

Red deer hunting—commercializing versus availability

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Abstract Many deer populations in Europe and North America have increased in abundance over the last decades. The increasing populations potentially entail both ecological and economic challenges and opportunities, but in practice we still know little about the extent to which these opportunities are being exploited in different management systems. The Norwegian red deer population has increased in density and expanded rapidly since the 1950s. Traditionally, red deer hunting has been undertaken by the local landowner and his relatives and friends. The present large population raises the question whether attracting other hunters could provide a higher economic return for the landowners and, if so, if they are interested in providing such hunting opportunities. We designed a survey to learn more about the landowners, both with respect to the present level of hunting income as well as economic costs of, for example, forest and agricultural damage; we also sought to understand their interest in increasing their income from red deer hunting and potential obstacles to realizing such an increased economic benefit. The results indicate that landowners on average think that red deer populations on their land result in higher costs than income but are nevertheless satisfied with the way things are. This highlights that increased numbers of deer need not automatically lead to more income for landowners and that the potential for income

may be hindered by cultural factors such as reluctance to allow access to non-local hunters.

Keywords Red deer hunting · Landowner survey · Hunting income · Browsing and grazing costs

Introduction

Many populations of deer in Europe and North America have expanded in distribution and rapidly increased in density over the last few decades (Gill 1990; McShea and Underwood 1997; Apollonio et al. 2010). There is currently much focus on the consequences of dense populations for management in terms of ecological and economic repercussions (Gordon et al. 2004; Mysterud 2006; Apollonio et al. 2010). Red deer in Europe are a typical example of such a development (Milner et al. 2006).

The Norwegian red deer population has increased steadily in both density and distribution since the 1950s (Fig. 1; see Andersen et al. (2010)). If we assume that hunting statistics reflect population trends, a sevenfold increase occurred between 1971 and 2000 (Andersen et al. 2010). For the first time, more red deer than moose were harvested in Norway in 2008. The total hunting quota in the 2009/2010 hunting season was 51,000 red deer, of which 37,695 were shot (Statistics Norway 2010). The explosive increase in the red deer population, particularly in the western part of Norway, has given rise to both ecological and economic issues.

The Norwegian hunting system

The legal regulations surrounding ownership of game and the right to hunt, and the way hunting quotas are determined and distributed, differ between countries (see Putman (2011) for a

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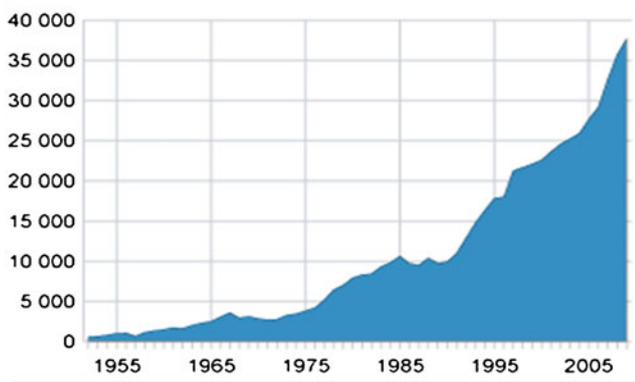
Felled red deer. 1952-2009

Fig. 1 Shot red deer in Norway in the period 1952–2009 (source: Statistics Norway)

review of the legal and administrative systems governing management of large herbivores in Europe). In Norway, all ungulate populations are defined in law as *res nullius*, meaning that they are owned by no one (Andersen et al. 2010). The right to hunt or sell hunting permits belongs to the landowners. However, while the right of hunting belongs to the landowner, a Wildlife Board within each municipality assesses population size, considers the impact of each species, and then determines the quotas to be set for moose, red deer, and roe deer in each area. These wildlife boards are composed of public agency staff, local landowners or landowners' associations, representative of hunters' associations, and people with similar related expertise or interests. Recently, there has also been an increasing emphasis on local population management plans. Red deer roam freely across different properties due to their migratory behavior (Myrsetrud et al. 2011). Thus, to ensure that hunting benefits and browsing and grazing damages are not unevenly distributed between different landowners, it is now frequently the case that several neighboring properties join together to comprise an independent management unit in which 3- to 5-year population plans are normally imposed. In order to be approved, these plans must describe the number and proportion of each sex and age category of animals proposed to be harvested during the planning period and demonstrate that these are adapted to the municipal management goals (Andersen et al. 2010). In consequence, while the right to hunt technically belongs to the landowner, he or she does not have complete freedom over what may or may not be hunted since quotas are defined in the municipality. Only when a quota has been agreed are landowners free to lease the quota allocated, or part of it, to other hunters.

The landowner may hunt the quota at his property himself, with his family and friends, or sell hunting permits to paying hunters. A paying hunter pays the landowner in advance for the right to hunt at the property. Such hunting permits are usually specified with different prices for different categories of red deer (e.g., calf, hind, stag) shot. They

may also be limited to a certain time period within the overall hunting season. For example, a hunter or hunting team may buy the right to hunt the first week of the hunt and be permitted to shoot one calf and one stag. The hunters normally take the meat home and pay the landowner per animal or kilogram of meat.

Traditionally, red deer hunting has been undertaken by the local landowner and his relatives and friends. Despite the fact that fewer red deer are shot each year than are actually established as quota, this continues to be the norm at present. However, the difference between the quota granted and the actual harvest clearly indicates that there is a potential for a greater scale of both recreational hunting by the landowner, relatives, and friends and in licenses sold to others. In this paper, we explore whether the apparent lack of uptake of the commercial possibilities of increased hunting possibilities is a consequence of lack of will, lack of initiative, or lack of ability to develop hunting as a commercial activity and offer more hunting to paying hunters. For this reason, the attitude among landowners with respect to the commercialization and preparation of deer hunting is assessed. In the Norwegian cultural context, such availability first and foremost means that permits are available for sale on the market. Hence, lack of commercialization is typically seen to favor local participation (family, friends, and local people) in the hunt. At the same time, commercializing typically means that the price for participating in the hunt is higher due to, for example, additional services offered (guiding, accommodation, lodging, etc.), which may be bundled together with the permit price in different ways. The traditional fear in rural areas is that rich hunters from big cities and other countries will pay high prices and thereby shut the local people out from the hunt. Hence, commercialization may be associated with both higher levels of availability for non-local hunters and lower levels for local hunters.

The present and related studies

There is not much literature on landowner attitudes with respect to big game hunting. The surveys on big game hunting in Scandinavia have mainly concentrated on the hunters and assessed their willingness to pay (Johansson et al. 1988; Mattsson 1994). One exception is the study of Home and Petäjistö (2003). These authors designed a choice experiment survey to reveal the forest owners' preferences with respect to alternative moose management regimes. They found that the Finnish landowners preferred to have fewer moose, even if the economic value of hunting exceeded the economic cost of damage from browsing. Other important exceptions are studies from Scotland by MacMillan (2004), MacMillan and Phillip (2010), and MacMillan et al. (2010). MacMillan (2004) looked at the potential benefits of inducing a tradable culling obligation system

for red deer in Scotland. He found that there was a demand for hind stalking and concluded that a trading system could provide incentives to increase the culling of hinds. On the other hand, when asking estate owners about their perceptions, he found that almost one third of the estate owners believed that market demand was too low for successful commercialization of stalking hinds. MacMillan and Phillip (2010) investigated the potential role of market incentives to increase venison production as a mechanism for resolving conflict over wild red deer management in the Scottish Highlands. Combining econometric analysis with qualitative data, they found little evidence to support the proposition that increased venison revenues were likely to increase hunting. In fact, all stalkers interviewed agreed that higher venison prices would have no impact on deer culling decisions. One of the main explanations for this result coincides with the results from the study of MacMillan et al. (2010). These authors considered the estate owners' views of land use in a broader perspective, but where the findings with respect to red deer management also constituted an important part. The main finding was that personal reasons, rather than profit, seemed to be the most important motive for owning sporting land. Commercialism was regarded to be undesirable as it would reduce personal sporting opportunities. Also of relevance in this respect is the work of Irvine et al. (2010) that looked at stakeholder priorities and perceptions in an attempt to identify effective mechanisms for encouraging collaboration over deer management in Scotland. In Norway, Thorvaldsen et al. (2010) estimated the income and costs for a specific hunting area containing red deer, the Eikås storvald, based on the specific price system in this hunting area and browsing and grazing damage assessments in the field.

In this study, a postal survey was sent out to landowners in the Sogn og Fjordane county of Norway in 2007. The county Sogn og Fjordane is the “number one” red deer county in Norway, with 11,800 red deer shot during the hunting season of 2010. The present level of activity, the importance for the landowners, and the potential for developing the hunting industry were all studied. We sought to answer the following questions: How important is the red deer stock as an economic resource today? Are there huge differences between different landowners when it comes to benefits and costs from red deer hunting and, if so, why? Is red deer hunting first and foremost an annual tradition the landowner shares with family and friends, or is it primarily a source of income? Is there any interest in increasing this income among the landowners? This is interesting not only from a business policy perspective but also because it concerns the management of a common resource associated with considerable costs in terms of traffic accidents and damage to agriculture and forestry (Mysterud 2004; Andersen et al. 2010; Thorvaldsen et al. 2010; Reimoser and Putman 2011).

Methods

The survey

The survey was undertaken in cooperation with the Nordic Family Forestry (the Nordic forest owners' associations). A postal questionnaire was sent to about half of the members of the Nordic Family Forestry in the county Sogn og Fjordane, resulting in a potential sample of 483 landowners. Only one reminder was sent out due to budget constraints. After this reminder, 224 landowners responded, i.e., a response rate of 46%. In order to make sure that the questions asked were relevant and appropriate, they were first debated within a test group consisting of hunters, landowner representatives, red deer scientists, economists, and managers.¹ The questionnaire was divided into a number of sections covering both factual and attitudinal questions about the landowner, the property, and the local community. Specifically, questions about the landowner included socio-demographic attributes such as age, educational level, and income. Questions about the property included questions about the size of the property, main types of production, and how hunting was organized at their property, as well as questions about the benefits and costs associated with red deer hunting.

In addition, owners were asked to state:

- to what extent they considered it to be a potential for increasing their hunting-related income and, if so, by which means
- what they considered the most important obstacles to developing a more commercialized red deer hunt at their property
- their general attitude with respect to commercialized red deer hunting and their comprehension of attitudes towards commercialization among the local people
- their impression of the size of the red deer population at their own property and in their municipality in general
- how they would respond to a permit price increase at a nearby property and how they would respond to an increased influx of hunters
- if they were satisfied with the hunting quota at their property, and if not, what the main reason for why they would like to change it was.²

Statistical treatment and analysis

The questionnaire form requested estimates for cost and benefit data in bands, e.g., NOK 0–999 (€ 0–128), 1,000–1,999 (€ 129–256), 2,000–2,999 (€ 257–384), 3,000–4,999

¹ See acknowledgment for members of the group

² The full questionnaire is available online at: <http://www.toh.hist.no/~jono/>.

(€ 385–641), 5,000–6,999 (€ 386–897), more than 7,000 (€ 898).³ Respondents were then asked to choose the band that best represented their estimated value.

Since the true amount lies between the amount picked and the next amount on the response card, these income and costs responses define intervals. There are several ways to proceed when estimating average numbers from such data. One option is to use the midpoint of each interval, meaning that all respondents choosing the NOK 0–999 (€ 0–128) interval are registered as choosing NOK 500 (€ 64). This would provide a correct estimate if the true amounts were uniformly distributed over the interval. It is well known that this is a somewhat ad hoc method since the real underlying values are unknown and since it is far from obvious that they are uniformly distributed over the whole range of the interval (Stewart 1983).

A more robust option is therefore to run a grouped data regression. The dependent variable is a latent variable as the actual income and cost amounts are not directly observable. This means that the observed information about the dependent variable that we utilize is that it falls within a certain interval of the underlying real line. The real line is divided into M ($m=1\dots M$) mutually exclusive and exhaustive intervals, the m -th being given by (A_{m-1}, A_m) . In addition, the data is right-censored due to open-ended upper interval, that is $A_M=\infty$ (e.g., the more than NOK 7,000 (€ 898) interval). By utilizing the information on which of these intervals the dependent variable falls into, such latent dependent variable models can be estimated by grouped data regression (Stewart 1983). Stewart (1983) developed a least squares algorithm to attain the maximum likelihood estimator and combined this with a moment estimator of the OLS regressors in what he referred to as a two-step estimator. It was demonstrated that the procedure allowed consistent and efficient parameter estimates in the case of grouped dependent variables. This procedure later came to be known as the grouped data regression model. Hence, instead of assuming that the true amounts are uniformly distributed over the whole range of each interval and apply the midpoint of each interval when estimating costs and benefits, the values are simply estimated by running the grouped regression with a constant term only. In addition to the grouped data regression approach, chi-square tests were run to reveal if potential differences in attitudes and perceptions were significantly different.

Multivariate analysis

As mentioned in the “Introduction”, a main objective is to reveal if there are differences among landowners in terms of benefits and costs from red deer hunting. Moreover, we

investigated whether these differences are random or if they result from systematic differences between the landowners with respect to property size, hunting quota, ways of organizing the hunt, and so forth. Hence, we want to explain differences in the hunting income, hunting costs, and net benefits associated with the red deer hunt. In order to find such explanations, the abovementioned group consisting of hunters, landowner representatives, red deer scientists, economists, and managers suggested various explanatory variables for consideration.

Finally, we ended up with the following variables to explain income and cost differences: First, gender is represented with a dummy variable, *female*, coded 1 if the respondent is a female and 0 otherwise (male) (Gujarati 1995). Further, the education of the landowner is represented with the dummy variable *education*, coded 1 if the landowner has low education (primary and lower secondary school only) and 0 otherwise (upper secondary school or more). In addition, the *property size* (in acres) is included as an explanatory variable. The age of the landowner was also suggested but was later omitted since age was not found to have a significant effect in any of the analyses. In the category of variables we group as “hunting arrangement,” many explanatory variables were suggested. The variable considered most important by the group from the outset was whether the landowner made use of a hunting tour operator. The dummy variable *agency* is hence coded 1 if the landowner employed a hunting tour operator and 0 otherwise. Since there was a general agreement in the group about including this variable, it is included in the model even if it had no significant effect.

In terms of the question of providing additional products/services, the group suggested several potential income-contributing services: guiding, butchering premises, help/assistance with butchering, sporting dog,⁴ transport, meat sale from shot animals, food and drink, and accommodation. In the analyses, only transport services were found to have a significant effect, and hence *transport* was included as a variable with the value 1 if such services were offered. In addition, a variable coded 1 was included if the typical hunter was a *visitor* hunter. Finally, we included two different attitude/opinion variables. First, the general *attitude* among the landowners towards providing hunting for sale is measured at a scale from 1 (very negative) to 5 (very positive). Further, *shut out* measures to what extent the landowner considers it to be a problem that local hunters may be shut out if the hunting is commercialized. *Shut out* is measured on a scale from 1 (of little importance) to 5 (very important). All of these explanatory variables were then

³ 1 EUR=7.8 NOK (Aug. 2011)

⁴ In Norway, it is permitted to use sporting dogs for the red deer hunt, and it is also required that the hunter has an authorized sporting dog available to search for wounded red deer (see Putman (2011)).

used to explain the gross income from hunting, the cost of hunting as well as the net income from hunting. However, only the gross income and costs are possible to apply as dependent variables when running the grouped data regression model. The technical reason for this is that when the costs data are included as intervals, some observations fall outside the allowed interval limits. Hence, an ordinary least squares regression was required to run the net income model.

Results

The landowner, property, and hunting arrangement in Sogn og Fjordane

The average landowner in Sogn og Fjordane is a 52-year-old male who has graduated from upper secondary school. His gross total income is approximately NOK 342,000 (€ 43,850), from which about NOK 16,000 (€ 2,050) is forest-related, NOK 139,000 (€ 17,820) is agriculture- and livestock-related, and NOK 177,000 (€ 22,690) stem from alternative employment (work outside the farm). An average property is 1,187 acres, of which 755 acres are forest and 109 acres agricultural land. The agricultural land is used mainly to produce grass and roughage for the winter foddering of cattle and sheep (92%).

When it comes to red deer hunting, the typical property (about 90%) is part of a larger hunting area (local management unit), where the landowner property constitutes about 20% of the total hunting area on average. Of all landowners, 53% state that they do not offer red deer hunting for sale at their property, 8% report that they offer hunting permits through some kind of hunting tour operator, and 39% report that they offer hunting permits for sale themselves. Although some owners do lease some hunting on their property, despite this, as much as 66% report that the most common hunting at their property is the landowner hunting together with family and friends.

At a typical property, 0.6 calves, 1.0 hinds, and 0.9 stags were hunted by landowners, family, and friends, while 0.3 calves, 0.5 hinds, and 0.3 stags were shot through hunting arrangements involving sale of permits. Only about half of the landowners offer some sort of complete/composite (hunting) package to the hunters. When asked about what hunting-related services these packages included, we found that butchering facilities were a part of the package 21% of the time, help/assistance with butchering 11% of the time, use of hunting dogs 20%, transport 15%, guiding 4%, meat sale from shot animals 24%, food and drink 2%, and accommodation 16%.

The typical hunter is for the most part a friend, relative, and/or acquaintance (60%), or local hunters (20%), while about 19% are visitor hunters. Recruitment of hunters through marketing is almost non-existent. Generally, the same hunters come back from year to year. Only 3% of landowners report marketing through newspaper advertisements, while about 2% advertise on the Internet, and only about 1% advertise through a hunting tour operator.

The results show that the gross total income from red deer hunting is NOK 4,830 (€ 619) on average (Table 1). Further, the average costs associated with this sale is NOK 1,488 (€ 191), leaving an average net income of NOK 3,342 (€ 428). In addition, Table 1 provides an overview of the average hunting permit prices of the different categories of red deer, that is, calf, hind, and stag. When considering the total costs with respect to the red deer stock facing the landowner, we also have to consider the agricultural field damage costs and the forest damage costs. Since these are self-reported figures, the uncertainty is quite high. However, there is no compensation system in place (or planned) that provides incentives to over- or underreport strategically. On average, the landowners estimate forest browsing costs to NOK 5,417 (€ 694) per year, while the agricultural field costs are supposed to be NOK 6,535 (€ 838) per year (Table 1). The quite high standard deviations suggest large differences between different landowners, which are to be expected insofar as property size, share of forest and home field, and red deer population density vary among owners.

In sum, when all costs and benefits associated with the red deer population are taken into account, the landowners face a net loss of NOK 8,600 (€ 1,103) on average.⁵ The loss is mainly due to damage of their home field and forest.

Attitudes, possibilities, and obstacles

Given the reported net loss of NOK 8,600, it is interesting to note that the landowners remain relatively satisfied with the present red deer population on their property. In fact, 53% of the landowners state that the red deer population is “just the right size” (see Table 2). This reveals that the landowners are willing to accept quite high costs in order to hold a high deer population on their property. They seem, to a large extent, to be willing to bear the costs such entails.

Nevertheless, the landowners tend to be more satisfied with the population size on their own property than in the

⁵ Note that if we estimate average figures based on the mid-point of each reported reply interval, the net loss becomes NOK 11,400 (EUR 1,462).

Table 1 Descriptive statistics, income, and costs from red deer hunting (in NOK; 1 €=7.8 NOK, Aug. 2011)

Variable	Estimated average	Std. deviation	<i>z</i>	<i>P</i> > <i>z</i>	Number, <i>n</i>
Hunting income	4,830	661	7.30	0.000	155
Hunting costs	1,488	253	5.87	0.000	153
Browsing costs	5,417	705	7.68	0.000	206
Grazing costs	6,535	734	8.91	0.000	209
Permit price, calf	1,166	132	8.83	0.000	93
Permit price, hind	2,191	227	9.65	0.000	94
Permit price, stag	2,560	271	9.44	0.000	91

municipality in general. Table 2 shows that, while 53% think the red deer stock on their property is just the right size, only 40% feel the same about the red deer stock in their municipality in general. At the same time, more than 54% think the red deer stock in their municipality is “too high,” as opposed to about 42% stating the same about the red deer stock at their own property. Hence, the results in Table 2 may indicate that some landowners feel that they carry a disproportionate share of the costs of the red deer population. A statistical test (chi-square test) of the difference between the evaluation of the red deer stock on the respondents’ own property and in the municipality in general confirms this as the difference is significant at the 1% level (p -value=0.0016).

We also wanted to explore if the low share of visitor hunters (19%) is due to a lack of willingness or a lack of ability to organize hunting for sale. Table 3 gives an overview of some of the attitudes with respect to providing red deer hunt for sale. While 43% of the landowners are quite or very positive about red deer hunt sales, they think only 20% of the general population in the municipality share this view. The chi-square test of the difference between their own attitude and their perception of the general attitude in the municipality confirms that the differences revealed in Table 3 are statistically significant at the 1% significance level (p -value=0.0000).

At the same time, the study shows that 61% think that the most important problem (quite or very important) with commercialized sale of hunting permits is that local hunters are shut out.

Other challenges are that the landowners fear that visitor hunters are more careless when handling weapons (62% report this fear to be quite or very important) and that visitor hunters are too engaged in trophy hunting (54% report this

to be quite or very important). Lack of accommodation seems to be considered less important (31% report this to be quite or very important).

When it comes to the possibilities of increasing the hunting income, 48% think that there is a very good possibility of increasing hunting income by increasing prices. About 8% of the landowners state that this is something they are considering. Forty-two percent consider a great potential in improved cooperation with other landowners, and about 10% state that this is something they are currently working on. Eighty-three percent claim that they do not see “increasing the red deer population” as a potential option. About 25% think that the income may be increased by using a hunting tour operator, but only about 4% state that they are considering it. Finally, about 40% of the landowners see potential in dividing the hunting season into shorter sale periods.

The most important reason why the landowners are not considering ways to increase hunting related income is that they “are satisfied with the way things are.” Seventy-nine percent state this reason to be quite or very important. Further, 65% think it is “too much work,” and lack of knowledge/information is quite or very important for 43% of the landowners. Negative attitudes in the general population in the municipality with respect to commercialized hunting are stated to be quite or very important by 42%. Another important obstacle seems to be cooperating with other landowners, which is considered to be a quite or very important obstacle by 48%.

When asked how they would respond to a price increase at nearby hunting properties, 17% state this to be irrelevant as they are already cooperating on price setting, 24% would increase the price, 17% would keep the price unchanged, and 42% of the landowners were uncertain about how they would respond. If faced with an increased influx of hunters,

Table 2 Evaluation of the red deer population at own property and in the municipality by the landowner in Sogn og Fjordane, Norway

	Too low (%)	Just the right size (%)	Too high (%)	Do not know (%)	Number, <i>n</i>
Evaluation of red deer stock size at own property	4.5	53.4	41.7	0.4	223
Evaluation of red deer stock in municipality	1.4	40.1	54.4	4.1	217

Table 3 Landowner attitude towards commercialized red deer hunting and their comprehension of attitudes towards commercialization among the local people

	Very negative (%)	Quite negative (%)	Neither... nor... (%)	Quite positive (%)	Very positive (%)	Do not know (%)	Number, <i>n</i>
Landowner attitude towards commercialization	11.2	9.7	28.6	31.1	12.1	7.3	206
Landowner comprehension of attitudes towards commercialization in the municipality	7.4	20.6	37.7	19.6	0.5	14.2	204

32% would increase their price, 14% would keep the price unchanged and sell to more hunters, while 48% were uncertain what their response would be.

If the landowner was given the opportunity to decide the hunting quota at his own property, 48% would keep the quota unchanged, about 25% would increase the quota by two to three animals, while 11% would increase the quota by one animal. Only 3% would reduce the hunting quota.

Table 4 shows the main reason for changing the quota. Forty-three percent state the main reason to be the agricultural damages and 18% reduced forest damages. A total of 11% of the landowners would increase the hunting quota in order to achieve larger animals in general. The consideration of changing the quota in order to increase hunting benefits (6%) and reduce traffic accidents (2%) seems to play minor roles.

Drivers of hunting benefits

The multivariate grouped regression model explaining hunting benefits is presented in Table 5. Somewhat surprisingly, female landowners report higher gross income from red deer hunting than male landowners. The average difference is almost NOK 5,300 (€ 679) (significant at the 5% level). An apparent reason for this is that female landowners hunt less themselves and thereby offer more of the hunting for sale. When it comes to the attitude to visitor hunters, the coefficient is of an order of magnitude such that a very negative landowner reports a NOK 5,000 (€ 641) lower red deer hunt income on average than a very positive owner. Here, a discussion of causality may be necessary. We could suspect that a landowner who receives high benefits from visitor hunters becomes more positive towards visitor hunters. Despite this, the attitude variable remains significant even after controlling for the effect of having mainly visitor hunters. Those reporting that the most typical hunter at their property is

a visitor hunter report on average NOK 3,800 (€ 487) higher income than those typically hunting with friends and relatives (significant at the 5% level). As expected, the property size also affects the gross income positively (1% level). Those reporting to provide transport services state almost a NOK 6,000 (€ 769) higher income than others (significant at the 1% level). Somewhat surprisingly, low total annual income is associated with higher gross revenue from hunting.

Usually, one would perhaps expect low education to be correlated with lower income. However, a higher educational level may also indicate that the landowner is employed outside the farm, typically those in part-time farming. Are part-time farmers more likely to consider hunting a hobby? If we control for income generated outside the farm, we find some support for this hypothesis as this income correlates with higher education. Finally, those stating that shutting out local hunters is a problem report a lower income from red deer hunting (significant at 5% level). The fact that age did not have any significant effect in the regression, and was hence omitted, may also be seen to be an important result. For the whole model, the coefficient of determination is 0.54 (Mckelvey and Zavoina’s R^2).

As mentioned, due to the specific technical design associated with the grouped data regression approach, it is not possible to run a net hunting income regression. However, when running a grouped data regression with the gross red deer hunting costs as dependent variable, none of the explanatory variables come out with significant coefficients. Moreover, when running an ordinary least squares regression with net hunting income as dependent variable using midpoints of each cost and benefit interval, as discussed in the “Methods” section, the same explanatory variables as in the gross hunting income regression in Table 5 are found to be significant, except *shut out*, which is no longer significant (p -value=0.11). In addition, the variables *female* and

Table 4 Most important reason why the landowner wants to change the quota

	Increase hunting income (%)	Reduce traffic accidents (%)	Reduce damage, home field (%)	Reduce damage, forest (%)	Achieve larger animals (%)	Other reasons (%)	<i>n</i>
Change quota, most important reason	5.6	1.9	43.1	17.5	11.2	20.6	160

Table 5 Grouped data regression results. Dependent variable: gross income from hunting

	Coef.	Std. dev.	Z	P> z	95% conf. interval	
Female	5,273.06	2,309.198	2.28	0.022	747.1148	9,799.005
Attitude	1,262.966	566.3018	2.23	0.026	153.0349	2,372.897
Visitor	3,837.278	1,583.497	2.42	0.015	733.6806	6,940.876
Property size	1.26216	0.2322582	5.43	0.000	0.8069426	1.717378
Transport	5,919.366	1,857.369	3.19	0.001	2,278.989	9,559.742
Education	4,134.514	1,418.857	2.91	0.004	1,353.606	6,915.421
Shut out	-1,523.688	683.0714	-2.23	0.026	-2,862.484	-184.8932
Agency	2,719.612	1,790.043	1.52	0.129	-788.8071	6,228.031
Const.	-764.8317	3,031.585	-0.25	0.801	-6,706.63	5,176.967
/Insigma	8.684562	0.0681664	127.40	0.000	8.550959	8.818166
sigma	5,910.953	402.9283			5,171.71	6,755.863

$n=123$. McKelvey and Zavoina's $R^2 = 0.54$. All coefficients and standard deviation in NOK (1 €=7.8 NOK Aug. 2011)

Female dummy for female landowners, *Attitude* measures the landowners general attitude towards commercialized red deer hunting (scale: 1, very negative–5, very positive), *Visitor* dummy indicating that the typical hunter is a visitor hunter, *Property size* total size of the property, *Transport* dummy for landowners offering transport services, *Education* dummy for forest owners with low education, *Shut out* measures to what extent the landowner considers it to be a problem that local hunters may be shut out if the hunting is commercialized (measured on a scale from 1—of little importance to 5—very important), *Agency* dummy for landowners that use a hunting tour operator

attitude are now significant at the 10% level with p -values of 0.06 and 0.09, respectively.⁶

Discussion

There is a need for studies addressing how local managers such as landowners face the opportunities and challenges related to rapidly expanding deer populations across the various cultural settings in Europe. Our survey of the landowner-based system of Norway confirms the traditional view that red deer hunting is mainly performed by the landowner together with his family and friends. However, the typical Norwegian landowners consider themselves to be more positive towards commercialized red deer hunting than the municipality in general. Most of them think that there are great opportunities to increase the red deer-related benefits. The greatest obstacles are that the owners claim to be “satisfied with the way things are” and think it is “to much work” compared with the benefits. Difficulties in cooperating with other landowners and negative attitudes in the municipality with respect to commercialization also seem to be of some importance. In addition, most landowners think that the possibility that local hunters may be shut out is a problem. This shows the importance of detailed knowledge regarding the cultural setting to estimate the response to increased deer populations.

The balance of costs and benefits

Our main finding is that the landowners seem to be satisfied with the population size as well as the management of the red deer population, even though they report a net loss of about NOK 8,600 (€ 1,103) on average when forest browsing and agricultural grazing damage costs are taken into account. However, as these figures are based solely on self-report of the landowners, one may ask if they can be considered reliable. It is therefore of interest to compare with the results from a recent study by Thorvaldsen et al. (2010). They estimated the income and costs in a specific hunting management unit containing red deer, the Eikås storvald, based on the specific price system in this hunting area and browsing and grazing damage assessments in the field. One important result from this comparison is that the self-reported benefits and costs in our study appear to correspond quite well to the estimated numbers from Thorvaldsen et al. (2010). Their results are based on the situation in one specific hunting management unit only. Compared to their results, it actually seems like the landowners in Sogn og Fjordane underestimate both agricultural and forest damage costs. Given the net costs of red deer, it is therefore interesting that we find that most landowners would keep the hunting quota unchanged if they were to decide it on their own. This can partly be explained by the Norwegian management system in which the landowners often take part in setting hunting quotas at the local management unit level. It may also indicate that the coordination of setting the hunting quotas at the local

⁶ Available online at <http://www.toh.hist.no/~jonoo/>

management unit level works better than the process of agreeing on how the hunting should be organized with respect to commercialization.

Commercialization versus availability—why say no to more money?

In the “**Introduction**”, it was mentioned that the discussion regarding red deer hunting for sale revolves around the issues of commercialization versus availability. Commercialization of hunting has a tendency to be considered as something negative in Norway, often associated with trophy hunting by rich foreigners shutting the local people out. This is probably the reason why the landowners consider it to be a problem that local people are shut out. On the other hand, this view must be balanced with respect to the availability for the general public. A necessary condition for the public to have access to hunting is a certain degree of commercialization. At the same time, high permit prices may be considered problematic for the same reason as they may shut local people out. This may also explain why the landowners do not increase permit prices even if they think this could increase their hunting benefits. To secure availability and find the correct hunting prices is a fine balancing act, as already indicated by a national investigation conducted in 1982:

When determining hunting prices both the profits obtained by the landowner and the recreational value of the hunter should be taken into account. The hunter must be willing to pay sufficiently to secure a motive for the landowner to provide hunting. On the other hand, the price must not be so high that some sections of the population are shut out. (Berganutvalget 1982, p. 8)

As mentioned in the “**Introduction**”, MacMillan (2004) looked at the potential for introducing tradable hunting obligations for regulating red deer numbers in the Scottish Highlands. In the Scottish case, the problem of increasing red deer numbers is due to under-hunting (MacMillan 2004). This seems to reflect the fact that the estate owners’ main motivation for hunting is stag (trophy) hunting for sport, while many estate owners seem to let professional stalkers take care of the venison hunting of hinds, primarily by removing old or weak animals (MacMillan and Leitch 2008). MacMillan (2004) found evidence of a considerable demand for hind hunting and hence concluded that a tradable hunting permit system might work well. This corresponds to the results of the present study in which the landowners think that there is a great potential for increasing hunting benefits by, e.g., increasing permit prices. This perception reveals that they consider the hunting permit demand to be high. On the other hand, MacMillan and Phillip (2010) found that economic incentives to increase

venison production in the Scottish Highlands are unlikely to be effective due to conflict with more important non-pecuniary objectives of landownership such as *sporting quality* and *exclusivity*. Again, even if the Norwegian hunting objectives are less associated with trophy and sporting quality, while venison on the other hand remains an important attribute of the hunt, the results of the present survey points in exactly the same direction; that is, economic incentives are unlikely to work well because the landowners are satisfied with the ways things are. In the Scottish case, we find the same attitude as one of the main conclusions from MacMillan et al. (2010): “Innovations were largely frowned upon and there appeared to be little enthusiasm for change of any kind” (p. 39). Moreover, only about 10% of the Scottish estate owners reported *maximizing profits* to be the most important management objective (Macmillan and Leitch 2008). Hence, although venison or trophy hunting is the main hunting objective of the landowner, the results seem to suggest that profit is of minor importance in both cases.

Commercialization and scale of management

The fact that many of the landowners reported negative attitudes in the municipality towards a more commercialized sale of red deer hunting to be a quite or very important obstacle may also be seen in light of the Norwegian hunting administration system. In Norway, most practical management decisions are taken at the local level (by the Wildlife Board in the municipality and/or at the local management unit), and this may lead the landowner to place importance on the prevailing local perception of commercialization. It is therefore interesting to discuss this result in light of the study by Kenward and Putman (2011). They studied the effect of governance and administrative structures on sustainable management of ungulates by reviewing and comparing management systems of ungulates in Europe. For example, they found that the number of hunters is high when hunting organizations perceived that the relationship between hunters and other groups at the local level was good. They also found a high degree of centralization of the management to be associated with a high number of hunters. The fact that Norwegian landowners think that their perceptions differ from those of the local people with respect to a more commercialized sale of red deer hunting in general combined with the fact that they think that it is a major problem if local hunters are shut out from the hunt and that most practical management mainly take place at the local level in Norway may all be seen to support the tendencies revealed in Kenward and Putman (2011). On the other hand, as mentioned, it is not clear to what extent a more commercialized red deer hunt would imply more or fewer hunters since more visitor hunters may substitute local

hunters. However, since the total hunting quota of red deer in Norway is far from being harvested (see “Introduction”), there is much potential for visitor hunters to complement instead of substitute locals.

Conclusion

We may conclude that the landowners feel that the alternative costs of a transition from a “family and friend” to a more commercialized hunting setup is regarded as quite high. By alternative costs, we think of costs in a wide range. The landowners must reduce his own hunting as well as access for relatives and friends. Higher direct hunting-related costs must be expected, while local hunters being shut out may also be considered a cost. Since most landowners consider it to be a great potential for increasing hunting benefits, the reason why they choose not to is interesting. Obviously, there is little reason in trying to change the fact that they are “satisfied with the ways things are.” Nevertheless, about 10% are working on various initiatives to increase the benefits.

One obstacle it should be possible to overcome is the reported coordination problem. A potential solution would be to work out some simple user instructions on how to arrange red deer hunting for sale, followed by some real-life examples in order to reveal the potential benefits. Such initiatives may also help to reduce the perception that it is “too much work compared to the benefits.” A survey on the willingness to pay for hunting tour packages among red deer hunters could also provide information on the income potential. Our survey shows that there are very few such packages available in the market, and the results clearly indicate that this is due to supply side circumstances. Supplying the landowners with this type of information would also meet the challenge many of the landowners identified when they stated that they lack information/knowledge needed to increase their hunting-related income. Our results point out that attracting visitor hunters and offering transport services are factors that significantly increase hunting-related benefits. These factors should be quite easy to address for the landowners. Nevertheless, given the landowners’ satisfaction with the status quo, it seems unlikely that commercialization will take off in the near future. If left to the landowners alone, it seems more likely that the present state of affairs will continue. Since there is clearly room for more harvest given the difference between the overall national quota and the actual harvest levels, a call for management action at the state level may seem necessary. The cultural resistance towards opening up to larger hunter groups may also have important implications for the future development of populations as the culturally determined management system has been found to be the single most important predictor when predicting population development of red deer across 11 European countries (Milner et al. 2006).

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