Research Article

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Farm size and its impact on land use: The case of the South African private wildlife industry

Abstract: This study briefly discusses the relatively young private wildlife industry of South Africa which surfaced in the late 1990s, early 2000s. The industry has unique conservation management models and land uses that include hunting, breeding and game sales and ecotourism and by-products as well as mixed farming practices that include stock and crop farming. The research found that breeding and game sales are the most productive land-use form. Since this research was conducted, the market for live game sales collapsed and the authors believe that other wildlife-related land uses, such as ecotourism and by-products, will gain popularity in the future to replace breeding which is now less favourable. Furthermore, it was also found that different farm sizes influence the land uses, and a combination of land uses was chosen to be incorporated on a private wildlife establishment. A qualitative research approach was followed, and 223 privately owned wildlife establishment owners and managers were interviewed at fourteen auctions across South Africa. This research also concludes that since most wildlife are found on private conservation land, this research is a must for the industry as it can guide private wildlife establishment owners and managers to manage their private wildlife establishments most productively. Since this research was conducted, the market for live game sales collapsed, and the results show that fewer wildlife establishments are now breeding with game. These game farmers or wildlife establishment

owners are now looking for different options on their land. If they cannot find an alternative in the wildlife industry, they will divert to other farming activities such as cattle farming. This will lead to a decrease in land for wildlife, which can impact wildlife numbers in South Africa. The authors believe that land use such as ecotourism and by-products will gain popularity in the future to replace breeding. This research also shows where there are opportunities in the wildlife industry.

Keywords: land-use, private wildlife industry, agriculture, management, conservation

1 Introduction

South Africa is a well-known wildlife destination with an abundance of wildlife. This is due to the unique conservation management model that South Africa has, which is referred to as the three-legged stool. The first leg is the public sector or government (national parks, provincial parks and other state-owned conservation/protected areas), the second is the private sector/individuals (privately owned game farms/lodges/reserves) and the third is the free-market economy that determines the economic value of wildlife/tourism and the price of goods and services applicable to it. Also, the uniqueness of the industry also stems from the fact that wildlife species can be owned by private individuals (Cloete 2017; Pack et al. 2017). Only a few countries in the world allow this, as in most countries, wildlife belongs to the government and the public may not own wildlife species. In South Africa, farmers or wildlife ranchers can own the wildlife on their land, by certifying their fence for the game on the land. This is called an exempted certificate. Therefore, the fence must prevent the game from escaping from the land. This certification allows the owner of the farm to trade with wildlife either for breeding purposes or hunting (Van der Merwe and Du Plessis 2014). It is a fact that due to this model, more wildlife in South Africa are found on private land than in all of the national and provincial parks. This contributing immensely to the conservation

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of wildlife in South Africa (Van der Merwe and Du Plessis 2014). The cooperative engagement of these three institutions has resulted in South Africa providing the most cost-effective and efficient access in all of Africa to a thriving wildlife sector. As a result, there is more land under wildlife production and more wildlife itself in South Africa today than at any time over the past 100 years because of specific land-use (Mahoney et al. 2011; PHASA 2017).

To accomplish this unique model and good state of wildlife was not an easy road to travel and not without any bumps in the road. The first Europeans who entered the country almost depleted the abundant game numbers in South Africa, and between 1,780 and 1,880 wildlife numbers drastically decreased due to mining and the muzzleloader. It was further believed, by the early settlers, that wild animals transmitted diseases such as the rinderpest and Naga illness to domestic animals and were seen as a threat to domestic animals (Suich et al. 2009; Van der Merwe and Du Plessis 2014). In the early 1780s to 1850s, there was little to no management plan for wildlife conservation in South Africa, which further contributed to the decrease in wildlife (Suich et al. 2009; Van der Merwe and Du Plessis 2014).

Conservation consciousness only occurred post-1857 when legislation was implemented by the South African government of that time. Legislation first related specifically to the conservation of elephants and buffalo and later to regulate hunting using permits and licences (Suich et al. 2009; Van der Merwe and Du Plessis 2014). At around 1920, the South African government decided to increase conservation efforts by putting aside and establishing land for the conservation of wild animals known as national parks that would be protected using regulations and management (Suich et al. 2009; Van der Merwe and Du Plessis 2014). The first national parks, namely Kruger and Tsitsikamma National Parks, were proclaimed during this time frame.

The private sector (farmers) at first did not share the government's idea of wildlife conservation. Wildlife conservation was seen as unprofitable until national parks started to attract tourists and generate income for them. The country slowly became popular as a big game-hunting destination among Americans and Europeans (Suich et al. 2009; Lindsey et al. 2013b; Van der Merwe and Du Plessis 2014). Soon landowners realised that wildlife has an economic value. The result was that the private sector increasingly invested in wildlife, and farmland was converted into game farms and wildlife reserves (Lindsey et al. 2013b; Van der Merwe and Du Plessis 2014).

According to Dry (2013), the private wildlife industry has grown into an industry of its own, where private wildlife establishments in South Africa have more land under conservation for wildlife than the public sector. The private wildlife industry has shown the fastest growth in the agricultural sector since 1996 (NAMC 2006). The current core land use of the private wildlife industry is based on four pillars, namely hunting, breeding and game sales, ecotourism and by-products (i.e. venison, leather products and curious) (Van der Merwe and Saayman 2004; Van der Merwe and Du Plessis 2014). The literature also revealed that, in addition to these four pillars, some private wildlife establishments also incorporate traditional farming activities such as stock, crop and poultry farming with wildlife and is referred to as mixed farming (Lindsey et al. 2013a).

Unlike other agricultural sectors, the biggest growth of the private wildlife industry was in the past 20 years. However, the problem is that the private wildlife industry land-use has not been researched to determine best practices and to encourage high growth and profit for the wildlife industry (Taylor et al. 2015). Because of this, it can be argued that there are no guidelines and no model that will indicate to private wildlife establishment owners what land uses to incorporate to be as productive as possible. Because of the lack of guidelines and a land-use model, there is a necessity to determine how private wildlife establishments of different sizes manage their land uses productively and what land uses are incorporated to ensure productive land use. If this land use can be determined in relation to land size, it will aid the private wildlife industry to grow through sound management decisions based on different land sizes found in the wildlife industry (Pretorius 2009). Thus, the need to gain information on the land use of privately owned wildlife establishments. If a landowner owns a farm small or big, this research aims to determine what will be the best pillars combination for his/her land to have the best production output, total income generated and expenditures based on capital layout. Thus, if new private wildlife establishments are established, managers and owners will have guidelines in terms of land use, and it will also benefit current product owners who struggle to make a profit on their land to run their farms/land more profitable. Therefore, this research aims to determine what is the relationship between farm sizes and land use in the private wildlife industry of South Africa by considering average production output, total income generated and expenditures based on capital layout. The significance of the study relates to the guidance it gives to current and new privately owned wildlife establishments in terms of which land-use activities, or a combination thereof, are beneficial in terms of income, expenditure and production output. To accomplish this, a literature background will

be given on the private wildlife industry. This will be followed by an explanation of the methodology, the research findings and last conclusions will be drawn.

2 Literature background

Land use is defined as the function or functions that humans apply to the land available to them. The study of land use is the study of how land is managed, including how the natural world is adapted to human needs (Wood 2019). Dickinson and Shaw (1977) define land use as man's activity on the land or the purpose for which the land is being used. Wood (2019) adds to this by defining land use as the function or functions that humans apply to the land available to them.

Generally, land use involves management operations on land to produce specific goods and services from that land. The goods and services obtained from the land depend on particular ecosystems and socio-economic market forces (Pretorius 2009). Land use is further influenced by changes in natural and economic environments (Pretorius 2009; Otieno and Mchapondwa 2016).

On wildlife establishments, there are different land-use forms that include the four pillars mentioned. These pillars must have a commercial value, which involves making a profit through activities (Mail and Guardian 2012; Cambridge Dictionary 2016; Macmillan Dictionary 2016). However, profit should not be the only goal of privately owned businesses (Stimpson and Joyce 2014). Goals should also include sustainability, which improves biodiversity, reduces habitat loss, increases animal welfare, benefits local communities and increases wildlife's economic value (Selier and Di Minin 2015). If the natural habitat and game that depend on the habitat are not managed sustainably, long-term damage can occur that hinders future sustainability. Proper management is imperative, and certain activities have developed into pillars that assist with the sustainability of the game-farm industry (Mail and Guardian 2012; Pirota and Lusseau 2015). The different land uses are discussed next.

2.1 Land-use forms (pillars)

As indicated earlier, there are four land-use forms concerning the private wildlife industry, namely hunting, game breeding and sales, ecotourism and by-products.

2.2 Hunting

Hunting involves the search, kill, capture and extraction or removal of wildlife for trophy and food purposes (South Africa 2010; Van der Merwe and Du Plessis 2014; Duffy et al. 2015). Hunting is divided into two categories, namely biltong hunting and trophy hunting.

2.2.1 Biltong hunting

Biltong hunting involves the use of bow and arrow or rifle to obtain meat used to produce biltong (cured, dried and salted meat) as well as venison products such as steak, sausage, salami, *droëwors* and other meat products (Van der Merwe and Du Plessis 2014; Taylor and van Rooyen 2016; Jones et al. 2017). The individuals who participate in biltong hunting are mostly middle-aged males from South Africa (Van der Merwe and Du Plessis 2014).

2.2.2 Trophy hunting

Trophy hunting involves hunting wildlife to obtain specific body parts that have specific characteristics (Palazy et al. 2011; Van Hoving 2011; Crosmary et al. 2015a; IUCN 2016), for example, the head, skin, tusks and horns amongst others (Lindsey et al. 2006; Van der Merwe et al. 2014; IFAW 2016; Taylor et al. 2016). Individuals who participate in trophy hunting are mostly international male tourists (Lindsey et al. 2006; Strauss 2015; IFAW 2016; IUCN 2016; Taylor et al. 2016; Muposhi et al. 2017).

2.3 Breeding and game sales

Breeding and game sales refer to the breeding of plains game, endangered game and high-value game. Breeding is conducted by landowners to increase game numbers, to prevent endangered species from extinction (because of threats due to diseases and habitat destruction), better genetics and food security (Van der Merwe et al. 2010; Leus 2011; Oldenbroek and van der Waaij 2014; Janovsky 2015). There are two breeding categories, namely intensive and existence breeding. Intensive breeding occurs in smaller fenced-off camps and focuses on developing animals with specific characteristics or traits (DEA 2015; Taylor et al. 2016). Extensive breeding involves

less human interference in the breeding process and animals can roam freely, select mates and breed in a natural environment that has sufficient natural vegetation and water (Van Hoving 2011; Oldenbroek and van der Waaij 2014).

2.4 Ecotourism

Ecotourism is non-consumptive and environment-friendly activities that occur in the natural environment in which wildlife occurs (Higginbottom 2004). Importantly, the aim of ecotourism activities is to care for and conserve the natural environment while considering the people and wildlife species that occur in the ecotourism area (Higginbottom 2004; Newsome et al. 2005; De Witt et al. 2011; INTOSAI 2013; Phiri and Okeyo 2015; Willemen et al. 2015). Examples of activities include beautiful scenery, watching wildlife and hiking (Newsome et al. 2005; Tapper 2006; Meletis and Campbell 2007; Kays et al. 2017).

Wildlife tourism includes ecotourism as well as rural tourism, human relations, nature-based tourism and consumptive activities such as hunting (Page and Dowling 2002). Wildlife tourists want to encounter non-domesticated animals in both the captive (zoo) or natural environments they occur in. Activities that tourists participate in include both consumptive and non-consumptive activities (Van der Merwe and Du Plessis 2014).

2.5 By-products

By-products involve different forms of practical or decorative items that originate from the meat, skin, bones, horns and other body parts of animals (Department of Arts and Culture 1998; Festa-Bianchet 2012). Venison by-products such as steak, salami, sausage and other meat products are either sold privately or commercially in shops such as butcheries or retail outlets (Hoffman 2007; Van Zyl 2018). Legislation, a lack of knowledge and a lack of trust, with regards to quality and taste of meat products, hinder the growth of this land-use form (Hoffman and Schutte 2004; Neethling 2016; Van Zyl 2018).

By-products produced from the skin involve leather products that include car seats and furniture on a large scale, and whips and traditional clothing on a smaller scale (National Department of Agriculture, Forestry and Fisheries 2012; Akinbileje 2014; Shava 2015).

Other by-products include animals' bones and horns that are used to produce traditional and designer clothes, wares and household items, tourist souvenirs and clothing (Akinbileje 2014; Shava 2015). Lastly, the meat, skin, bones, horns and other body parts are used for conventional or spiritual, traditional or cultural medicinal purposes (Department of Arts and Culture 1998; Soewu 2013; Shava 2015; Van Zyl 2018).

2.6 Mixed farming

Mixed farming as a fifth pillar refers to the involvement of crop, poultry or stock farming with wildlife (Statistics South Africa 2012). The reason to incorporate traditional agricultural and farming practices with wildlife is that landowners want to maximise their income from the land they own, and in some cases, certain parts of a farm or game reserve are more suitable for normal farming activities (Lindsey et al. 2013b; Cholo et al. 2016; Otieno and Mchapondwa 2016).

3 Method of research

To determine the land-use forms, qualitative research was conducted, namely action research (action research focuses on a specific problem experienced) using a semi-structured interview instrument to conduct the interviews.

The study area consists of private wildlife owners in South Africa. The semi-structured questionnaire for the interviews was developed by consulting existing literature (Higginbottom 2004; Van der Merwe et al. 2010; Festa-Bianchet 2012; Oldenbroek and van der Waaij 2014; Van der Merwe and Du Plessis 2014) and industry experts that were interviewed at a workshop that was held in 2017 at WRSA (Wildlife Ranching South Africa) headquarters, based in Pretoria. The workshop was attended by the former WRSA president, an agricultural economist, and the CEO (Chief Executive Officer) of WRSA. The measuring instrument was then sent for input to the presidential board member responsible for research, after which it was then sent for final approval to the presidential council of WRSA. The final interview instrument consisted of six sections, namely demographic aspects, land-use forms, economic aspects, challenges experienced, possible planned future investments, and other comments made by interviewees that are related to the private wildlife industry.

Thirteen wildlife auctions were attended in 2017 and 2018 in seven of the nine provinces of South Africa. Limpopo wildlife auctions in Bela were attended on 11 February 2017, 24 February 2017, 12 May 2017 and 10 June 2017. Free State wildlife auction was attended on 17 February 2017 in Gariep, Stellenbosch in the Western Cape province on 17 March 2017, Mkuze in the KwaZulu-Natal province on 22 April 2017, Graaf-Reneit in the Eastern Cape province on 30 September 2017, Koster in the North West province on 4 May, Kimberly in the Northern Cape province on 31 May and Ermelo in Mpumalanga on 14 April 2018. The auctions were used as a platform to conduct the interviews as most of the private wildlife industry at some stage attend these auctions to trade their wildlife. Further to this, the 2017 annual WRSA conference held in Polokwane on 24 March 2017 was used to conduct interviews. This making sure that all industry role players are covered. Interviews were held before and during the auctions and conference with 223 privately owned wildlife establishment owners and managers. The interviews were conducted by the researcher as well as various honours and masters students who were trained in conducting interviews prior to the fieldwork. Non-probability or purposeful sampling methods were used. Non-probability sampling involves a small sample that has information on a real-life phenomenon. In this case, the private wildlife industry has specific knowledge that the researcher needed to complete the study (Martella et al. 2013; Maree 2016; Taherdoost 2016).

Private wildlife establishment owners were approached and asked to voluntarily participate and answer questions during the interview that lasted between 15 and 30 min. Face-to-face interviews were held by the researchers predominantly in English and Afrikaans. Interviews were recorded manually by interviewers making notes on the semi-structured questionnaire that was used during the interview.

Collected data were transcribed into text and presented in narrative form, after which it was analysed by using Creswell's six steps in data analysis and interpretation. The six steps of Creswell (2009) are depicted in Figure 1 after which each step is explained

- Step 1 involves organising and preparing the data. This included organising the data as well as the transcriptions of the recorded interviews and preparing it for analysis. The research was also conducted by employing content analysis utilising the search results of numerous scholarly journals that have researched CSFs in the tourism industry to obtain a background
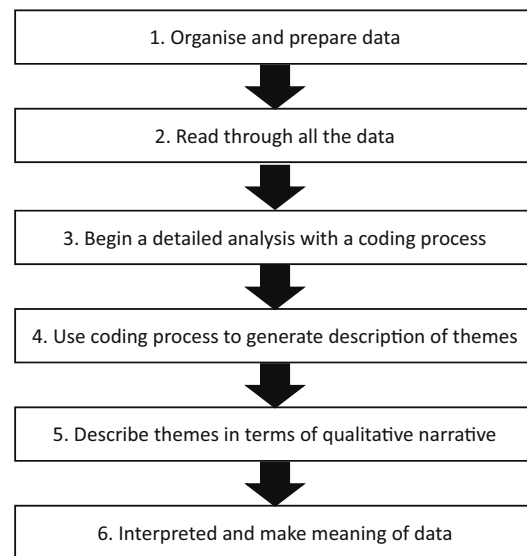

Figure 1: Creswell's six-step data analysis and interpretation process.

regarding the similarities or gaps between the different approaches and perceptions towards CSFs.
- Step 2 involves reading through all the data. During this step, the data were read through several times to obtain a general sense of the information.
- Step 3 involves beginning a detailed analysis which includes a coding process. The data about land use of the private wildlife industry were coded to identify the important aspects. After that, a recoding process was followed to ensure trustworthiness. The results were then compared with one another to gain an overall perspective.
- Step 4 involves the coding process to generate a description of the setting or people as well as categories or themes for analysis. The various codes were then divided into categories, whereafter themes were allocated to each category. The allocated themes appeared as the major findings in the results and were used to create headings in the findings section of this study. Excel was used to analyse the data.
- Step 5 offers a description and themes will be represented in the qualitative narrative. A discussion followed by mentioning the chronology of the importance of the themes identified. This step conveys descriptive information about each given theme and the information identified by each respondent.
- The final step, step 6, involves data analysis where data are interpreted in a meaningful way. Lastly, personal interpretation and understanding were formulated with regard to the results gained from this research.

Trustworthiness is an indication of methodological soundness and adequacy (Holloway and Wheeler 2010). For this research, trustworthiness was illustrated using coding and recoding the data. Data were verified and validated, as after the interviews, respondents could look at their answers and could make corrections if needed for final input and verification.

4 Results

The results are presented in two sections: the first section provides the demographic profile of the respondents, while the second section talks about the land-use of the private wildlife industry when compared with farm (land) size.

4.1 Demographics profile of respondents

The demographics are summarised in Table 1, and they are briefly discussed here.

Fifty-two percent of the respondents were located in the Limpopo province, followed by the Northern Cape (17%) and the North-West province (12%). This confirms previous research by Van der Merwe (2004), who indicates that most private wildlife establishments are found in the Limpopo province of South Africa. Of the rest of the respondents, 6% were from the Free State province, 3% from the Mpumalanga province, KzaZulu-Natal province and the Eastern Cape province, 2% from the Gauteng province and 1% from the Western Cape province. In addition, 1% of respondents did not indicate the province their private game reserve is located in.

The majority of the respondents' private wildlife establishments are located in the Savannah biome, followed by the Grassland biome. Table 1 highlights the most popular biomes, per province, in which private wildlife establishments are located.

In total, 73.43% of private wildlife establishments are located in the Savannah biome. This is followed by 14.98% that is located in a Grassland biome, 8.21% that is located in a Nama-Karoo biome, 1.45% that is located in a Succulent Karoo biome and less than 1% that is located in a Forest and Fynbos biome.

The average private wildlife establishments/farms are 4,744 hectares in size. Thirty-three percent of wildlife establishments are less than 1,000 ha in size, followed by 21% between 1,001 and 2,000 ha and 13% between 8,001

and 70,000 ha in size. Farms that range between 2,001 and 8,000 ha constituted between 3 and 8% of respondents. As the wildlife establishments, 1,000 ha and less forms the biggest percentage. These farms were further analysed. Farms of 200 ha and smaller made up the largest portion, namely 26%. This was followed by farms of 401 to 600 ha in size (22%), 201 to 400 ha farms (19%), 801 to 1,000 ha farms (18%) and farms between 601 and 800 ha (16%).

The average wildlife establishment has been in existence for 17 years and 9 months. The largest percentage of interviewees (40%) has been in operation for ten years or less. This is followed by 34% that have been operational for 11 to 20 years, 5% that has been in operation for 31 to 40 years, 7% that has been in operation for more than 41 years and 2% that did not indicate how long they have been in operation.

The ten most popular species owned by wildlife establishments on these private wildlife establishments are kudu (82%), impala (79%), nyala and the common duiker (70%), blue wildebeest (68%), gemsbok (61%), blesbok (60%), steenbok (59%), waterbuck (58%) and eland and burchell's zebra (57%).

Forty percent (40%) of wildlife establishments' form of business is sole proprietor, followed by trusts (26%), pty's (a company that trades for profit and which is a separate legal entity) (20%) and 10% being cc's (closed corporations). The total number of permanent employees for the sample was 3,540 employees, with 242 temporary employees.

4.2 Farm (land) size and land-use forms

The size of the farm was compared with the different land uses identified in the literature, namely hunting, breeding and game sales, ecotourism, by-products and mixed farming. This is measured according to average production output, total income generated and expenditures based on capital layout.

4.3 Farm size in relationship to average production output

Figure 2 illustrates the average production output of interviewees per pillar (breeding and game sales, ecotourism, hunting, by-products and mixed farming) when

Table 1: Demographic profile of respondents

Results

Province

Gauteng	Mpumalanga	Limpopo	Free state	Eastern Cape	Western Cape	Northern Cape	North West	KwaZulu-Natal	Not indicated
2%	3%	52%	6%	3%	1%	17%	12%	3%	1%

Biome

Savannah	Grassland	Nama Karoo	Succulent	Forrest	Fynbos
73.43%	14.9%	8.21%	1.45%	0.97%	0.97%

Size

Not indicated	0 – 1,000 ha	1,001 – 2,000 ha	2,001 – 3,000 ha	3,001 – 4,000 ha	4,001 – 5,000 ha	5,001 – 6,000 ha	6,001 – 7,000 ha	7,001 – 8,000 ha	8,001 – 70,000 ha
2%	33%	21%	5%	8%	7%	4%	3%	4%	13%

Length of existence

Not indicated	0–10 years	11–20 years	21–30 years	31–40 years	41+ years
2%	40%	34%	12%	5%	7%

Popular species

Kudu	Impala	Nyala	Duiker (common)	Blue wildebeest	Gemsbok	Blesbok	Steenbok	Waterbuck	Eland	Zebra (Burchell)
82%	79%	70%	70%	68%	61%	60%	59%	58%	57%	57%

Type of ownership

Sole proprietor	Trust	PTY	Closed corporation	Other	Not indicated
41%	26%	18%	7%	6%	2%

compared with the size of the farm. The farm sizes are divided into four categories: namely <500 ha, 501 to 1,000 ha, 1,001 to 3,000 ha and >3,001 ha.

For all four farm size categories breeding and game sales, hunting and mixed farming as the land-use form had the highest average production output.

4.3.1 Breeding and game sales

Farms larger than 3,001 ha had the highest percentage (42%) and was followed by farms smaller than 500 ha (35%) with farm sizes between 1,001 and 3,001 ha (34%) in the third place. The farm size that had the lowest production output percentage (31%) was the farms between 501 and 1,000 ha.

4.3.2 Hunting

Farms between 1,001 and 3,000 ha had the highest average production output for hunting (23%), followed by farms between 501 and 1,000 ha and farms 3,001 ha and larger with 20%, respectively. Small farms (500 ha and smaller) had the lowest average production output for hunting (14%).

4.3.3 Mixed farming

Farms smaller than 500 ha had the highest average production output for mixed farming (23%). From Figure 2, it is clear that the bigger the farms, the lower the average production output, due to mixed farming.

4.3.4 Ecotourism and by-products

These two land uses had the lowest production output. It is interesting to note that the highest percentage for average production output regarding ecotourism as land-use form was for farms larger than 3,000 ha.

4.4 Farm size measured concerning expenditures based on the capital layout

Figure 3 depicts the average expenditure for the different farm sizes, based on the capital layout of interviewees per pillar (breeding and game sales, ecotourism, hunting, by-products and mixed farming). The farm sizes are divided into four categories, namely <500, 501 to 1,000, 1,001 to
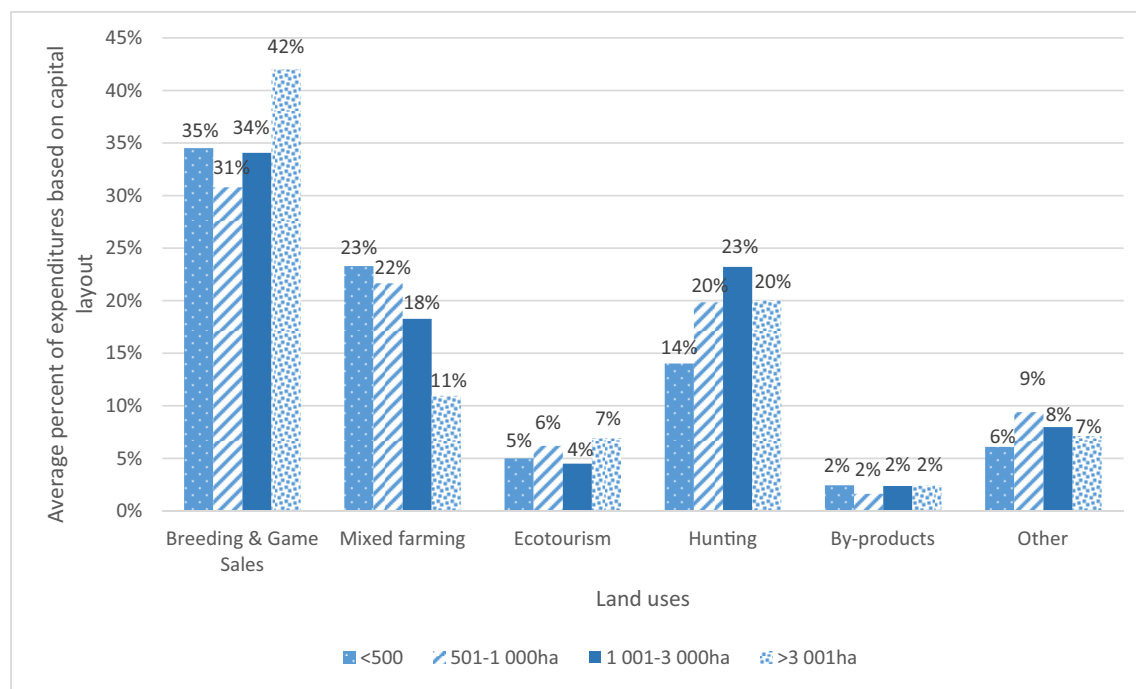

Figure 2: Average farm size versus average production output per land-use form.

3,000 and >3,001 ha. For expenditures based on capital layout, the land-use forms that scored the highest average percentages are breeding and game sales, hunting and mixed farming.

4.4.1 Breeding and games sales

This land use had the highest capital layout averages for farms larger than 3,001 ha (46%), followed by farms between 1,001 and 3,000 ha (35%), farms smaller than 500 ha (30%) and last farms between 501 and 1,000 ha (29%).

4.4.2 Mixed farming

Farms smaller than 500 ha had the highest percentage (29%) regarding expenditure based on capital layout. Farms larger than 3,001 ha had the lowest percentage (11%).

4.4.3 Hunting

All farm size categories scored similar percentages. The highest percentage was for farms between 1,001 and 3,000 ha (28%) and the lowest percentage for farms between 501 and 1,000 ha (26%). Therefore, hunting

equally contributes to all farm sizes regarding their capital layout or is seen as a high capital layout for all farm sizes.

4.4.4 Ecotourism

Farms 3,001 ha and larger had the highest percentage (8%) for expenditure based on the capital layout for this land use.

4.4.5 By-products

All land sizes had a low capital layout for this land-use form. Therefore, not much is invested in by-products as land-use form by landowners.

4.5 Average income generated compared to farm size

Figure 4 considers the average income generated from interviewees per land-use form (pillar) (breeding and game sales, ecotourism, hunting, by-products and mixed-farming) based on the size of the farm. The farm sizes are divided into four categories, namely <500, 501 to 1,000 ha, 1,001 to 3,000 and >3,001 ha.
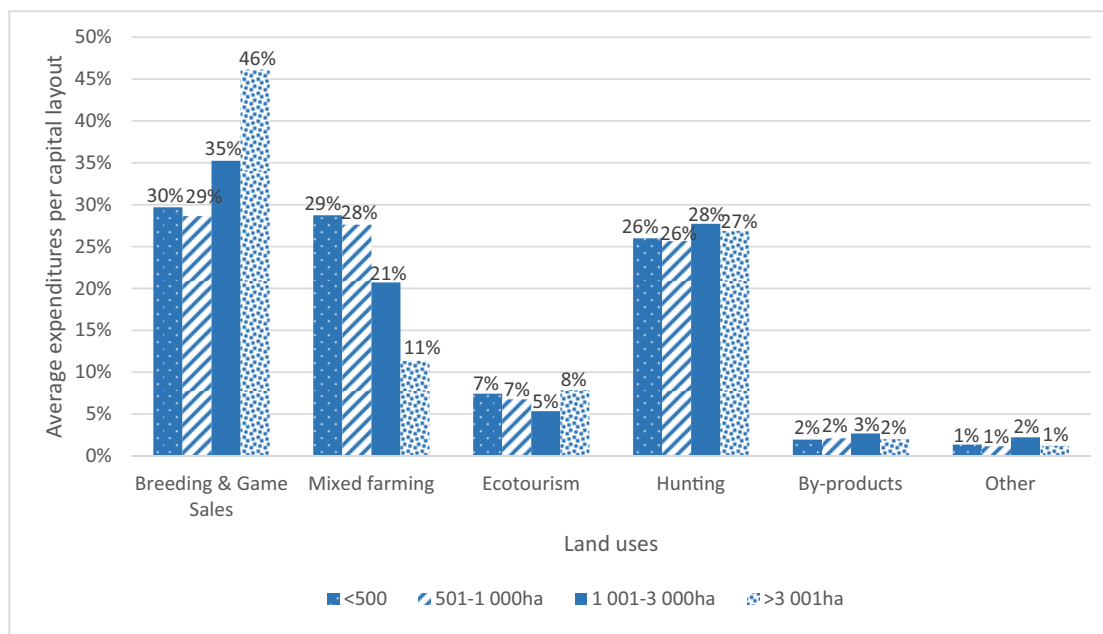

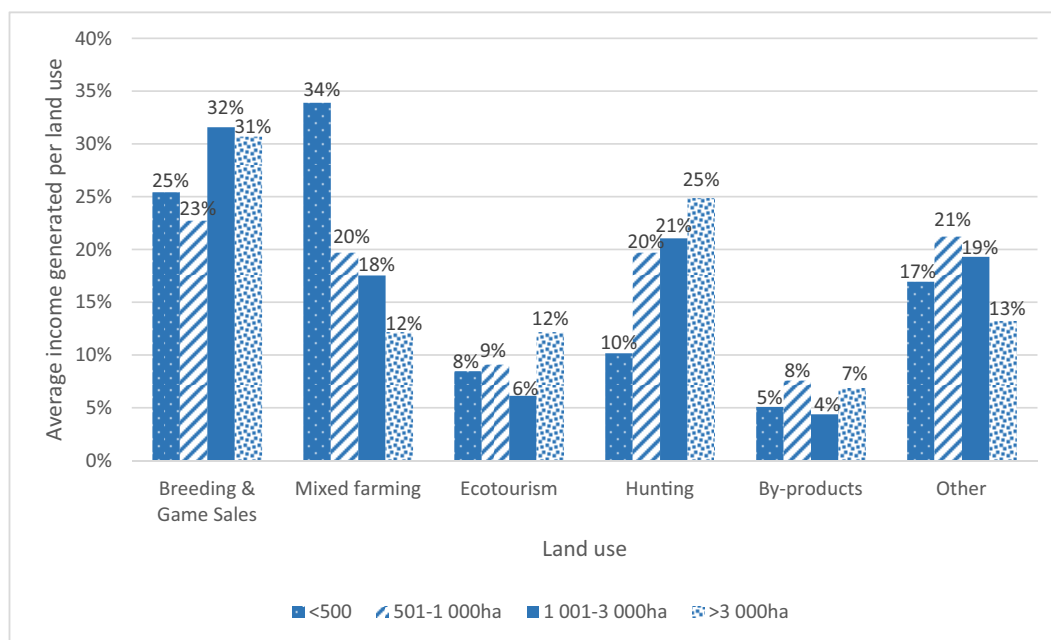**Figure 3:** Average expenditures per capital layout based on farm size and land-use form.

Figure 4: Average income generated per land use compared to farm size.

4.5.1 Breeding and game sales

The land size that had the highest average income (32%) for this land-use form is farms between 1,001 and 3,000 ha, followed by farms larger than 3,000 ha (31%). Farms between 501 and 1,000 ha had the smallest percentage (23%).

4.5.2 Mixed farming

Farms smaller than 500 ha had the highest percentage (34%) income generated from mixed farming. This was followed by farms between 501 and 1,000 ha (20%). Farms larger than 3,001 ha had the lowest percentage, namely 12%. It is thus evident that, as farm size increases, the income generated from mixed farming decreases.

4.5.3 Hunting

In the case of hunting, a similar trend was experienced, as larger farms (1,001 to 3,000 and 3,000 ha or more) generate more income from hunting than smaller farms.

4.5.4 Ecotourism and by-products

These two land uses had the lowest percentages for income generation when compared with the other land uses. It is also evident from Figure 4 that farms larger than 3,000 ha derived more income from ecotourism than smaller sized farms.

5 Discussion

The first finding of this research is that size does count! Based on income generation per land-use form, it is evident that larger farms generate more income, especially for land-use forms such as breeding and game sales, hunting and ecotourism. Therefore, the implication is that landowners must strive to invest in larger land sizes to be more profitable in their operations (Bernick 2015). Hope (2015) concurs with this by stating, midsize and large-scale farms enjoy higher profit margins. This can be achieved either by buying more land or farmers merging their lands to have larger conservation areas that will be more economically viable and jointly managed and focus on conserving wildlife through land use. A study on land use and wildlife has shown that, even though there was an increase in the size of farmlands, there was a decline in forests, grasslands, wetlands and woodlands because of agricultural activities and land policies, amongst other things. A recommendation in the study was that the zoning should be implemented to specifically benefit wildlife (Nayamasyo and Kihima 2014). Further to this Wildlife Ranching South Africa,

the representative body of the private wildlife industry must engage in talks with the government and the banking sector to provide loans with the lower interest rate to farmers who want to enlarge their farms for conservation purposes.

The second finding is that breeding and game sales and hunting as land use require the most capital layout (on average) to be developed by all farm sizes. The implication of this finding is those product owners who would like to develop these land-use forms need more start-up capital or investors to develop these land-use forms.

The third finding of the research is that farms smaller than 500 ha had the best production output from mixed farming and breeding. One tends to get the idea that owners with smaller land tend to incorporate as much as possible land-use activities on their land to be sustainable. The implication is that smaller farm owners must investigate these two land uses if their land is not profitable or non-sustainable. It is, however, important to note that since the research was conducted (2017/2018), the value of the game has remarkably decreased due to numerous factors of which one is that supply has outplayed demand. The result is that breeding and game sales have decreased in popularity amongst product owners. The implication is that landowners must investigate and plan land use such as tourism and by-products to replace breeding of game to increase possible income from their land, not only for smaller farms but also larger farms. Nature-based tourism constitutes 80% of South Africa's tourism offering, and therefore, it makes sense to expand it as a land-use form (Kriek 2017; Wildlife Auctions 2019). A study conducted in Namibia mentioned that hunting and ecotourism generated the most income on private wildlife establishments (Lindsey et al. 2013). In South Africa, the results showed that hunting is a productive land use, but that not a lot of private wildlife establishments are necessarily incorporating tourism yet.

The last finding is that by-products are the least-utilised land-use form. The implication is that this land-use form, specifically venison production, can be more explored in the light of the fact that breeding and game sales have collapsed. This will also contribute to the food security of the country.

6 Conclusions

This study researched the question: do different farm sizes in the private wildlife industry have different land uses? The answer to this question is yes. The research

makes the following contributions: firstly, this was the first-time land use was measured against farm size in the South African private wildlife industry. Thus, a second contribution is that the private wildlife industry now knows which land-use forms are most productive and generate the best income for different farm sizes. The third contribution is that breeding and game sales were identified as an important land-use form, but since this research was conducted, the market for life game has collapsed, making this land use a less profitable option. It appears that land-use forms such as ecotourism and by-products (venison sales) will increase as land-use forms in the future. The last contribution is that new entries into the private wildlife industry have now more knowledge to plan a sustainable wildlife business. Overall, knowing what land uses are more productive, can be combined and can be incorporated productively will guide new and existing small and large private wildlife establishments to make good land-use decisions from the start of the operation and be productive early on. It will also guide existing private wildlife establishments on what land uses, or combination of land uses, are more productive if land-use changes are necessary because of environmental changes (due to global warming) or because the land size is increased.

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