

THE ECONOMIC IMPACT OF HUNTING IN THE LIMPOPO PROVINCE

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Received: October 2013

Accepted: August 2014

Abstract

This study evaluated the economic impact of hunting on the regional economy of South Africa's Limpopo Province. Data on biltong hunting was derived from a national survey conducted in 2009 and data on trophy hunting from the Professional Hunting Association of South Africa (PHASA). Using the input-output (social accounting matrix) and multiplier analyses, we found that the direct economic impact of hunting in the regional economy of the Limpopo Province, as a result of increased expenditure, exceeded R669 million (US\$83.6 million). This direct impact resulted in a total economic impact in the order of R1.2 billion (US\$150 million) and consequently in a multiplier effect of 1.76. With regard to employment, we estimated that some 8 382 jobs, in addition to those of the employees directly involved, may be dependent upon hunting in the province, which supports the notion that this is a viable and important sector of the tourism industry.

Keywords

Accounting matrix, biltong hunting, economic impact, hunting, South Africa, Limpopo Province, tourism, trophy hunting

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1. INTRODUCTION

Wildlife-based tourism is attracting increasing interest from governments and the tourism industry alike. Whale watching, safaris, bird watching, fishing, and hunting are among the many activities involved. Higginbottom (2004:2) defines wildlife tourism as “tourism based on encounters with non-domesticated (non-human) animals such as springbok, elephant and lions.” It can take place either in the animals’ natural environment, such as reserves, game farms, and national parks or in areas where animals are in captivity, such as zoos and wildlife breeding institutions. Wildlife tourism activities can be classified into two main groups: non-consumptive (e.g., viewing and photographing wild animals) or consumptive (e.g., hunting and fishing). This study focuses on the latter, specifically hunting.

The greater portion of wildlife tourism in South Africa takes place on more than 6000 privately owned farms and game reserves, which constitute 17.9% of the total land suitable for agriculture in South Africa (Van der Merwe, 2004; Damm, 2005; Samuelson and Stage, 2007). This translates into 14.7 million ha (Van Hoven 2005). Although hunting does not take place on all of these privately owned game farms, it remains the main sources of income for those that do participate in the activity of hunting (Van der Merwe et al., 2004).

A game farm is defined as land that is adequately fenced, containing a variety of species that can be used for hunting, meat production, live game sales, and to provide infra- and supra-structures for eco-tourists (Van der Merwe et al., 2004). In South Africa hunting is mostly of two kinds, biltong and trophy hunting. Van der Merwe et al. (2004) define biltong hunting as a cultural activity where wildlife is hunted by means of a rifle, bow or similar weapon to produce a variety of meat (venison) products, such as biltong and salamis. Biltong is a kind of cured meat that originated from South Africa and is made from different types of meat, such as beef and game meats as well as ostrich fillets. Biltong is made from raw fillets of meat cut into strips (Van der Merwe and Saayman, 2004). It is similar to beef jerky found in the United States: both are spiced and dried meats, but differ in ingredients used, taste and how they are produced. The main difference is that biltong is not as sweet as jerky.

Trophy hunting may be similarly defined as an activity where wildlife is hunted by means of a rifle, bow or similar weapon, primarily for horns (measured according to Rowland Ward and Safari Club International) and skin, which are displayed as trophies (Saayman et al., 2009).

Wildlife tourism is widely considered to be a growth sector that can contribute significantly to the economy of its host country (Higginbottom, 2004). Damm (2004) says worldwide experience suggests that carefully managed conservation-hunting programmes can contribute significantly to successful wildlife conservation. In 2008 the indigenous species hunted for trophy purposes in South Africa accounted for R724.69 million (at time of writing the exchange rate was 1.00 ZAR = 0.124484 US\$) and exotic species for R4.2 million. The daily fees collected from the trophy hunters (mainly foreign, e.g., from the United States, Germany, and Spain) accounted for R244.2 million, giving a total income of R973.2 million generated by trophy hunting in that year (Lindsey et al., 2007). On the other hand biltong hunting (mainly by local South African hunters) generated R5 billion in the 2009 and 2010 season, made up of R2.3 billion for general expenditure (e.g. accommodation, food, and transport) and R2.7 billion for game hunted (Van der Merwe et al., 2011).

Combined trophy and biltong hunting contributed approximately R6 billion to the South African economy for the 2009 and 2010 season. Research conducted by the International Association of

Fish and Wildlife Agencies in America (IAFWA) indicated that the total multiplier effect of hunting in the United States was US\$67.5 billion in 2002 (IAFWA 2002). Similar research by Baldus and Cauldwell (2004) in Tanzania showed that gross income from hunting was US\$27.6 million in 2001.

These amounts support the belief that hunting has the potential to generate employment opportunities and spread wealth to more rural areas of the country, as most provinces where hunting is conducted are rural, such as the Limpopo Province (Van der Merwe and Saayman, 2008). Most of South Africa's hunting takes place in five of the nine provinces: Free State, Northern Cape, North West, Limpopo, and Eastern Cape (PHASA, 2009; Warren, 2011; Van der Merwe et al., 2011). Of these, the Limpopo Province benefits most from hunting (Van der Merwe et al., 2011; Warren 2011), for three reasons: first because 50% of all privately owned game farms and conservation areas in South Africa are located here (Eloff, 2002), second because the largest percentage of biltong and trophy hunters hunt here, and third because a high percentage of the most preferred hunting species (kudu, impala, blue wildebeest, and warthog) are found here (PHASA, 2009; Warren, 2011; Van der Merwe et al., 2011). A study of the Northern Cape, one of South Africa's top three hunting destinations (Warren, 2011), found that hunting contributed R774 million to that province's economy (Saayman et al., 2011). The present study was therefore conducted to ascertain the economic impact of South Africa's largest hunting province, the Limpopo Province.

2. STUDY AREA

Ritchie and Goeldner (1994) define the economic impact of tourism as the net economic change in a host community that results from the spending of tourists (in this case, hunters) in a given area. The magnitude of the economic impact of tourism depends on the following: first, the total number of tourists (in this case number of hunters) who visit an area or country; second, the duration of the stay; third, the average spending of the tourists (hunters) in that area or country; and fourth, the circulation of tourism expenditure throughout the area or country (Saayman, 2000). This last is the multiplier effect, which is normally explained in terms of the direct, indirect, and induced effects that expenditure has on the regional economy. The importance of this is that it shows the leakages from the local economy – and the smaller the leakages the greater the economic impact. FIGURE 1 shows a conceptual framework for estimating the total economic impact of hunting.

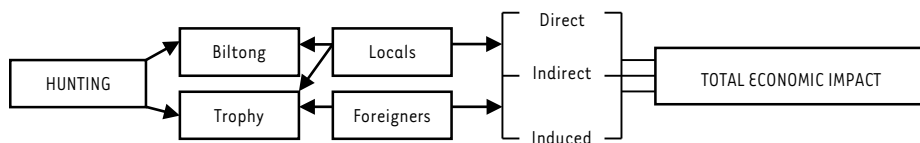


FIGURE 1: Conceptual framework for determining the economic value of hunting

To estimate economic impacts, the “new money” generated for the local economy by tourism is normally considered (Gelan, 2003). Within tourism, tourists visiting a province or region usually create this “new money”. This study therefore considered revenue from both foreign and domestic hunters visiting the Limpopo Province from outside the province to represent “new money”, and excluded day excursions to the region by local people. Tourism researchers usually count as “new money” only that generated by visitors from outside the area. Hunters’

expenditure is an important economic driver because it has an impact on various sectors of the economy, especially in predominantly rural provinces such as the Limpopo Province. Saayman et al. (2009) list many ways in which hunting contributes to forward and backward linkages in South Africa, such as developing infrastructure, creating jobs, improving services, and so on. Forward linkages refer to the supply of additional inputs to other 'upstream' sectors, whereas backward linkages refer to the additional inputs required by producers to supply additional output to meet the increased demand (Conningarth Consultants, 2006b).

Economic impact analyses have been carried out in various fields of tourism research, including those as diverse as sport tourism (Gelan, 2003; Daniels, 2007; Solberg & Preuss, 2007; Saayman and Rossouw, 2008), regional and country economic impacts (Zhou et al., 1997; Frechtling & Horvath, 1999; Walpole & Goodwin, 2000; Fayissa et al., 2008; Lee & Chang, 2008), the economic impact of events (Van Heerden, 2003; Saayman & Saayman, 2004; Van der Merwe & Saayman, 2008; Saayman & Rossouw, 2010), and, increasingly, wildlife tourism (Nijkamp, 2004; Tisdell & Wilson, 2004; Getzner et al., 2005). With regard to economic impact studies of hunting tourism, we found the following international examples: Lindsey et al. (2007), the economic and conservation significance of trophy hunting in sub-Saharan Africa; IAFWA (2002), the economic impact of hunting in America; Baldus and Caulwell (2004), the economic impact of hunting tourism in Tanzania; and BBC Research and Consulting (2008), a report for the Colorado Division of Wildlife on the economic impact of hunting, fishing, and wildlife watching in Colorado. The following are some corresponding studies that have been done in South Africa: Van der Merwe and Saayman (2005, 2008), Scholtz et al. (2010), and Van der Merwe et al. (2011), all of which covered only the economic impact of biltong hunting and not both trophy and biltong hunting. A study conducted in Namibia by Barnes et al. (2009) on income generated by hunting, both trophy and biltong, found that trophy hunting generates more income than biltong hunting. The only data we could find about the spending or economic impact of trophy hunters in South Africa was that of the Professional Hunters Association of South Africa (PHASA, 2009), and the only study of the economic impact of both trophy and biltong hunting in South Africa was research conducted by Saayman et al. (2011) in the Northern Cape province. To date no studies have been done of the economic impact of hunting in Limpopo, South Africa's most important province for both trophy and biltong hunting. This will assist in obtaining accurate economic data on hunting, assist in building the hunting industry and identify possible areas of concern.

3. METHOD

The research method is divided into three categories: surveys, expenditure data, and SAM multiplier analysis.

3.1 Surveys

The study used three data sets, consisting of secondary and primary data. The first derived from a South African quantitative survey of biltong hunters (secondary data), conducted via an online interactive questionnaire hosted on "Potshot", the weekly electronic newsletter of the magazine 'SA Hunter' from October 2009 to January 2010. A total of 344 (n) completed questionnaires were returned and used in the statistical analysis (Scholtz et al., 2010). The questionnaire consisted of three sections of which only sections A and B were used. Section A collected demographic details (marital status, age, and province of origin), Section B investigated spending behaviour (number of persons paid for, number of times the park has

been visited, length of stay, and amount spent), and Section C asked for more detailed information about the consumers' general behaviour (asking which magazines and newspapers and hunting techniques they preferred). This paper refers only to the data from Sections A and B. The questionnaire, which had been used in previous similar research, was designed by Saayman et al. (2011).

The second data set came from interviews with game farm owners in Limpopo in May and June 2010 (primary data). This questionnaire was also Saayman et al. (2011). The Wildlife Ranching South Africa (WRSA) database, which has a member basis of 797 (N=797) product owners, was used for the Limpopo Province. From this database, a probability sample was drawn of 206 respondents (N=206), who were telephonically interviewed in the evenings between 18:00 and 20:00, when they were likely to be accessible. The third data set, representing trophy hunting participation and expenditures for the 2007–2008 hunting season, was obtained from the Professional Hunters Association of South Africa (PHASA) (secondary data). The data represents all trophy hunters who have hunted in South Africa during the 2007–2008 hunting season (6 841 respondents).

The aforementioned datasets were combined and used collectively in the multiplier analysis (i.e. as the total hunter spend), which is discussed in the following sections.

3.2 Expenditure data

We estimated that hunters spent a total of R1.5 billion on licences, travel, supplies, and services directly connected with hunting in Limpopo in 2010. Of the total spending by all hunters (see column 4 in TABLE 1), biltong hunters spent an estimated 94% of this total and trophy hunters only 6% (see TABLE 1). Spending on species accounted for 45% of total expenditure, accommodation and food for 22%, new equipment for 10%, fuel and transport for 9% and meat processing services for 5%. All other expenditures accounted for approximately 9% of the total expenditure for 2010. On average, biltong hunters contributed an estimated R1.4 billion and trophy hunters R88.2 million to the Limpopo economy in 2010. If expressed in 2006 terms, biltong hunters contributed R1.4 billion and trophy hunters R84.4 million.

In comparison, in the Northern Cape hunters spent an estimated R696 million (biltong hunters R661.7 and trophy hunters R34.3 million) in total. Food and accommodation accounted for approximately 16% of the total expenditure, new equipment 8%, fuel/transportation 8% and meat processing services 6%. Spending on game/species accounted for 56%. All other expenditure accounted for approximately 8% of the total expenditure to the Northern Cape economy (Saayman et al., 2011:123).

TABLE 1: Expenditure directly related to hunting in 2010 (incl. game; ZAR, deflated to 2006 prices)

<i>Category</i>	<i>Trophy hunters</i>	<i>Biltong hunters</i>	<i>Total hunters</i>
Accommodation	21 645 386	155 306 343	176 951 729
Fuel	0	125 427 463	125 427 463
Food	9 276 594	81 410 095	90 686 689
Meat processing	0	66 767 057	66 767 057
Ammunition	3 092 198	70 850 079	73 942 277
Gear	3 092 198	38 882 508	41 974 706
Daily fees	0	44 777 800	44 777 800
Beverages	0	46 519 579	46 519 579
Butchery facilities	0	32 490 437	32 490 437
Clothes	3 092 198	29 621 887	32 714 085
Toiletries	618 439	12 594 311	13 212 751
Medicine	618 439	8 555 140	9 173 579
Tobacco	0	4 358 886	4 358 886
Transport	12 368 792	0	12 368 792
Trophy handling fees	1 855 319	0	1 855 319
Other	6 184 396	27 656 975	33 841 371
Game/Species	22 599 789	641 979 812	664 579 601
Total	84 443 749	1 387 198 373	1 471 642 121

Source: Authors' calculations based on PHASA (2008) data and Scholtz et al. (2010)

Because most hunters are accompanied by friends or family members, the total number of visitors to the Limpopo Province would therefore most likely exceed the number of hunters. This additional value-added impact was not, however, covered by this research.

3.3 Economic impact

The goal of economic impact analysis is to measure the economic activity attributable to some activity or event. It is typically measured in terms of gross output or production, value added or income, employment, and tax revenues generated by expenditures made as a result of the activity or event.

Economic impact analysis views the economy as a system of interrelated sectors. The system is driven by the demands for final goods and services. Initial expenditures (e.g., by hunters) are generally called the direct costs of an activity and their effects on the economy are direct effects. Purchases by suppliers (e.g., tourist outfitters, hotel and restaurant owners, charter operators) of the final goods, and services of materials and supplies to maintain the original

purchases are called indirect effects. Induced effects occur when workers in the sectors that benefit from direct and indirect expenditures spend their additional income on consumer goods and services. The direct plus indirect plus induced effects equal the total effect.

Two popular methods to derive the indirect and induced effects are input-output analysis (I-O) and social accounting matrices (SAMs), which deliver multiplier effects (Wagner, 1997). In addition, the use of Computable General Equilibrium (CGE) models has gained ground in recent years, with the studies by Zhou et al. (1997), Dwyer et al. (2004), and Saayman and Rossouw (2010), which has the advantage of modelling additional price effects. Yet the I-O models and SAMs, together with the multiplier analysis that these generate, remain some of the most popular methods of estimating the economic impact of activities or events. Wagner (1997) notes that the SAM is based on I-O models, since an I-O model forms part of the SAM, but the SAM has the advantage of including additional information on income distribution within an economy.

At each step of the spending chain some demand will be directed to goods and services produced outside the immediate economy. Imports of goods and services produced in other provinces and countries are leakages from Limpopo's economy. Likewise, at each step of the spending chain some expenditure is absorbed by indirect taxes. Both imports and indirect taxes will reduce the size of indirect effects. Similarly, leakages in the form of direct taxes and household savings limit the size of the induced effects.

Hunters spend money on a variety of goods and services for trip-related and equipment-related purchases. Trip expenditures include food, accommodation, transport, and other incidental expenses. Equipment expenditures consist of rifles, ammunition, hunting gear, camping equipment, special hunting clothing, and other costs. These direct expenditures are only part of the economic impact of hunting, since they also have ripple effects throughout the economy.

The effect on the economy in excess of direct expenditures is known as the multiplier effect. For example, an individual may purchase ammunition to use while hunting. Part of the purchase price will stay with the local retailer. The local retailer in turn pays a wholesaler who in turn pays the manufacturer of the ammunition. The manufacturer then spends a portion of this income to pay businesses supplying the manufacturer. Each rand of local retail expenditure can affect a variety of businesses.

Thus expenditure associated with hunting can ripple through the economy, affecting economic activity, employment, and household income. To measure these effects, a regional input-output modelling method was used in this study to derive estimates for gross output, value added, employment, and labour income associated with hunting.

The estimates for total industry output, employment, and employment income were calculated using a SAM for the Limpopo Province.

3.4 SAM multiplier analysis

The multiplier concept is applied using economy-wide consistent data on a particular (regional/provincial) economy as is normally contained in a SAM, which extends the basic I-O concept from production to income distribution and includes both social and economic data for a region (Raa & Sahoo 2005). A SAM consists of data from I-O tables, national income statistics, and household income and expenditure statistics. Unlike national accounts, 'a SAM attempts to classify various institutions according to their socio-economic backgrounds instead of their economic or functional activities' (Chowdhury & Kirkpatrick, 1994). In the present study we used

a SAM for the study area (i.e. the Limpopo Province) which was developed by Conningarth Consultants (2006a). The SAM (based on 2006 prices) used in these analyses distinguishes 46 sectors, 12 household types, and 4 ethnic groups.

In order to transform a SAM into a model suited for economic impact assessment it is necessary to assume that all the relations in the SAM are of linear type and that prices are fixed (at best in the short run). Thus, the SAM can be used directly to simulate the effects of shocks on some exogenous variables or accounts (i.e. expenditure-induced effects by the hunting activity). This type of exercise is known as SAM multiplier analysis (Dumont, 2000).

Various studies on the decomposition of activity multipliers that explain the circular flow of income (Stone, 1981; Pyatt & Round, 1979; Defourny & Thorbecke, 1984; Robinson & Roland-Holst, 1988) form the basis of the method applied in this study. A brief explanation of the method—of how specific multipliers were calculated—is provided below (based on the work of Dumont, 2000).

The first step is to define A_n as the matrix of average expenditure propensities, which can be obtained by dividing a particular element in any of the endogenous accounts by the total for the column account in which the element occurs. X_n represents the exogenous accounts and Y_n the total of each endogenous account. Based on these notations it follows that:

$$y_n = A_n Y_n + x_n = (I - A_n)^{-1} x_n = M_a X_n \quad (1)$$

According to Pyatt and Round (1978) the multiplier matrix (M_a) can be decomposed into three economically meaningful additive components: (i) a transfers matrix that picks up the net multiplier effects induced on a given set of accounts by exogenous transfers accruing to the given set; (ii) an open-loop matrix that captures the cross effects between different groups; and (iii) a closed-loop matrix specifying the multiplier effects of an exogenous inflow on an endogenous account and return to the original recipient.

First, one can start with $\hat{A}$ as the diagonal bloc matrix extract from the matrix A_n :

$$\hat{A} = \begin{bmatrix} A_{11} & 0 & 0 \\ 0 & A_{22} & 0 \\ 0 & 0 & A_{33} \end{bmatrix} \quad (2)$$

From equation 2 it follows that:

$$\begin{aligned} y_n &= A_n Y_n + x_n = (A_n - \hat{A}_n) y_n + \hat{A}_n y_n + x_n \\ &= (I - \hat{A}_n)^{-1} (A_n - \hat{A}_n) y_n + (I - \hat{A}_n)^{-1} x_n \\ &= A^* y_n + (I - \hat{A}_n)^{-1} x_n \end{aligned} \quad (3)$$

By multiplying both sides of equation 3 by A^* and substituting for $A^* y_n$ on the left-hand side now gives:

$$\begin{aligned} y_n &= A^{*2} y_n + (I - A^*) (I - \hat{A}_n)^{-1} x_n \\ &= (I - A^{*2})^{-1} + (I - A^*) (I - \hat{A}_n)^{-1} x_n \end{aligned} \quad (4)$$

Likewise, multiplying both sides of the initial equation (3) by A^{*2} yields:

$$\begin{aligned}
 y_n &= A^3 y_n + (I - A^2)(I - \hat{A}_n)^{-1} x_n \\
 &= (I - A^3)^{-1} + (I - A^* + A^2)(I - \hat{A}_n)^{-1} x_n
 \end{aligned} \tag{5}$$

Otherwise put:

$$y_n = (I - A^k)^{-1} + \left(\sum_{j=0}^{k-1} A^{*j} \right) (I - \hat{A}_n)^{-1} x_n \tag{6}$$

It is also important to note that the three-step decomposition that will be retained reflects the sequence of substitution that corresponds to one complete cycle in the circular flow of income within the economy and thus that it is not an arbitrary choice (Dumont 2000).

If one notes that $M_{a1} = (I - \hat{A}_n)^{-1}$, $M_{a2} = I + A^* + A^{*2}$ and $M_{a3} = (I - A^{*3})^{-1}$ it follows that: $M_a = M_{a1} M_{a2} M_{a3}$.

Finally M_a can also be re-written as:

$$\begin{aligned}
 M_a = & \underbrace{I}_{\text{Initial Change}} + \underbrace{(M_{a1} - I)}_{\text{Net contribution of transfer multiplier}} + \underbrace{(M_{a2} - I)M_{a1}}_{\text{Net contribution of open loop or cross-multiplier effects}} + \underbrace{(M_{a3} - I)M_{a2}M_{a1}}_{\text{Net contribution of circular or closed-loop multiplier effects}}
 \end{aligned} \tag{7}$$

The following section describes the results obtained through the application of the aforementioned method.

4. RESULTS AND DISCUSSION

Using the figures in TABLE 1 and the latest SAM for the Limpopo Province (the SAM was compiled by Conningarth Economists and is available from the Development Bank of Southern Africa [DBSA]), the researchers were able to determine the estimated share of expenditure in the study area (using the multiplier concept). In TABLE 1, the real spending by both groups of hunters (biltong and trophy) on goods and services in the province is presented. The expenditure data by hunters have been deflated to 2006 values, allocated to industry sectors and converted to producers' values to be compatible with the Limpopo SAM. All the results are therefore expressed in 2006 values.

The information included in the SAM enabled the researchers to identify the impacts of hunting on different household groups, different components of the labour force, and income inequality (Blake et al., 2008). The figures in TABLE 1 for spending by hunters, recorded in surveys (biltong and trophy hunters), were used to estimate the share of total expenditure in the study area resulting from hunting (TABLE 1). On the basis of these figures, one can expect that the manufacturing and service industries catering directly for hunters will experience the greatest direct economic impact from hunting-related activities. Conversely, the industries that only indirectly supply these activities will receive less benefit (subject also to the 'backward linkages' in the regional economy).

4.1 Secondary and total economic impact

Biltong and trophy hunters' spending data were converted to the associated increase in production, income and jobs in the region using economic multipliers from a SAM for the Limpopo Province. The SAMs multiplier approach uses distinct multipliers for each expenditure-related sector. The multipliers convert expenditure into the associated increase in production, jobs and income and estimate secondary effects as spending circulates through the regional economy. To show this for the biltong and trophy hunter spending, one needs to 'correct' the direct impact (e.g., expenditure figures in TABLE 1) by the multiplier effect. These results, based on the 'corrected' spending by the two types of hunters (refer to Column 2 in Tables 2 and 3), are contained in the next two sections.

4.2 Trophy hunters

The quantification of the direct, indirect, and induced impact of spending by trophy hunters in the region (Limpopo) in 2010 (deflated to 2006 prices) is summarized in TABLE 2. As this expenditure in part comes from trophy hunters from other provinces and abroad buying goods and services in the region, it represents an inflow of money into the region, mobilizing economic activity, and generating employment and additional revenue for the province. 'Production' refers to the total turnover generated by each sector in the regional economy. As such, production comprises two components: demand for intermediate inputs (resources) by an activity (domestically produced and imported goods and services); and the total value-add generated by an activity (Conningarth Consultants, 2006b). TABLE 2 shows the effects on production (using the production multipliers) of expenditure resulting from trophy hunting in 2010 (deflated to 2006 prices).

The trophy hunters' spending was mostly on trade and accommodation. From TABLE 2 it is clear that the largest direct impact was on trade and accommodation (32%), transport and communication (23%), manufacturing (13%), and financial and business services (11%). Through the 'backward linkages', large indirect and induced impacts were also experienced in the manufacturing sector, reflecting an indirect impact of R4.4 million and an induced impact of R1.9 million. Note that if one ignores the direct effect in the manufacturing sector one finds that 46% of the total increase in production was as a result of 'backward linkages', with direct expenditure representing 54%. A more detailed (disaggregated) analysis of the various sectors would be useful, but unfortunately the researchers did not have sufficient expenditure data to do this.

Any acquisition of goods and services from non-regional suppliers (leakages) was excluded from the analysis and therefore did not exert a significant direct or indirect effect in the regional economy. By excluding this indirect impact, although small in significance, one was able to present a more accurate estimate of the impact of trophy hunting in the region.

TABLE 2: Trophy hunters' impact through production multipliers (ZAR, 2006 prices)

<i>Sector</i>	<i>Direct impact¹</i>	<i>Indirect impact²</i>	<i>Induced impact³</i>	<i>Total impact⁴</i>	<i>Percentage (total)</i>
Agriculture	5 586 410	2 230 692	1 695 729	9 512 832	9.2%
Mining	974 494	280 702	393 288	1 648 484	1.6%
Manufacturing	7 438 722	4 412 471	1 940 025	13 791 218	13.3%
Electricity & water	1 559 626	784 766	605 308	2 949 700	2.8%
Construction	528 920	328 672	136 354	993 946	1.0%
Trade & accommodation	17 699 069	9 673 342	6 036 442	33 408 853	32.3%
Transport & communication	13 763 136	5 766 398	4 409 484	23 939 018	23.1%
Financial & business services	6 427 399	2 220 026	2 618 146	11 265 571	10.9%
Community services	3 683 023	822 893	1 549 930	6 055 847	5.8%
Total (in ZAR)	57 660 800	26 519 962	19 384 707	103 565 469	100.0%

Source: Authors' calculations based on multiplier analysis

1 Initial expenditures (for example, by day visitors) are generally called the direct costs of an activity and their effects on the economy are direct effects.

2 Purchases by suppliers (for example, hotel and restaurant owners, and charter operators) of the final goods, and services of materials and supplies to maintain the original purchases are called indirect effects.

3 Induced effects occur when workers in the sectors stimulated by direct and indirect expenditures spend their additional income on consumer goods and services.

4 The direct plus indirect plus induced effects equal the total effect.

The analysis of the spending by trophy hunters in 2010 (deflated to 2006 prices) allows for two conclusions. The first is that the direct effect represents 56%, the indirect effect 26%, and the induced affect 19% of the total increase in expenditure. The second is that the activity sectors that benefited most from spending by trophy hunters were trade and accommodation, transport and communication, manufacturing, and financial and business services. The regional spending by trophy hunters in these sectors exceeded R103.6 million, and represented some 9% of the total spending by all hunters (including biltong hunters) in the region. Research by Saayman et al. (2011) on the economic impact of hunting in the Northern Cape Province showed that the impact of trophy hunting totalled R65 million, which is significantly less than that of the Limpopo Province.

4.3 Biltong hunters

To estimate the economic impact of the spending by biltong hunters (meaning non-residents or foreigners as well as those living in Limpopo and the rest of South Africa), the researchers used

the same approach as for trophy hunters. On the basis of the expenditure figures, it was estimated that the direct impact in the region of the biltong hunters' expenditure amounted to approximately R1.1 billion, distributed among the nine activity sectors. The sectors that benefited most from spending by biltong hunters were trade and accommodation, agriculture, financial and business services, and manufacturing.

It is important to note that the direct impact of the biltong hunters' expenditure (R611 million) represented more than 91% of the total expenditure by hunters (R669 million) in Limpopo in 2010. The quantification of the direct, indirect, and induced impact of this expenditure in the region is summarized in TABLE 3. The total impact was R1.1 billion (TABLE 3). Limpopo biltong hunters spent approximately the same as those in the Northern Cape (Saayman et al., 2011).

TABLE 3 clearly shows that the largest direct impact was on trade and accommodation (29%), agriculture (21%), financial and business services (18%), and manufacturing (16%). Through the 'backward linkages', large indirect and induced impacts were also experienced in the agricultural sector, reflecting an indirect impact of R53.5 million and an induced impact of R40.6 million. If the direct effect in the agricultural sector is ignored, 42% of the total increase in production is as a result of 'backward linkages', with direct expenditure also representing 58% of the total impact. To sum up, it can be concluded that the direct effect represented 57%, the indirect effect 23%, and the induced affect 20% of the total increase in expenditure.

TABLE 3: Biltong hunters' impact through production multipliers (ZAR, 2006 prices)

<i>Sector</i>	<i>Direct impact</i>	<i>Indirect impact</i>	<i>Induced impact</i>	<i>Total impact</i>	<i>Percentage (total)</i>
Agriculture	132 203 241	53 503 603	40 551 917	226 258 761	21.0%
Mining	9 510 222	2 974 040	3 810 698	16 294 960	1.5%
Manufacturing	96 803 252	49 884 310	27 372 868	174 060 430	16.2%
Electricity & water	12 712 128	6 420 320	4 926 177	24 058 625	2.2%
Construction	4 564 505	2 836 395	1 176 712	8 577 612	0.8%
Trade & accommodation	169 095 864	88 128 240	59 533 195	316 757 299	29.4%
Transport & communication	49 506 488	20 360 653	15 882 533	85 749 674	8.0%
Financial & business services	117 489 921	23 179 175	52 129 839	192 798 935	17.9%
Community services	19 352 209	4 323 838	8 144 010	31 820 057	3.0%
Total (in ZAR)	611237 829	251 610 575	213 527 949	1 076 376 353	100.0%

Source: Authors' calculations based on multiplier analysis

4.4 Overall impact

The analysis described in the two previous sections allowed us to estimate the direct impact on the Limpopo economy of spending by trophy and biltong hunters. However, to evaluate the total impact of the spending by hunters in the province, it was necessary to ‘correct’ the direct impact by the multiplier effect. Production multipliers were thus used for each of the activity sectors. Multiplying the direct impact in each activity sector for the specific production multipliers gives the total impact of the hunter spending for each of the province’s economic sectors (TABLE 4). The sum of the impacts in each of the sectors gives us, in turn, an estimate of the total impact of hunter spending in the province.

TABLE 4: Total impact of hunter spending in the Limpopo Province on regional production (ZAR millions, 2006 prices)

<i>Sectors</i>	<i>Spending by biltong hunters</i>	<i>Spending by trophy hunters</i>	<i>Direct impact of hunters</i>	<i>Production multipliers¹</i>	<i>Total Impact</i>
Agriculture	132.203	5.586	137.790	1.650	235.772
Mining	9.510	0.974	10.485	1.777	17.943
Manufacturing	96.803	7.439	104.242	1.594	187.852
Electricity & water	12.712	1.560	14.272	1.932	27.008
Construction	4.565	0.529	5.093	1.879	9.572
Trade & accommodation	169.096	17.699	186.795	1.879	350.166
Transport & communication	49.506	13.763	63.270	1.730	109.689
Financial & business services	117.490	6.427	123.917	1.762	204.065
Community services	19.352	3.683	23.035	1.322	37.876
Total	611.238	57.661	668.899		1 179.942

Source: Authors’ calculations based on multiplier analysis

1 Unit is ZAR millions except for the variable ‘Production multipliers’

The analysis of the results indicates that the direct economic impact of the two types of hunters’ spending in the region (which is in the order of R669 million), produced an additional R511 million of indirect and induced impact, giving a total impact in the region in excess of R1.2 billion for 2010 (deflated to 2006 prices). This is equivalent to an aggregated production multiplier in the order of 1.76 compared to the Northern Cape hunters spent in excess of R300 million (Saayman et al., 2011) more in the Limpopo Province. Therefore, for each rand spent by the two types of hunters in the region, 76 cents were generated additionally in terms of indirect

expenditure. The aggregated production multiplier is obtained by dividing the total impact by the direct impact.

One of the elements of the additional value-add that results from the hunters' spending in Limpopo is remuneration of employees, which in turn affects household income. The household income multiplier thus measures the magnitude of changes that occur both to household income and to spending and saving patterns. The impact on low-income households is particularly important, as it can be used to indicate how much hunting contributes to poverty alleviation throughout the provincial economy.

Low-income households in the Limpopo SAM receive earnings within the income intervals R1 – R6 400 (from the 2001 population census), representing about 50% of the total population in the province. These households receive about 23% of the income generated through low-skilled labour, 6% from skilled, and 2% from high-skilled labour. The rest of households in Limpopo earn between R6 401 and R204 201 or more and receive 11% of their income through capital invested in enterprises, followed by 10% from high-skilled labour. Production activities that consistently participate in the paths of income generation for enterprises and households are mining, petroleum, farming, forestry, and business services. Limpopo households therefore have relatively strong links to the mining and industrial sectors, and these sectors hire labour with different set of skills.

Using the same SAM for the Limpopo economy, it was thus possible to estimate the impact of total hunter spending at the level of families' income. To do this one calculates specific household income multipliers for each activity sector and then multiplies these by the values of the total sector's impacts (TABLE 5).

The low multipliers (ranging between 0.02 and 0.08) for low-income households in the province reflect a high degree of dependence of these households on government transfers as a source of income. For households in the lower 50% of the income distribution, government transfers represent a bit less than 33% of income. Hence, the small shares of factor earnings saved by low income households imply relatively low multipliers for these households.

The aggregated income multiplier, valued at 0.41, can be interpreted as the increment of the Limpopo family's income for each rand of spending by hunters in the province. It was estimated that a total of R480 million in remuneration in Limpopo would not have been received if there had been no hunting (TABLE 5).

TABLE 5: Impact of hunter spending in the Limpopo Province families' income (ZAR millions, 2006 prices)

<i>Sectors</i>	<i>Total impact (ZAR million)</i>	<i>Indirect and induced impacts (ZAR million)</i>			<i>Percentage (total)</i>
		<i>Low-income households</i>	<i>Rest of the households</i>	<i>Total households</i>	
Agriculture	235.772	12.710	72.026	84.737,	17.7%
Mining	17.943	1.372	7.081	8.453,	1.8%
Manufacturing	187.852	8.589	52.848	61.436,	12.8%
Electricity & water	27.008	1.808	10.537	12.344,	2.6%
Construction	9.572	0.416	2.496	2.912,	0.6%
Trade & accommodation	350.166	19.351	125.009	144.359	30.1%
Transport & communication	109.689	5.683	35.924	41.606	8.7%
Financial & business services	204.065	13.947	91.307	105.254	21.9%
Community services	37.876	2.081	16.889	18.970	4.0%
Total	1,179.942	65.957	414.116	480.072	100.0%

Source: Authors' calculations based on multiplier analysis

As expected, low-income households benefit from stronger ties with low-skilled workers, but they also receive income from enterprises. The skilled labour in low-income households obtained their incremental income primarily from agriculture, and indirectly from financial services used by business services. Income received by low-income households comes from a very diverse set of activities, whereas high-income households received capital rents from a larger set of activities, which is thereafter invested in enterprises.

Labour is a key element of the production process. This indicator measures job creation and reveals how much each sector contributes to creating employment opportunities and, ultimately, to distributing salaries and wages among various types of labourer, which in turn should have a positive impact on the economy of the Limpopo Province (TABLE 6).

TABLE 6: Impact at the level of employment

<i>Sectors</i>	<i>Total impact (ZAR million, 2006 prices)</i>	<i>Labour multipliers¹</i>	<i>Equivalent jobs (number)</i>
Agriculture	235.772	14.620	3447.0
Mining	17.943	4.037	72.4
Manufacturing	187.852	4.692	881.4
Electricity & water	27.008	3.925	106.0
Construction	9.572	6.292	60.2
Trade & accommodation	350.166	5.663	1982.9
Transport & communication	109.689	4.038	442.9
Financial & business services	204.065	5.774	1 178.3
Community services	37.876	5.576	211.2
Total	1 179.942		≈8 382

Source: Authors' calculations based on multiplier analysis

1 The labour multiplier indicates the number of job opportunities that will be created as a result of changes in production to the value of ZAR1 million caused by a particular activity)

Finally, using the values presented in TABLE 4, it was also possible to estimate the impact of hunter (biltong and trophy) spending at the level of jobs in Limpopo. On the basis of figures from the Limpopo SAM, and using data on the labour force per province relative to the business volume and jobs per activity sector in South Africa for 2006, it was possible to estimate the impact of hunter spending on the province's job level, as shown in TABLE 6. The table shows that 8 382 jobs may depend on hunting, in addition to those of people permanently employed at game farms in the province (4 603). This translates into 95 jobs per \$1 million tourism (hunters) spending. The World Travel and Tourism Council (2012) indicated that, on average, travel and tourism in the world create 50 jobs per \$1 million spend, and in the United States it is close 20 jobs per \$1 million. The reason for the difference might be that employees' average income in South Africa (or Africa) is lower than that of America; therefore more people get employed per \$1 million hunters spending. Consequently, the absence of hunting would have meant a reduction of 8 382 jobs in the province, and a reduction of the number of permanent employees (4 603). The sectors most affected by the absence of hunting would have been agriculture, manufacturing, and trade and accommodation. The jobs listed in TABLE 6 include the direct, indirect, and induced impact in a manner similar to total industrial output and include both full-time and part-time jobs.

5. MANAGEMENT IMPLICATIONS

The results of this research suggest the following implications for management. Firstly, it was confirmed that the Limpopo Province contributes the most to hunting and that hunting has an important role to play, which supports the finding by Warren (2011) that the Limpopo Province is South Africa's leading hunting destination. This finding has important management implications

for the hunting industry in this province. First, the government and private sector need to sustain and support this industry, as, if they neglect it, it will have negative consequences such as loss of income and job creation in the province. Therefore all stakeholders need to work together in marketing the province as a hunting destination and develop hunter-friendly legislation that will benefit hunting and the development of hunting products. Hunter-friendly legislation refers to easy accessible permits for hunting, transportation and location of game. Legislation concerning permits is a provincial matter; therefore it is possible to implement legislation in one province that differs from the others, which is currently the case (Koen, 2014).

Secondly, employment created in the province due to hunting is significantly greater than in other provinces (Saayman et al., 2011); therefore hunting can be seen as a tool to address poverty alleviation. The implication therefore is that the provincial government and private sector should provide game farm owners and employees with training programmes in skills such as tracking, guiding, professional hunters' training, skinning, taxidermy, and housekeeping to increase their skills and thus the quality of game farm products. Currently, skills training is neglected due to a shortage of training programmes and instructors or trainers, and these courses are also very expensive. Game farms are mostly located in rural areas, and this means that staff need to travel long distances for formal training. This also implies that they will be away from work for some time, which adds to the problems facing skills training (Giampicoli et al., 2014).

Thirdly, since biltong hunters spend significantly more than trophy hunters they remain the main hunting market in Limpopo. This supports the finding by Saayman et al. (2011) regarding hunting in the Northern Cape (but contradicts that of Barnes et al. (2009) regarding hunting in Namibia). The implication is that game farm owners should maintain good relations with the biltong hunter market and hunters' organizations. It is also important that product owners provide for the biltong hunters' needs, for example by stocking their game farms with the preferred species and developing hunting packages that are value for money.

Lastly, since hunting contributes to the province's overall tourism growth, for example by infra- and suprastructure development, marketing and promotion of the province, and conservation of fauna and flora, it is important to prevent leakages, for example by employing local people rather than outsiders and purchasing supplies locally rather than in neighbouring provinces such as Gauteng. Currently the tendency is that some lodges buy most of their supplies in Gauteng, as the prices are better and the variety greater. This implies that business chambers need to get involved. The sectors that benefit the most from hunting are trade and accommodation, agriculture, transport and communication, manufacturing, and financial and business services.

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