

*Full Length Research Paper*

# Demographic profiling and characterization of cattle and cattle farmers in Botswana

Goodhead Okechukwu Uchendu<sup>1\*</sup>, Njoku Ola Ama<sup>2</sup>, Andrew Olatunbosun Aganga<sup>1</sup> and Othusitse, Rick Madibela<sup>1</sup>

<sup>1</sup>Department of Animal Science, Botswana University of Agriculture and Natural Sciences, Private Bag: 0027 Sebele, Botswana.

<sup>2</sup>Tocchae Holdings Pty, 3 Tropic Bird Lane, Wilgeheuwel, Roodepoort, Johannesburg, South Africa.

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**Most published data on Botswana's cattle population neither represent demographics of cattle and cattle ownership nor capture political and gender factors that affect cattle farming. Decline in cattle population has largely been attributed to unthrifty climatic conditions of the predominantly semi-arid desert terrain of the nation. This demographic and characterization study estimated cattle population, its spread and ownership. It also investigated some non-climatic factors like, politics and gender dynamics of cattle ownership and farming that affect Botswana's cattle population. Non-participatory structured questionnaire, interviews, physical enumeration and measurements were used to collect primary data from farmers (n=149). Data were analysed and results presented using descriptive statistics (means±SEM). Demography of cattle, cattle ownership and farming potentials were analysed along the lines of gender, age, education, farming capacity and practice. Results show gaps for gender inequality and discrimination against women in land tenure system (for cattle farming), land ownership, cattle ownership and cattle inheritance. Difficulty in accessing credits arising from recent government policies favouring non-agricultural sectors, absence of insurance, erosion of socio-cultural pride derived from cattle farming and non-dependence on "cow money" resulted in decline in local young farmers' participation in cattle farming. Majority of cattle in Botswana are farmed in the Western Region by wealthy white Afrikaans women. Beef farming was preferred to dairy farming, and local and exotic beef breeds were more adapted than the exotic dairy breeds which were rarely farmed in Botswana; making Botswana a net importer of milk; also, Tswana breed was the most favoured breed. Thus, cattle insurance, land reforms that can encourage youth and women participation in cattle farming and fodder farming for making dairy cattle feed are recommended.**

**Key words:** Botswana, cattle farming, demography, gender inequalities, youth in agriculture

## INTRODUCTION

Botswana is a landlocked country with human population of 2.3 million in 2016 (Statistics Botswana, 2018). Similar to most other African countries, agriculture is vital to its

socio-economic development. Botswana is Africa's largest beef exporter (Burges, 2006; Engelen et al., 2013; Tshiamo, 2015). Beef industry is Botswana's third highest

\*Corresponding author. E-mail: [goodheadisgood@yahoo.com](mailto:goodheadisgood@yahoo.com)

foreign earner; largest component of the Agrifood System (Engelen et al., 2013), and strategic within the country's economic diversification agenda (Pablo et al., 2014).

Botswana lies between approximately 20° to 29.15°E and 18° to 27°S; covering about 582,000 km<sup>2</sup> (World Bank, 2010). Botswana is prone to drought; its climate does not support all-year round pasture and water supply (McLeod, 1992), and this impacts negatively on the cattle farming industry. Botswana's climate is driven by two distinct climate zones with majority falling under the Zaire Air Boundary climate zone to the north and a small part, mainly in the south-west, which is influenced by the South Atlantic Oscillatory climate system (Burgess, 2006; Botswana Tourism Organization [BTO], 2019). There is prolonged general rain, in the east, in summer and in the west during the winter season. There is also a commonly occurring, mini-drought period, from mid-January to late February (Burgess, 2006; World Bank, 2010). During these periods of rain, ranging from 250 to 650 mm, pasture and water are readily available for cattle. Temperature variations are extreme throughout the year. They also vary greatly within the daily cycle and according to location, vegetation cover, wind reach, and the presence of any large water bodies. In winter, from mid-May to mid-August, temperatures range from about 0°C, in the early hours of the morning to 20°C in the mid-day. In summer, temperatures vary from 12-15°C during the morning to 30-40°C by late afternoon in the hot, dry season (generally from mid-September to late October), but the maximum temperatures remain 25-30°C, during the rainy season. Temperatures in the northern and western desert areas can rise to about 40-45°C in the late dry season, prior to the rains (Burgess, 2006; World Bank, 2010).

Despite such challenging weather situations, cattle population had grown progressively from 2.25 million in 1996 to 3.10 million in 2005 (Burgess, 2006) to over 3.5 million cattle in 2012 (Statistics Botswana, 2013b). However, cattle population dropped to about 1.7 million in 2015 and 1.9 million in 2018 (Statistics Botswana, 2019). There has been a forty-five percent (45%) decline in cattle-raising households, from about 75,500 in 2004 to 39,000 in 2015 (Statistics Botswana, 2019). Unlike in most other countries, where cattle farming is an exclusive occupation of few farmers, in Botswana, cattle ownership has been a pride factor; a potential unifier and important source of food (Tshiamo, 2015); as every traditional family owns cattle (Thornton et al., 2003 in Patti et al., 2010). This is the natural advantage that the nation has over other nations in the beef industry (Pablo et al., 2014). Total traditional cattle holding has decreased progressively from 75,037 in 2007 to 74,664 in 2011 to 37,755 in 2015. Total commercial holdings increased from 527 in 2007 to 1,061 in 2010 before dropping to 765 in 2013. Similarly, total traditional cattle population has not been steady; increasing from 1,649,642 in 2007 to 2,260,262 in 2011 but decreased from 1,985,595 in 2012

to 1,596,605 in 2014. Total commercial cattle population also increased from 138, 736 in 2007 to 399,478 in 2010 but decreased to 238,981 in 2013 (Statistics Botswana, 2017). Total cattle population, traditional and commercial as at 2019 was estimated at 1,596,605 (Statistics Botswana, 2019).

Search for probable cause of decline of Botswana's cattle population has attracted several researches and investigation (Mogapi, 2019). Most published materials arbitrarily attribute cattle population decline to Botswana's unthrifty semi-arid desert climatic (McLeod, 1992) and poor funding of the agricultural sector due to change in government policies which favour non-agricultural sectors of the economy (Aganga, personal communication, March 8, 2017). This study hypothesized that some sociocultural and political factors may bear more serious effect on cattle population than the aforementioned. The aim of this demographic and characterization study was to estimate cattle population at regional and district levels and to understand the population and spread of cattle; cattle breeds distribution across population strata; analysis of farming systems (dairy, beef or dairy and beef); political influence and gender dynamics of cattle ownership and farming in Botswana. This study determined some non-climatic conditions that bear negative effects on cattle population in Botswana. These results provide a more accurate knowledge that can aid in policy advocacy for recovering Botswana's cattle population, alleviate poverty and increase farmers' income.

## MATERIALS AND METHODS

### Study area

This cross-sectional study was carried out in Central and North East Districts of Central Region and in Kalagadi and Ghanzi districts of Western Region in Botswana.

### Data source

Primary data were sourced through direct observation and face to face interviews using structured questionnaires. Secondary data were sourced from relevant published and un-published documents available at the Libraries of the Botswana University of Agriculture and Natural Resources (BUAN).

### Sampling techniques

The multistage sampling technique was used to identify animal holdings from the population which is stratified into regions and districts (Statistics Botswana, 2015a).

The purposive sampling technique was used to select two agricultural regions, (one with the highest cattle population, which was the Central region and second with the lowest cattle population, which was the Western region (Statistics Botswana, 2015b). From Central region, Central district with the highest cattle population and North East district with the lowest cattle population were selected. From the Western region, Ghanzi district with the

highest cattle population and Kalagadi district with the lowest cattle population (Statistics Botswana, 2015b) were selected. Snow ball sampling technique was used to identify individual respondents because human and animal populations are sparse and there is no sampling frame available for this population (Naderifar et al., 2017). Questionnaire was administered to one hundred and forty-nine (149) respondent households (Table 1).

### Data analysis

Descriptive statistics was used to lay out and describe the data. Percentages of variables were compared to show spread of answers from respondents.

## RESULTS AND DISCUSSION

There are more male than female cattle farmers in Botswana (Table 2). This trend reflects that in Botswana as in most African countries, cattle business is culturally male-dominated. This conforms with claims of Gender Researcher (2012) who remarked that “Cattle is a citadel of male power in Botswana” (Gender Researcher, 2012 in Andrea, 2016). Women inability to acquire land limits their participation in cattle farming. Historically, the Land Act of 1968 encouraged male dominance in land tenure. This Act was amended in 1993 and finally abolished in 2004 through the Abolition of Marital Power Act. This abolition therefore implies that any adult woman, married or not, can legally own (or use) land and cattle, sign contracts, and execute transactions with banks or other financial institution without the proof of her husband’s or male relative’s consent (Kalabamu, 2006 in Andrea, 2016). Despite this abolition, some respondents claimed that the actual process of implementing these laws still leaves gap for gender inequality and discrimination against women in the land tenure system for land ownership, cattle ownership, cattle farming and cattle inheritance. Gulbrandsen (2012) claims that in Botswana, property claims, rights and access to cattle have been of utmost importance for negotiating political and social relations, not the least for gender relations, where women have been excluded from cattle ownership (Kalabamu, 2005 in Andrea, 2016). Having more male than female farmers further agrees with the findings of the ‘feminist political ecology approaches’ that have emphasized how environmental resources in Botswana and elsewhere are gendered (Hovorka 2006; Sikor and Lund, 2009; Moepeng, 2013).

Another reason why there are more male than female farmers is that in Botswana, like in most African homes the man (male) is considered the head of the family. As such, he claims ownership of the entire family; the house, the cattle and even the woman. So, even when the woman participates more directly in the cattle business, the cattle is considered a property of the man. In a related discourse, the Head of Department of Agricultural Statistics and Research at the Ministry of Agriculture in Central Botswana, explained that out of respect, widows

might refer to their personal cattle as belonging to their late husbands’ (Andrea, 2016, p. 109).

It is imperative to note that the result of this study merely outlines gender ownership of cattle, not gender participation in the day-to-day operations of the cattle industry in Botswana (Tables 3, 4 and 9). Many feminists’ scholars argue that women contribute more than men in the cattle industry (Dahl, 1987; Talle, 1987; Curry, 1996; Broch-Due, 2000 in Hodgson, 2000; Hodgson, 2000; Njuki and Sanginga, 2013).

Results of this study disagree with claims of Thornton et al. (2003) who indicated that two-thirds (66%) of the world’s 600 million poor livestock keepers are rural women (Thornton et al., 2003 in Patti et al., 2010) because this study shows more male than female farmers.

Male farmers owned more large-scale cattle farms ranging between 100 to >500 cattle, than their female counterparts who owned lower capacities farms ranging from 5 to <100 cattle (Table 3), more small stocks (sheep and goat) and more chicken (Table 4). It could be that women’s access to credits and other inputs was insufficient for large scale cattle farming. The trend is however different in some regions of Botswana especially in Ghanzi where some “wealthy White Women” who are favoured by both “race and class” have shown to have easier access to credits and inputs and so own largescale cattle farms (Andrea, 2016).

Cattle breeds owned in their order of popularity are: Tswana (33.60%), Brahman (3.40%), Simmental (3.40%), Charolais (0.70%) etc (Table 9). This study showed that farmers owned more than one cattle breed; with Tswana and Braham combination being the highest combination at 14.8%, while 10.10% owned a combination of Tswana, Afrikaner, Brahman, Simmental, Charolais breeds (Table 9). Both men and women owned more local cattle breeds than exotic, while most exotic breeds were owned by men (Table 9). It is apparent that local breeds are better adapted to Botswana’s semi-arid desert climate than the exotic breeds. Similarly, among the exotic breeds, the beef breeds are more adapted and more popular than the dairy breeds (Table 3). Most dairy breeds are owned by Afrikaner Boers who are located in the Ghanzi districts (western region) where cattle are confined to Ranches and crawls.

Although youths of age 18-30 years make up 47.4% of the entire national population (Statistics Botswana, 2013b), their participation in cattle farming is 9.07%; majority of which are part time farmers (Table 2). Low youth involvement in agriculture is a big loss of useable man-hour/labour. Botswana youths, like youths in most other African countries perceive cattle farming unfashionable and tedious, preferring to engage in other jobs especially white-collar jobs, which further explains why their participation in cattle business is predominantly part time. Apart from this age group being the schooling age, most of the youth do not possess cattle, land and other inputs requisite for the cattle business. This result

**Table 1.** Sample size according to districts of respondents (number).

Districts	Sample size
North Central	30
Central	31
Kalagadi district.	36
Ghanzi	52
Total	149

**Table 2.** Demography of farmers according to age, level of involvement and Marital Status [No = Number (%)].

Age	Score [No (%)]	Level of involvement of farmers		Marital status of farmers		
		Full time	Part time	Unmarried	Married	Divorced
		No. (%)		No. (%)		
16-20	1(0.67)	0 (0.0)	1(1.1)	1(1.7)	0(0.0)	0(0.0)
21-25	4(3.0)	2 (3.2)	2(2.4)	4(6.7)	0(0.0)	0(0.0)
26-30	8(5.4)	3(4.8)	5(6.0)	8(13.3)	0(0.0)	0(0.0)
31-35	19(12.8)	7(11.3)	11(13.1)	13(21.7)	5(7.2)	0(0.0)
36-40	21(14.1)	6(9.7)	15(17.9)	17(28.3)	3(4.3)	1(9.1)
41-45	21(14.1)	10(16.1)	11(13.1)	9(15.0)	9(13.0)	2(18.2)
46-50	24(16.1)	8(12.9)	16(19.0)	5(8.3)	12(17.4)	4(36.4)
51-55	26(17.5)	6(9.7)	19(22.6)	2(3.3)	19(27.5)	3(27.3)
56-60	12(8.1)	7(11.3)	4(4.8)	1(1.7)	9(13.0)	1(9.1)
61-65	6(4.0)	6(9.7)	0(0.0)	0(0.0)	5(7.2)	0(0.0)
66-70	2(1.3)	2(3.2)	0(0.0)	0(0.0)	2(2.9)	0(0.0)
71-75	3(2.1)	3(4.8)	0(0.0)	0(0.0)	3(4.3)	0(0.0)
>75	2(1.3)	2(3.2)	0(0.0)	0(0.0)	2(2.9)	0(0.0)
Total	149(100.0)	62(42.5)	84(57.5)	60(42.9)	69(49.3)	11(7.8)

is in conformity with the publications of the Monitoring and Evaluation Unit, Agricultural Planning and Statistics, which realized that there was generally lack of youth participation in agriculture in Botswana (Ministry of Agriculture, 2008). In response, and to encourage the youth, the government in conjunction with a credit facility Citizens' Entrepreneurship Development Agency (CEDA), launched a specific programme known as Young Farmers Fund (YFF) in April 2006. This fund was aimed at enabling the youth to have access to credit for establishing agricultural businesses in Botswana. This program proposed that since the youth had difficulty accessing land, they were allowed to lease land so that they could carry out their businesses at low premium rates over a long grace period (Ministry of Agriculture, 2008).

Despite this effort, going by the findings of this study, the participation of youth in cattle farming remain low. Similarly, participation of farmers above 60 years (60->75 years) in cattle farming is low (Table 2). Possible explanation is that life expectancy at birth in Botswana is less than 70 years for both sexes. Life expectancy has progressed from 64.1 years in 2011 to 68.3 years for

women and from 58.32 years in 2011 to 62.94 years for men (Statistics Botswana, 2012; Country Economy.com, 2016). Statistically, Botswana has a total of less than 10,000 males of ages 'above 70 years' (Statistics Botswana, 2013a). Participation of this age group is predominantly on full time basis. Most farmers within this age range are civil servant retirees who focus on agriculture as full-time retirement work.

Ages 31-55 years which is the most energetic and productive class make up about 15% of Botswana's population (Statistics Botswana, 2013a). This group contributes 74.6% of cattle farmers; 67.0% of which are part time farmers (Table 2), because most of them engage in active civil service duties or other non-farming businesses. Statistics show that the overall population of active (traditional and commercial) farmers has decreased over the years (NBS, 2012, Statistics Botswana, 2019). Summarily, the analysis of level of involvement in cattle farming indicates that high proportion of highly skilled man-power and man-hour that would have been employed in the cattle farming business is trapped in civil service and other non-cattle enterprises (Table 2). Engaging this population in cattle farming would scale

**Table 3.** Demographics of farmers according to gender [% (No = umber)].

Demography	Description	Male	Female
		% (No)	
Sex		69.80 (104)	30.20 (45)
Marital status of farmers	Unmarried	67.21 (43)	32.79 (21)
	Married	72.82 (53)	27.18 (20)
	Divorced	63.64 (8)	36.36 (4)
Educational level of farmers	Primary	82.46 (14)	17.54 (3)
	Junior School	75.68 (25)	24.32 (8)
	Senior School	68.24 (15)	31.76 (7)
	Diploma	67.54 (26)	32.46 (13)
	First degree	55.95 (14)	44.05 (11)
	Masters	35.00 (1)	65.00 (2)
	Others	0.00 (0)	100.00 (2)
Level of involvement of farmers	Full time	74.22 (46)	25.78 (16)
	Part time	65.06 (57)	34.94 (30)
Other occupation of farmers	Trading	69.23 (10)	30.77 (4)
	Civil service	57.11 (34)	42.89 (25)
	Professional	50.00 (1)	50.00 (1)
	Others	84.21 (17)	15.79 (3)
	No other occupation	73.02 (42)	26.78 (35)
Family size of farmers	No child	70.69 (12)	29.31 (5)
	1-5 children	66.72 (67)	33.28 (33)
	6-10 children	85.25 (23)	14.74 (4)
	>10 children	25.93 (5)	74.07 (14)
Districts of farmers	North East	59.90 (18)	40.10 (12)
	Central	64.42 (20)	35.78 (11)
	Kalagadi	83.06 (30)	16.94 (6)
	Ghanzi	67.71 (36)	32.29 (17)
Age of farm	<1 year	61.11 (3)	38.89 (2)
	1-5 years	76.63 (33)	23.37 (10)
	6-10 years	65.68 (24)	34.32 (11)
	>10 years	66.14 (44)	33.86 (22)
Capacity of farm	>500	70.15 (21)	29.85 (9)
	100-499	75.37 (15)	24.63 (5)
	50-99	77.98 (39)	22.02 (11)
	10-49	66.04 (20)	37.96 (12)
	5-9	50.00 (6)	50.00 (6)
	< 5	39.39 (2)	60.61 (3)
Type of farm practice	Beef only	68.70 (54)	31.30 (24)
	Dairy only	68.42 (2)	31.58 (1)
	Dairy and Beef	40.74 (28)	59.26 (40)
Farmer's knowledge of bovine cysticercosis	Yes	70.06 (97)	29.94 (42)
	No	50.00 (5)	50.00 (5)
Record of bovine cysticercosis in farm or butcheries	Yes	74.47 (47)	25.53 (16)
	No	34.74 (16)	65.26 (30)
Financial effect of bovine cysticercosis on farmers	Yes	74.90 (56)	25.10 (19)
	No	64.69 (44)	35.31 (24)
Effects bovine cyticercosis on farmers' economy	Yes	72.63 (40)	27.37 (15)
	No	63.90 (55)	36.10 (31)

**Table 4.** Ownership of livestock according to farmers' gender [% (No=Number)].

Other livestock in the farm	Gender of farmers	
	Male % (No)	Female % (No)
Only cattle	55.12 (11)	44.88 (9)
Cattle and sheep	30.30 (1)	69.70 (2)
Cattle and goats	36.14 (6)	63.86 (11)
Cattle and horse	30.30 (1)	69.70 (3)
Cattle and donkey and horse	46.51 (1)	53.49 (2)
Cattle and sheep and goats	66.67 (7)	33.33 (4)
Cattle and sheep, goats, donkey and horse	83.92 (11)	16.08 (2)
Cattle and sheep, goat and horse	38.04 (4)	61.96 (8)
Cattle and goat, donkey and horse	100.00 (6)	0.00 (0)
Cattle and goat and donkey	52.63 (4)	47.37 (3)
Cattle and sheep, goats and chicken	34.48 (4)	65.52 (7)
Cattle and goat and chicken	39.74 (4)	60.26 (6)
Cattle and sheep, goats, donkey and chicken	52.63 (4)	47.37 (3)
Cattle and goats, donkey and chicken	12.82 (1)	87.18 (3)
Cattle and goats and horse	46.51 (1)	53.49 (2)
Cattle and sheep, goats and donkey	59.52 (8)	40.47 (5)
Cattle and chicken	46.51 (1)	53.49 (3)
Cattle and horse and sheep	100.00 (3)	0.00 (0)
Cattle and sheep, horse, donkey	100.00 (1)	0.00 (0)

**Table 5.** Farms capacities across district (%).

District	Capacity of Farm					
	>500	100-499	50-99	10-49	5-9	< 5
North East	6.46	12.94	23.38	33.33	13.43	9.95
Central	9.62	16.35	41.83	25.96	6.25	0.00
Kalagadi	22.31	5.37	55.37	11.16	5.37	0.00
Ghanzi	32.66	17.19	19.20	19.20	7.74	3.73
Sub Total	20.1	13.4	33.6	21.5	8.1	3.4

up productivity within the industry.

With about 41.9% of farmers in Botswana operating full time (Table 3), Botswana has more full-time cattle farmers than most other African countries. Nigeria for example, has less than 10% full-time cattle farmers (Mafimisebi et al., 2013). In Botswana, cattle farming is both a traditional lifestyle among/across all tribes, as every family owns cattle (Thornton et al., 2003 in Patti et al., 2010). Cattle industry is Botswana's third largest income earner after diamonds and tourism. On the contrary in Nigeria, cattle is owned by less than 5% elite, and are farmed predominantly in the northern part of the country (Mafimisebi et al., 2013). Eighty-five percent (85%) of Botswana's cattle are reared through traditional free-range farming system (Statistics Botswana, 2016) while in Nigeria, about ninety-nine percent (99%) of the cattle is farmed through pastoral Nomadism, which is

traditionally estimated at 83% pastoral, 17% village cattle and 0.3% peri-urban, with one percent (1%) reared in ranches (Mafimisebi et al., 2013; Uchendu et al., 2015; Ducrotoy et al., 2016).

Average family size of 4 person (Table 3) falls within range with the published figures of Botswana Core Welfare Indicators Survey of 2009 and 2010, of 4.5 persons in 1993/1994; 4.1 persons in 2002/2003 and 3.46 persons in 2009/2010 (Statistics Botswana, 2013a) In conventional un-mechanized farming setting, family size translates directly to the available farming workforce. With an average family size of 4 (excluding parents), Botswana possess, reasonable farming workforce.

This study recorded a high literacy rate of about 83.9% (Table 3) among farmers. This figure is higher but close to documented records of Statistics Botswana (2013a), which claimed that an overall, seventy-nine percent

**Table 6.** Farm capacities compared with type of farming practice [% (No = Number)].

Capacity of farm (number of cattle)	Type of farm practice		
	Beef only	Dairy only	Dairy and beef
>500	50.00(15)	3.33(1)	36.67(14)
100-499	35.00(7)	0.0(0)	63.00(13)
50-99	53.06(26)	2.04(1)	44.90(22)
10-49	58.06(18)	3.23(1)	38.71(12)
5-9	83.33(10)	0.0(0)	6.67(2)
< 5	50.00(2)	0.0(0)	50.00(2)
Total	53.42(78)	2.05(3)	44.52(65)

**Table 7.** Farmers' knowledge and experience of *Taenia saginata* cysticercus [%(No)].

Response	Knowledge	Record	Detained	Condemned	EFC
Yes	94.60(141)	42.30(63)	28.00(41)	14.70(22)	18.10(27)
No	5.40(8)	57.70(86)	72.00(107)	85.30(126)	81.90(121)
Total	100.0(149)	100.0(149)	100.0(148)	100.0(148)	100.0(148)

*Knowledge*: Farmers who had knowledge of *C. bovis*; *Record*: Farmers who recorded *C. bovis* in their Carcass; *Detained*: Farmers who carcasses were detained; *Condemned*: Farmers who Carcasses were condemned; *EFC*: Farmers whose Farm capacity were affected by *C. bovis*.

(79.0%) of the population had attended school as at 2012. However, in Botswana, as in most parts of Africa, cattle farming is considered a direct full-time enterprise for non-elites. The elites, comprising mostly of politicians, Afrikaners, and White women in Ghanzi who own the bulk of the cattle (Andrea, 2016) are involved as part-time or in-direct employees of the industry (Mulale, 2001). This phenomenon equally applies to Nigeria where cattle is owned by a small but influential elite group known as the "Meyiti Allah" who are indirectly involved but coordinate the activities of the Nomadic Fulani Herd Boys who hoof the animals (Ducrotoy et al., 2016; Integrated Regional Information Network, 2009a, b, c; 2010a, b, c in Ducrotoy et al., 2016). Recent studies have shown the positive correlation between educational level and agricultural development (Alene and Manyong, 2007). They however suggest that the impact of education is only significant in adoption of improved technology (Alene and Manyong, 2007, p. 157 in Aysegül, 2011). Furthermore, related studies show that level of education correlates directly with social status of farmers, ability of farmers in accessing credits, and adoption of cutting-edge technology, which correlates directly with the development in agriculture (Botswana Federation of Trade Unions (BFTU), 2007; Schultz, 1964 in Aysegül, 2011).

About 33.6, 13.4 and 20.1% of farmers own farms with capacities of 50-99, 100-499 and >500 cattle respectively. About 34.9% of cattle are farmed in Ghanzi district of Western region; same region contributing about 59.1% of Botswana's cattle population. Whites, Afrikaners and English farmers own a reasonable percentage of large-

scale cattle farms in Botswana. Some locals (Batswana) have also been spotted in this category. These are either in ranches, (fenced and unfenced) cattle farms and cattle post (Masicke and Ulrich, 2008 in Andrea, 2016). To this group, cattle farming is purely a commercial venture and being driven by 'rational' and 'economic' forces. However, another group of farmers referred to as the 'Communal farmers' are sometimes depicted as being less interested in commercial activity but rather focused on 'traditional' Batswana cattle exchanges and cattle accumulation per se (Burgess, 2006; Masike and Ulriich 2008; Ransom, 2011 in Andrea, 2016). Recently, cattle farming in Botswana have greatly moved away from the latter group to the former group, and from migratory animal to enclosed farms, and this portends positive results for Botswana in the beef export industry.

The Western region possesses more cattle farms and cattle population than the Southern and Central region individually (Annual Agricultural Survey Report, 2014 in Statistics Botswana, 2016, p. 46). Ironically, majority of the cattle owners live in Southern region so, cattle population by household is higher in the Southern than Western region (Annual Agricultural Survey Report, 2014 in Statistics Botswana, 2016, p. 31). Going by slaughter records, the Southern region has more cattle population than the Western region (Annual Agricultural Survey Report, 2014 in Statistics Botswana, 2016). Reason for this disparity is that the national export abattoir, the Botswana Meat Commission (BMC), is situated in Lobatse in the Southern and Maun in the Northern region of Botswana. BMC alone slaughters about 44% (110,000 out of 250,000 cattle) of all cattle slaughtered in

**Table 8.** Mean cattle farm capacities across years.

Farm capacity across years	No. of responses	Mean cattle heads
Farm capacity in 2009	137	200.44
Farm capacity in 2011	140	193.36
Farm capacity in 2013	144	194.06
Farm capacity in 2015	145	218.53
Farm capacity in 2017	145	243.86
Estimate percentage rise in number of cattle between 2015-2017		11.6

Highest mean farm capacity in 2017 was 243 cattle; least number of heads of cattle was 193.36, which was in 2011. Percentage rise in heads of cattle between 2015 and 2017 was 11.6%.

Botswana. However, most of these cattle come from the Western region. A further breakdown of the farmers' distribution according to districts shows that there are more farms but less farmers in the Ghanzi and Kalagadi districts of the Western Region than North East and the Central districts in the Central region (Table 6). In addition to having more population of animals, the Ghanzi and Kalagadi districts in the Western region possess more large-scale farms than the districts in the Central region. It therefore follows that the districts in Western region would suffer more financial loss and socio-economic effects than the districts in the Central region should there be a disease outbreak or the EU ban the exportation of beef from Botswana.

Botswana's cattle farming industry emphasizes production of 'beef only' at 53.4%, followed by a combination of 'beef and dairy farming' at 44.52% and dairy only at 2.05%. Dairy farming as a standalone-enterprise is shown to be viable in Botswana (Ministry of Agriculture, 2010) thus, are in short supply in Botswana (Ayşegül, 2011; Moreki et al., 2011). Moreki et al. (2011) reported that as at 2010, the dairy sub-sector's contribution to the national liquid milk demand was 17%; with a per capita consumption of milk at 25.2 L per person per year. These authors further claimed that the annual milk production was estimated at 7.70 million litres while 38.6 million litres were imported. Currently, about 80% of the milk consumed in Botswana is imported from South Africa (Ministry of Agriculture, 2010). Low milk production is attributed to lack of quality feeds for dairy cattle, high feed prices and unavailability of good dairy breeds suitable for local environmental conditions (Moreki et al., 2011). Interview results of this research showed that, unlike the beef cattle which graze freely across the country, the dairy cattle are perpetually ranched. In addition to housing cost, machinery and manpower requirements for dairy business are much higher than for the beef industry. Feed for dairy cattle are imported from neighbouring South Africa and are costly. Ultimately, profit margin is low and unsustainable; not even for the large-scale farmers. This condition has forced many dairy farms to shut down their dairy farms or revert to beef farming or a combination of beef and dairy (Mulale, 2001;

Ayşegül, 2011; Dzimiri, 2013).

In response, Botswana government engaged consultants under National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) to come up with recommendations to enable Botswana produce dairy food for food security. This therefore meant that Botswana would make efforts to foster dairy development plans wherever the potential exists. In so doing, the gap between production and consumption of dairy products in the country will be narrowed (Government of Botswana Publication, 2011). However, little progress was made.

In addition to the high cost of inputs in the dairy industry, during the heat splashes of September and October, in Botswana, the dairy cattle becomes unthrifty and milk production level is uneconomical. Further processing of milk into various products such as Skilm Milk Product, Whole Milk Product etc is one area that needs to be seriously considered by the processors (Moreki et al., 2011). It therefore follows that local production of feed for dairy cattle industry, like fodder production would reduce feeding costs. This viable business opportunity that can create employment to the locals and save the country foreign exchange should be explored in Botswana.

About 44.00% of farms and cattle post in Botswana are at least 10 years old, while less than 33% of farms were built in the last 5 years, most of which are predominantly small-scale farms (<100 cattle) (Table 3). Botswana is moving away from much dependence on what is called "cow money"; a practice that garnered funds used to build University of Botswana. This result favours the claims of the Assistant Minister of Education and Skills Development, Mr Moiserale Goya that the key national development goal is to move Botswana from a resource-driven economy to a highly diversified knowledge-based economy (Olesitse, 2015). In a related lecture, Prof. Roy du Pré, the EU Technical Advisor in Botswana and the SADC Region had published that the world has moved from being resource-based economies to knowledge-based economies and that Botswana has recently begun to beat the "Knowledge Economy" drum, indicating that Botswana must become a "Knowledge Society" and part

**Table 9.** Ownership of different cattle breeds according to gender of farmers [% (No = Number)].

Combination of breeds owned by farmers	Gender of farmers		Sub-total % (No.)
	Male	Female	
	% (No.)		
Tswana breed only	46.38 (13)	53.62 (27)	33.60 (50)
Brahman only	100.00 (5)	0.00 (0)	3.40 (5)
Simmental only	63.93 (3)	36.07 (2)	3.40 (5)
Charolais only	100.00 (1)	0.00 (0)	0.70 (1)
Tswana Cross Brahman	0.00 (1)	100.00 (1)	0.70 (1)
Brahman Cross Simmental	0.00 (0)	100.00 (1)	0.70 (1)
Brahman, Simmental, Beef Waster	100.00 (1)	0.00 (0)	0.70 (1)
Brahman, Red Sussex	100.00 (2)	0.00 (0)	1.30 (2)
Tswana, Brahman, Simmental	55.54 (8)	44.85 (7)	10.10 (15)
Tswana, Brahman, Simmental, Brown Swiss	0.00 (0)	100.00 (1)	0.70 (1)
Tswana, Afrikanner, Brahman, Hereford, Simmental, Red Sussex, Brown Swiss	46.34 (1)	53.66 (2)	2.00 (3)
Brahman, Simmental	100.00 (3)	0.00 (0)	2.00 (3)
Tswana, Brahman	43.87 (12)	56.13 (14)	14.80 (22)
Tswana, Brahman, Charolais	30.30 (1)	69.67 (2)	2.00 (3)
Tswana, Afrikanner, Brahman, Simmental, Charolais	74.56 (10)	25.44 (5)	10.10 (15)
Tswana, Red Sussex	30.65 (1)	69.35 (3)	2.70 (4)
Tswana, Simmental, Pinzgauer	0.00 (0)	100.00 (1)	0.70 (1)
Tswana, Brahman, Charolais, Brown Swiss	100.00 (1)	0.00 (0)	0.70 (1)
Brahman, Musi	30.30 (1)	69.67 (2)	1.30 (2)
Tswana, Brahman, Simmental, Charolais	56.86 (3)	43.14 (1)	2.70 (4)
Tswana, Brahman, Brahman Cross Tswana	100.00 (1)	0.00 (0)	0.70 (1)
Tswana, Brahman, Brown Swiss	0.00 (0)	100.00 (1)	0.70 (1)
Tswana, Limousin	30.30 (1)	69.67 (2)	1.30 (2)
Brahman, Simmental, Beef Master	100.00 (1)	00.00 (0)	0.70 (1)
Tswana And Afrikanner	100.00 (1)	0.00 (0)	0.70 (1)
Tswana, Hereford, Brahman, Simmental	100.00 (1)	0.00 (0)	0.70 (1)
Brahman, Simmental, Aberdeen Angus, Friesland	100.00 (1)	0.00 (0)	0.70 (1)
Tswana, Simmental, Afrikaaner	30.30 (1)	69.67 (2)	1.30 (2)

of the “Global Knowledge Economy” (Roy du ‘Pre, 2018).

Only 13.20% of farmers kept ‘only cattle’ in their farms; the rest kept two or more species of farm animals (Table 5) with less than 37% keeping only one breed of cattle (Table 9). Farmers claim that mixed livestock farming was a form of security in that, in an event of failure with one livestock they could fall back on the other. This served as a form of multiple strings of income (Uchendu, 2020). Furthermore, mixed livestock farming in Botswana is associated with cultural and social values as a source of pride (Pablo et al., 2014). Recently, donkey skin has been identified as a highly priced hide and skin. Botswana has widespread grazing pasture lands, thus have great potentials for the donkey industry. On the contrary, this industry is primordial and untapped with less than 40,000 donkeys as at 2014 (Annual Agricultural Survey Report, 2014 in Statistics Botswana, 2016). There is no farm in Botswana that is dedicated only to donkey farming. Goats are the next most populous farm animal to

cattle (Table 5).

About 94.60% of farmers had knowledge of bovine cysticercosis, while 42.30, 28.00 and 14.70% had recorded cases of bovine cysticercosis, experienced carcass retention and devaluation and carcass condemnation respectively (Table 7). This study agrees with Mosienyane (1986), Aganga (2009), Tshiamo (2015) and Mochankana and Robertson (2016) who confirmed that the cattle industry in Botswana has been affected economically by bovine cysticercosis. This zoonotic disease is caused by *Taenia saginata*/cysticercosis, the larval stage of the obligate human tape worm; *Taenia saginata* (*T. saginata*). Whereas 50.20% of farmers suffered financial losses due to bovine cyticercosis, only 36.9% experienced negative effect on their economy. Government interventions helped to cushion effect of financial loss on farmers’ economy (Uchendu 2020). Ghanzi has highest cattle population (Table 6) as well as highest bovine cysticercosis prevalence (Uchendu et al.,

2020).

Mean cattle population was 200.4, 193.36, 218.53 and 243.85 heads per farmer in 2009, 2011, 2013 and 2017 respectively (Table 8). This result shows progressive population growth except for a dip in 2011, during which time the nation experienced severe drought that led to death of cattle (Burgess, 2006). This work agrees with Modisa (2014) and Statistics Botswana (2019) that there was a slight decrease in cattle population between 2011 and 2012. Although this study did not capture cattle population for 2018 and 2019, it disagrees with findings in Statistics Botswana (2019) that shows a steady drop in population of cattle capacity from 2012 till date.

## Conclusion

Recent decline in Botswana's cattle population has been arbitrarily attributed to the unthrifty semi-arid desert climate of the nation. Contrary to this assertion, this demographic and characterization study clearly demonstrates that apart from adverse climatic conditions, issues that border on gender inequalities, low youth involvement in cattle farming and government policies that favour non-agricultural sectors bear adverse effect on cattle population, ownership and farming. Botswana's cattle industry has potential for women involvement and dairy farming. These areas are currently unexplored in Botswana. Also, bovine cysticercosis has been recorded in Botswana with adverse economic and public health impacts.

This study is essential because it provides evidence-based knowledge for policy recommendation on how to revive Botswana's currently dwindling cattle population and diversify the industry

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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