005, 2007-2008, 2012 and 2014. These droughts affect people's livelihoods and stretch government's resources by way of subsidizing livestock feeds, vaccines and anthelmintics, thus affecting implementation of prioritised national projects and programmes. Drought also results in a decline in livestock populations due to inadequacy of range resources. Natural disasters such as floods influenced by heavy rains have been reported in some parts of the country. Compared to other districts, floods were more pronounced in Tutume Sub-district from 2010 to 2015 (Statistics Botswana, 2018). Floods often lead to displacement of people and livestock mortalities, whereas heavy rains result in outbreaks of pests such as *S. calcitrans* in Ngamiland. Efforts to increase small ruminant populations are

undermined by the ongoing Covid-19 pandemic due to restrictions being placed on human movement to reduce infection. As Botswana depends on regional and extra-regional imports for food, especially for the urban areas, the country is particularly vulnerable to disruptions in international logistics and distribution due to Covid-19 pandemic, in addition to production challenges in other countries (United Nations Botswana, 2020). This has resulted in food shortages and increased food prices. Additionally, AU-IBAR (2020) mentioned that restricted movement due to Covid-19 pandemic, as well as, reduced imports of live animals and inputs will affect the management of animal enterprises that require daily access to basic inputs such as grazing, feed, water, veterinary and other production supplies, thus leading to decreased production and productivity. In Nigeria, Olugbemi and Salehi (2021) reported that the lockdown has affected transportation of livestock, livestock products and livestock feed from farms and industries to the market, and across interstate borders. The COVID-19 has resulted in reduced consumption of animal products and loss of jobs due to reduced production. According to FAO (2020), world meat trade was forecast to grow to 37.6 million tonnes in 2020, up 3.9% year-on-year, which is lower than 6.9% registered in 2019, reflecting import curtailments by many countries in line with the negative impacts of COVID-19 market disruptions to global meat trade and the deep global recession. Previous study by Fikru and Gebeyew (2015) found that marketing problems remain a major challenge in small ruminant production system in Eastern Ethiopia. According to Table 3, marketing and infrastructure related challenges come second in importance after production challenges. This could be attributed partially to the non-existence of processing plants (abattoirs) for small ruminants in the

country. The slaughter of small ruminants at Botswana Meat Commission (BMC) abattoirs has long been stopped; instead small ruminants are slaughtered at slaughter slabs and homes. BMC only slaughters cattle mainly for the export market and about 80% of cattle come from smallholder farmers. Lack of slaughter facilities for small ruminants serves as an impediment to the growth of the industry. It has been reported (Kgosikoma and Batisani, 2014) that the market for goats in Botswana is not well organized compared to that of cattle. In an endeavour to overcome market challenges in the small ruminant sub-sector the government is constructing a multi-species abattoir in Tsabong in southern Kgalagadi, Botswana are expected to be established across the country. Other challenges reported were lack of developed market (Centre for Applied Research, 2005) and lack of formalized marketing channels (Nsoso *et al.*, 2004b). According to Bahta *et al.* (2013), the three marketing channels for sheep and goats are butcheries, individuals and Government programmes such as LIMID, PEP and Women Empowerment Scheme. However, the top channels for selling small ruminants are butcheries and individuals. This indicates that market for small ruminants is not as developed as that of cattle and this discourages farmers from significantly increasing their stock levels. According to Druilhe and Barreiro-Hurle (2012), farmers in SSA face several challenges including lack of access to credit. Although commercial banks in Botswana offer loan facilities, accessing credit is difficult to most farmers. For example, the National Development Bank (NDB) loan facility, “*Ntlhatlosa kwa morakeng*” with flexible loan range of P10 000 to P750 000 is only favourable to the working citizens over non-working citizens. The loan facility covers working capital/seasonal inputs; purchase of equipment, machinery and vehicle;

purchase of farm and infrastructure and solar equipment. In the opinion of Jefferis (2012), Botswana government institutions such as NDB, Citizen Entrepreneurial Development Agency (CEDA) etc. and support programmes including LIMID and PEP that provide financial assistance to agriculture are somehow not helping the development of the small ruminants industry because of high arrears rates (unpaid amounts), political interference and in part, lack of commercial focus. Gutierrez-A (1986) mentioned that even if good production management practices are employed which could increase the number of small ruminants, lack of available capital remains a challenge. Lack of capital has a negative impact on the performance of any industry including small ruminants (PEMconsult, 2019).

The study by Binge *et al.* (2020) reported delayed payment by government agencies as a challenge in small ruminant production in Botswana. Similarly, Moreki *et al.* (2010) in their evaluation of the performance of LIMID in seven districts of Botswana found late payments of suppliers to be a challenge in the implementation of the programme. Late payment of farmers that supply small ruminants to LIMID beneficiaries positioned them at a disadvantaged end, thus making them unable to buy inputs (i.e., feed and veterinary requisites) on time to support the remaining stock. Again, late payments of suppliers of inputs by the government agencies negatively affects the performance of the sub-sector and the farmers' livelihood.

***Suggested strategies to raise small ruminant sub-sector performance***

To grow the small ruminant sub-sector the following are suggested:

Training of small ruminant farmers in husbandry management be intensified. As indicated in table 3, most of the challenges are production/management oriented,

indicating inadequacy of technical support to small ruminant farmers. Equipping farmers with knowledge and skills should lead to increased small ruminant numbers to service the local and external markets.

To improve the quality of national flock, establishment of Breeders societies must be rigorously encouraged and more breeding sites established across the country. The AR (2005) suggested that availability of breeding stock can be improved through Breeders societies. Therefore, there is urgent need to encourage registration of local Breeders societies to reduce imports of breeding stock from neighbouring states. This will in turn significantly reduce import bill and lead to employment creation in the country.

Establishment of small ruminants handling and marketing facilities must be encouraged (CAR, 2005). In their evaluation report of the Second Livestock Development Project in Botswana, World Bank (1977) concluded that there is good potential to expand small ruminant production if marketing channels were improved, giving rise to small ruminants providing an important means of increasing rural incomes. As Central district as the largest population of small ruminants in the country it is necessary that a slaughter facility similar to the one in Tsabong in Kgalagadi South be established in the district to provide marketing outlet for small ruminants. This should encourage small ruminant production in the district leading to increased population of the national flock.

Traceability issues must be addressed

urgently to tap into the secured external markets in the Middle East and Europe. This is an export market requirement which requires funds to actualize. Therefore, funding is needed to purchase equipment and train staff that will be involved in the registration of sheep and goats in accordance with Botswana Animal Traceability System (BAITS).

In an endeavour to increase the national small ruminant population, the use of assisted reproductive technologies such as artificial insemination (AI) and embryo transfer (ET) should be employed to small ruminants. In Botswana, AI technology is currently applied to cattle hence the need to extend its usage to small ruminants. In addition, there is need to consider developing the AI value chain.

### **Conclusion**

Sheep and goats produce meat, milk and valuable byproducts, provide employment opportunities and serve as specimens for agriculture and biomedical research. The semi-arid climatic conditions of Botswana are favourable to the rearing of small ruminants, which are drought tolerant and easy to manage than cattle. In Botswana, small ruminants are raised under traditional and commercial production systems with the traditional sector being predominant. Productivity is slightly low in the traditional sector compared to the commercial sector. However, birth rate is high in the traditional sector than in the commercial sector. The population of small ruminants has declined over time due to a myriad of challenges, which can be grouped into four categories: production, technical, financial, and marketing and infrastructure. Although efforts to increase the national small ruminants population needs participation of government and private sector, it is necessary that government and private

extension services step up education and training of farmers as a matter of urgency. Interventions that have been suggested to address the identified challenges could help raise the national flock numbers and improve productivity.

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