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Supplementary feeding of game; an attitude survey of hunters, forest owners and farmers

Stödutfodring av vilt; en attitydundersökning mellan jägare, skogsbrukare och jordbrukare

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Abstract

Different stakeholders are affected by large ungulate densities in different ways and often have various goals with the management of ungulates. Some appreciate high ungulate densities, while others want to keep the densities low, and conflicts are imminent when different interests must be put against each other. Supplemental feeding is widely spread as a game management method and has the intention of both increasing population densities and reducing it. However, supplemental feeding may have both desired and unwanted effects and inappropriate fodder may cause animal health concerns as well as damage to forestry and agriculture. An increase of the use of supplementary feeding has been seen and the purpose of this study was to investigate its current extent, regarding the proportion that feed, amount of feed used (kg) and its cost (SEK), as well as which fodder that was used. By analysing responses from attitude surveys of randomly selected hunting lease holders in 2009, 2013 and 2017, I found that the proportion of hunters that were supplementary feeding game was decreasing rather than increasing. Likewise, the average cost (SEK) and amount of fodder (kg) used per hunter and year was decreasing. The fodder provided is often inappropriate for wild ungulates, since it contains high concentrations of non-structural carbohydrates (e.g. root crops). An increased use of roughage (e.g. silage) and a decreased use of concentrates (e.g. root crops) can be noticed between 2009 and 2013, and my analysis of the study of 2017 shows that this trend continues. By comparing studies from 2014 and 2017, I found that more hunters, than forest owners and farmers, were feeding game. All stakeholder groups considered that they did it particularly to increase the survival rate of game.

Introduction

Ungulates are an important natural resource, (Gordon *et al*., 2004; Milner *et al*., 2014) with an essential part of the forest ecosystem (Edenius *et al*., 2002; Garrido and Kjellander, 2015), and the hunt creates good conditions and great opportunities for recreation, as well as tremendous values in form of meat (Ingemarson *et al*., 2007). Nevertheless, ungulates also affect ecological processes negatively (Edenius et al., 2002) and may cause extensive damage to agriculture and forests (Bergström et al., 2010b) resulting in major socio-economic problems (Ingemarson *et al*., 2007). This creates conflicts between stakeholders who benefit economically from wildlife (e.g. hunters) and those who are adversely affected by large ungulate densities (e.g. land managers, farmers, forest owners, conservationists) (Austin *et al*., 2010).

Wild ungulates affect forest owners through their natural browsing, sweeping, stabbing and rooting (Bergström et al., 2010b) causing reduced timber quality, reduced tree growth and changes in the tree species composition (Cederlund et al., 1998), resulting in financial losses of forestry (Ezebilo *et al*., 2012).
Moose (*Alces alces*), roe deer (*Capreolus capreolus*), fallow deer (*Dama dama*) and red deer (*Cervus elaphus*) are ruminants, whilst wild boars (*Sus scrofa*) are omnivores (Bergqvist, and Bergström). The moose is found in the entire country, except Gotland (SJV, 2015), and browse to a large extent on pine trees, twigs and bark of deciduous trees during winter (Aronson & Eriksson, 1990) thriving in forests (Edenius *et al.,* 2002) but can also be seen on cultivated fields during summer (Ingemarson *et al*., 2007). The roe deer browse selectively for the nutritious herbs, mushrooms, twigs, leaves, grass and crops and is found in all ecosystems (Aronson & Eriksson, 1990), except in the northernmost parts of the mountain range (SOU 2014:54). Red deer and fallow deer utilize farmland in a greater extent than both roe deer and moose (Bergström & Bergqvist) and their grazing on grass, herbs and cultivated fields with e.g. rape seed and clover during summer, causes significant damage on farmed land. Their winter diet consists of buds, shoots and bark of bushes and deciduous trees, as well as on buds and tops shoots from conifers (Aronson & Eriksson, 1990) causing damage to forests (Bergström *et al.,* 2010b). Wild boars prefer deciduous forests combined with dense green forest near cultivated land (Aronson & Eriksson, 1990) and are mainly missing in areas above Mälardalen (south-central Sweden) (SOU 2014:54). The agricultural landscape is consequently mainly affected by the rooting of the wild boar but is also affected by the grazing of the deer (Bergström *et al*., 2010a). The differences in damage by wild ungulates are substantial as many population sizes vary considerably between habitats, even if the proximity between them is rather small, and higher ungulate densities often lead to increased damage to forest and crops Furthermore, different species may cause different environmental effects depending on the type of environment being studied (SOU 2014:54).

Supplemental feeding is an increasingly debated topic among various interest groups, industry, research and government agencies (Milner et al., 2014). The high ungulate populations are currently causing significant damage to different stakeholders (Cederlund et al., 1998) and the debate is basically about how all stakeholders, agriculture/forestry or hunting shall prevail in case a consensus solution cannot be reached, regarding the size of the population of wild ungulates (SOU 2014:54). Moreover, from a societal perspective, conflicts are imminent when different interests must be put against each other (Ingemarson *et al.*, 2007) and due to the fact that different stakeholders often have their own goals with ungulate management (Storaas *et al.*, 2001)

Supplemental feeding means that food is intentionally placed in the environment on an annual, seasonal, or emergency basis with the intention of regulating the availability of forage for wildlife (Inslerman *et al.*, 2006; Sorensen *et al.*, 2014) in order to increase the survival of game and improve their health (Felton *et al.*, 2016). More food available, or food of higher quality, generally leads to an increased survival and growth rate in most species (Ballesteros *et al.,* 2013; Milner *et al.*, 2013; Andersson, 2017) unless counteracted by increased hunting efforts and predation. The result is larger wildlife populations, clustered in certain areas (Sorensen *et al.*, 2014). Supplementary feeding is also used to attract species to specific places with the intention of maintaining high densities of ungulates for e.g. viewing or hunting (Putman and Staines, 2004; Bischof *et al.,* 2008), and to increase the hunting experience with an increased density of trophy males and improved trophy size; higher antlers points and weights (Putman and Staines, 2004).

Supplemental feeding is performed mainly during winter to prevent wildlife from losing body mass or starving to death, when the animals have difficulties finding food and forage its natural food resource due to snow cover (Widemo *et al.*, 2010; Milner *et al.*, 2014; Sorensen *et al.*, 2014; Felton *et al.*, 2016). Milder winters correlates to a reduced use of supplementary feeding, and ungulates use feeding stations more frequently when the environmental conditions are harsher (Doenier *et al.*, 1997; Schmitz, 1990; Ossi *et al.*, 2017). Still, supplementary feeding is a widely spread game management method performed more frequent (Katona *et al.*, 2014; Murray *et al.*, 2016), even during the vegetation period, either as supplementary or diversionary (SOU 2014:54).

Diversionary feeding is when food is used to steer the animals away in order to reduce or prevent wildlife damage to damage susceptible forests and crops (van Beest *et al.*, 2010b; Widemo *et al.*, 2010; Milner *et al.*, 2014; Kubasiewicz *et al.*, 2016). The intention with diversionary feeding is that one bite of the supplementary fodder should result in one less damaging bite to forest and crops (Felton *et al.*, 2016), and since the intensity of grazing/browsing damage is negatively related to the amount of food available, it could be possible to reduce the damage to forestry and agriculture by increasing the availability of food in the landscape for a given ungulate density (Månsson *et al.*, 2015). Providing forage in strategic locations is therefore an practiced method to redistribute the grazing/browsing pressure over the landscape, and steer the game away from habitats of high commercial or conservational value, to areas where a certain grazing pressure is more acceptable (Sahlsten *et al.*, 2010; van Beest *et al.*, 2010a; Milner *et al.*, 2014). However, there is little knowledge about its success to protect agriculture and forestry, or what influences its efficiency to produce outcomes that meet stakeholder objectives (Milner *et al.*,2014; Kubasiewicz *et al.*, 2016).

The actual effects of feeding may function both as supplementary and diversionary, despite the stated purpose (Milner *et al*., 2014), and may have both the desired and unwanted effects and might benefit/affect other species than the ones targeted (Felton *et al*., 2016; Andersson, 2017). For example, the fodder provided is not always appropriate for wild ruminant species and the high concentration of non-structural carbohydrates that is common in supplementary fodder are higher than what ungulates normally consume during winter (Felton *et al*., 2016). These types of supplemental fodder may cause animal health concerns as well as more damage to forest, due to a higher intake of woody browse by ungulates to compensate for the nutritional incorrect feeding (Felton *et al*., 2016). For example, Garrido and Kjellander (2015) studied how the browsing pressure on spruce was influenced by winter feeding stations and found that the pressure was higher near the feeding stations, decreasing with distance from the stations. Moreover, there is a risk of ungulates clustering around feeding sites, thus establishing local increased populations, which in turn leads to increased local grazing/browsing pressure and damage (Milner *et al*., 2014). Bleier *et al*. (2012) found that the amount of damage may correlate with population density, meaning that growing populations can lead to increased conflicts between stakeholders.

Sweden is a country with a long tradition of hunting (SOU 2014:54) and game management has a central role in the hunting legislation and should be carried out with consideration of both individual and public interests (Michanek, 2010). Still, there are no rules or simple solutions regarding when to feed, by whom, and at what scale (Inslerman *et al*., 2006; SOU 2014:54), but there are regulations regarding the production of food targeted for wildlife, which covers who is permitted to produce what (SOU 2014:54).

The hunting act, fourth paragraph, says that "*wildlife should be cared for*" and "*receive protection and support*", which the landowner and hunting right holder should be responsible for. This means that the responsible persons shall adapt the hunt for the availability of game and ensure that wild ungulates are protected and supported, not necessarily only with food but with other resources such as cover and water (SOU 2014:54).

Aims of study

The aims of this study were to analyse data provided from three repeated questionnaires directed to holders of hunting licenses, and two questionnaires directed to farmers and forest owners, with the intention to investigate the main reason for feeding ungulates. The aim with the study was also to determine how the attitudes toward feeding of ungulates differed between hunters, farmers and forest owners. I also analysed the data directed to holders of hunting licenses with the intention to examine the extent of supplementary feeding and which fodder that were used, as well as how the responses had changed over time and its regional differences.

Hypothesis and predictions

Since stakeholders often experience the effects of feeding differently depending on their interests and utilization of land (Austin *et al*., 2010), my first hypothesis is that attitudes towards feeding ungulates differs between stakeholders who are engaged in hunting and those who are engaged in agriculture or forestry. As many hunters consider feeding as an important management tool (Sorensen *et al*., 2014; Andersson, 2017) while farmers and forest owners often believe feeding leads to negative impacts on their forest or agriculture (Andersson, 2017), I predict a significant higher proportion of hunters, than farmer or forest owners, using fodder to manage wildlife. Though, landowners are often engaged in both agriculture/forestry, and hunting, and many hunters are also landowners (SOU 2014:54).

My second hypothesis is that the objectives for feeding wildlife differs between different stakeholders, and I predict that hunters are feeding wildlife with the aim to increase population numbers (supplementary feeding), and on the opposite side, the aim of feeding is from farmers and forest owners to divert game from their land (diversionary feeding).

Since the use of supplemental feed is linked to environmental conditions (Doenier *et al*., 1997; Schmitz, 1990; Ossi *et al*., 2017) it is possible that supplemental feeding is used at a greater extent in the northern parts of Sweden, where the winters are generally harsher. On the other hand, the ungulate population densities are generally higher, and more diverse by a higher number of species, in the southern parts of Sweden (SOU 2014:54). Therefore, my third hypothesis is that the geographical differences are significant and as the use of supplementary feeding increases with the number of established species (SOU 2014:54), I predict that supplementary feeding as a game management tool is more common in the southern areas of Sweden, where the ungulate densities are high.

Material and methods

My study is based on surveys of hunters, conducted in 2009, 2013 and 2017. Questionnaires were sent to 300 random holders of hunting license in each county of Sweden, each year, resulting in a total of 6300 holders of hunting license approached per year. Due to an administrative error, there was a total number of 6600 respondents in 2009.

Randomly selected holders of hunting licenses received questionnaires regarding their supplementary feeding habits during the hunting years of 2008-09 and 2013-14. To compare how the feeding habits differs between the years, I started developing comparable questionnaires during the spring of 2017, regarding the supplementary feeding habits of the respondents, during the hunting year of 2016-17. These questionnaires were then distributed in July. As the responses were sent back in August, I began storing the data in Excel. Then I analysed and compared the statistical results from the three surveys.

The questionnaires contained yes/no questions regarding if supplementary feeding had occurred and multiple-choice questions regarding the average total cost (SEK) spend on supplementary feeding per hunter and year, the average amount of supplementary feed distributed per hunter and year, and the choice of fodder (see Appendix).

Hunters are often landowners and farmers are often hunters; thus, there is an overlap between the stakeholder groups in the different surveys. I did not separate the stakeholder groups within surveys in the analyses but compare attitudes of all hunters (including landowners and farmers) to attitudes of all forest owners and farmers (including hunters), respectively. However, there was also a variation whether the respondents were both hunters and landowners, or only hunters/only landowners (Fig. 1).

Year of survey	Hunter & landowner	Only hunter	Only landowner
2009	38%	61%	1%
2013	39%	60%	1%
2017	39%	60%	1%

Figure 1. The proportion of respondents that were hunter and landowner, only hunter, or only landowner (of all respondents).

Supplied from SCB, 1200 randomly chosen forest owners owning > ten hectares, and 1200 randomly chosen farmers who had handed in applications for compensation from the single payment scheme for farmers under the Common agricultural policy from the EU, were sent surveys including questions about supplementary feeding in 2014. I analysed and compared the statistical results between farmers, forest owners and holders of hunting licenses to examine how supplementary feeding habits differ between different stakeholders.

These questionnaires contained yes/no questions regarding if supplementary feeding had occurred as well as multiple choice questions regarding the objectives for feeding (see Appendix).

The response rate in 2009 was 62 per cent (6600 holders of hunting license), 67 per cent in 2013 and 55 per cent in 2017 (6300 holders of hunting license respectively). Regarding response rate for farmers, it was 62 per cent (1200 respondents in 2014), and for forest owners, it was 55 per cent (1200 respondents in 2014).

Statistical analysis

Yes/no-questions were analysed with chi-squared test for association. A chi-squared test is used to determine whether the distribution of observations for the first variable differs depending on the category of the other variable, i.e. whether two categorical variables are associated. The null hypothesis assumes that there are no associations between the variables, i.e. the variables are independent. The alternative hypothesis assumes that there is an association between variables, i.e. the variables are dependent. The null hypothesis is true, and cannot be rejected, if the p-value are less than the significance level ($p<0.05$). If the calculated p-value is greater than the significance level ($p>0.05$), there is an association between the two variables and the null hypothesis can be rejected (Minitab, 2016a).

Multiple-choice questions were analysed with a Kruskal-Wallis test. A Kruskal Wallis test is a nonparametric test (Statistics Solutions, 2018) that are used to determine whether the medians of different groups (≥2 groups) differ (Minitab, 2016b). The null hypothesis assumes that the medians are equal among the sample groups. The alternative hypothesis assumes that at least one of the sample groups is significantly different from the other group(s). The null hypothesis is true, and cannot be rejected, if the calculated value of the Kruskal-Wallis test is less than the critical chi-square value ($p<0.05$). If the calculated value of the Kruskal-Wallis test is greater than the critical-square value ($p>0.05$), at least one of the sample groups differs significantly from the other groups and the null hypothesis can be rejected (Minitab, 2016b).

Maps showing the regional differences were made in Q-GIS. Most of the statistical analyses and graphs were made in the statistical software program Minitab, yet some of them were made in Excel.

Comparisons between years (2009, 2013, 2017) and stakeholder groups (hunters, farmers, forest owners) were made with the assumption that each county had the same influence on results, regardless of the number of licensed hunters, living or hunting in a certain county. I did not consider whether the hunters were landowners, or whether the forest owners/farmers were hunters, in my analysis.

Results

Yearly differences

During the hunting year of 2016-2017, 47 per cent of the hunters had fed on their main hunting ground, which was significantly less than 2013 (χ^2=81.068 n= 3810; 3114, p= 0.000), but comparable to the proportion that fed in 2009 (χ^2= 1.319 n= 3595; 3114, p= 0.251).

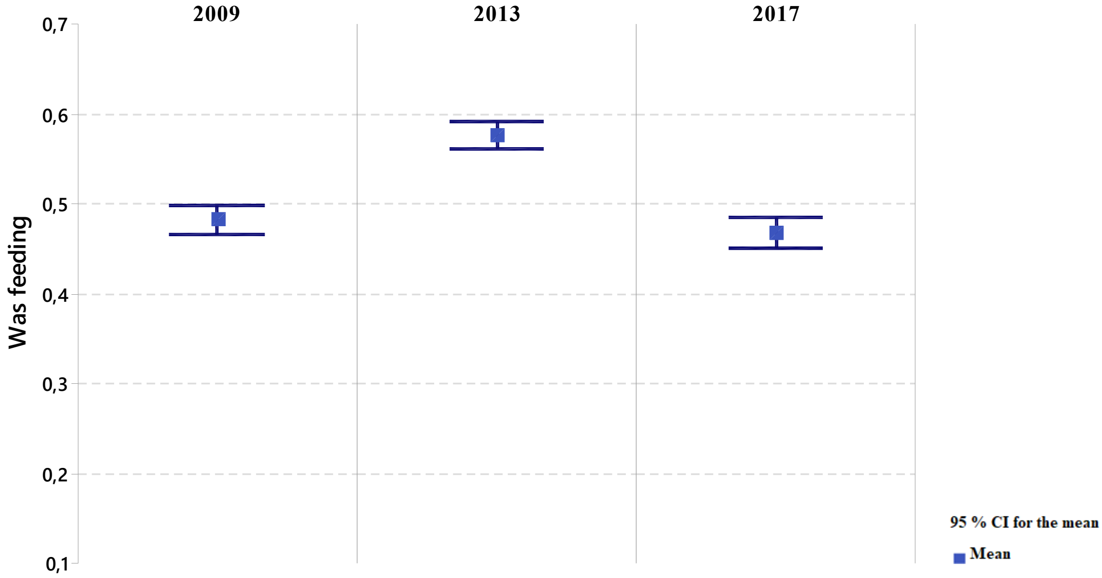

Fig 2. The proportion of hunters stating that they or someone else in the hunting team was supplementary feeding game.

The average amount (kg) of fodder was significantly higher in 2013 than in 2009 and 2017 (Fig. 3) (Kruskal-Wallis, H= 176.65, p< 0.0001).

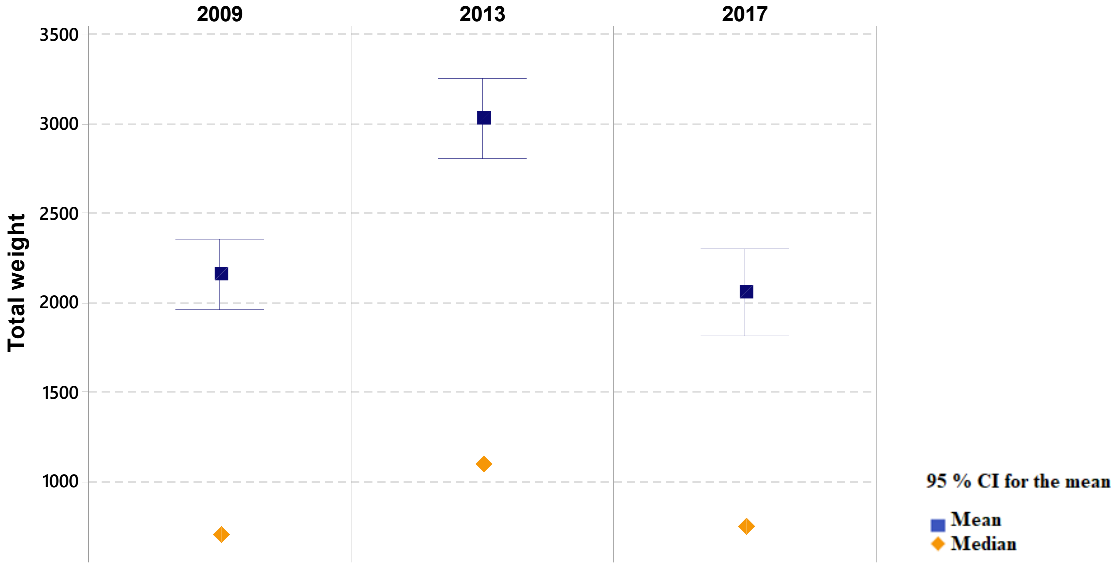

Fig 3. The total weight of fodder used per hunter and year (of those who were supplementary feeding).

The average total cost of supplementary feeding was significantly higher in 2013 than in 2009 and 2017 (Fig. 4) (Kruskal-Wallis, H= 54.52, p< 0.0001).

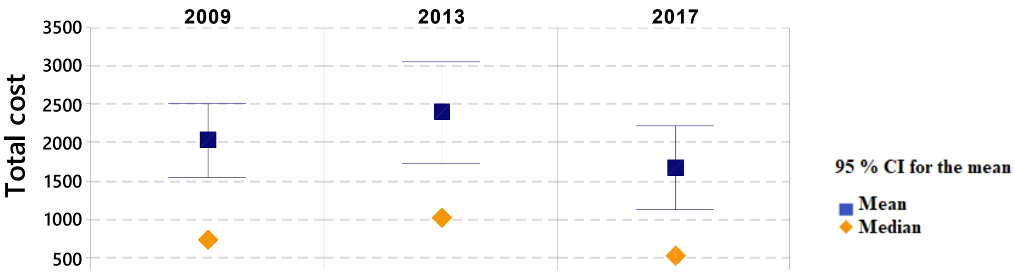

Fig 4. Total cost (SEK) of fodder per hunter and year (of those who were supplementary feeding).

The average amount of silage used in 2013 was significantly higher than in 2009 and 2017 (Fig. 5) (Kruskal-Wallis, H= 94.13, p< 0.0001)

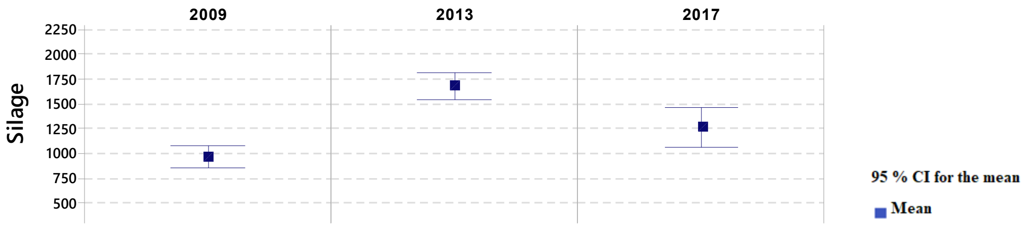

Fig 5. Average amount of silage per hunter and year (of those who were supplementary feeding).

The average amount of grain used in 2009 were significantly higher than in 2013 and 2017 (Fig. 6) (Kruskal-Wallis, H= 1687.97, p< 0.0001).

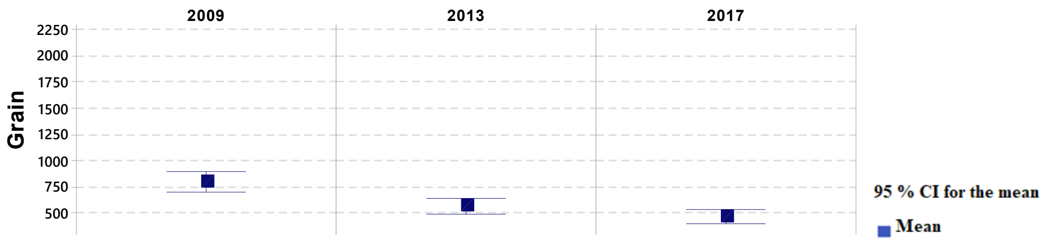

Fig 6. Average amount of grain per hunter and year (of those who were supplementary feeding).

The average amount of root crops used in 2009 were significantly higher than in 2013 and 2017 (Fig. 7) (Kruskal-Wallis, H= 2021.43, p< 0.0001).

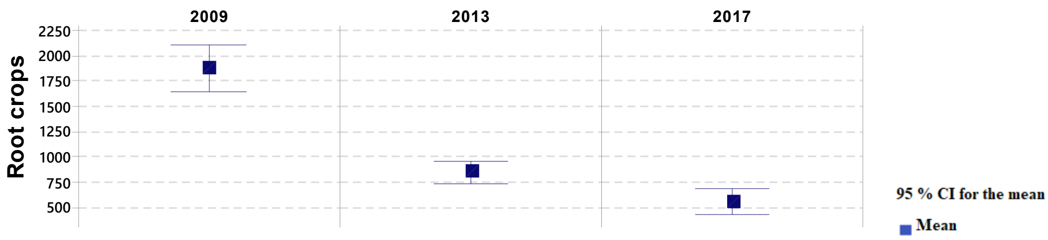

Fig 7. Average amount of root crops per hunter and year (of those who were supplementary feeding).

Differences between stakeholders

During the hunting year 2012-2013, 58 per cent of the hunters had fed on their main hunting ground, which was significantly higher than for farmers (Fig. 8) (χ^2= 277.269, n= 3811;1597, p= 0.000) and for forest owners (χ^2= 228.084, n= 3811;651, p= 0.000).

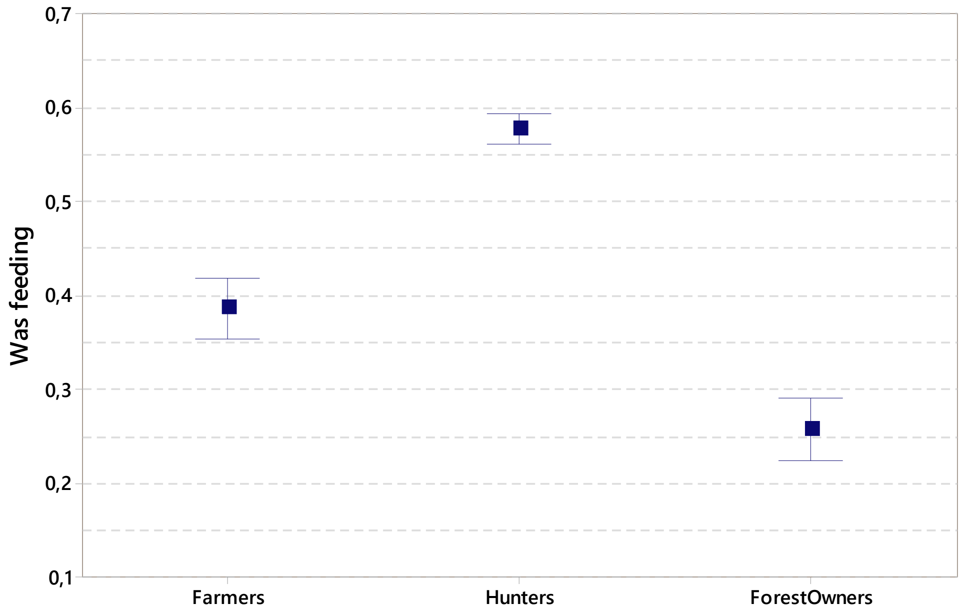

Fig 8. The proportion of respondents stating that they, or someone else in the hunting team, was supplementary feeding game.

All three stakeholder groups that were supplementary feeding, contended that the main reason for feeding wildlife was to increase survival. Hunters were more interested in reducing damage than farmers (χ^2=62.808, n=352; 1460, p= 0.000) and forest owners (χ^2= 14.133, n= 1460; 168, p= 0.000). Farmers (χ^2=15.401, n=352; 1460, p= 0.000) and forest owners (χ^2=7.192, n=168; 1460, p= 0.007) were more interested in reducing suffering than hunters.

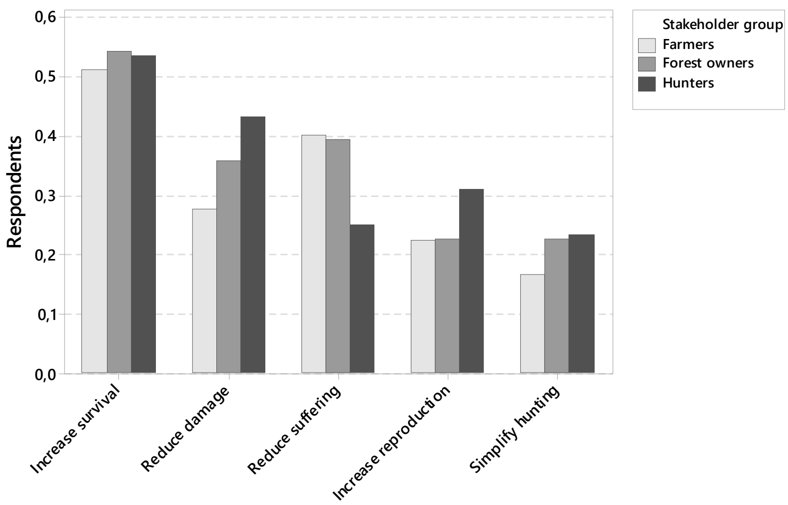

Fig 9. Farmers', forest owners' and hunters' proportions for feeding.

Geographical differences

Supplementary feeding occurred to the greatest extent in Södermanland and Västmanland (79 – 86 per cent), followed by the counties of Skåne and Stockholm (72-79 per cent) in 2016-17. Supplementary feeding occurred to the least extent in Jämtland and Västernorrland (16-23 per cent) (Fig. 10).

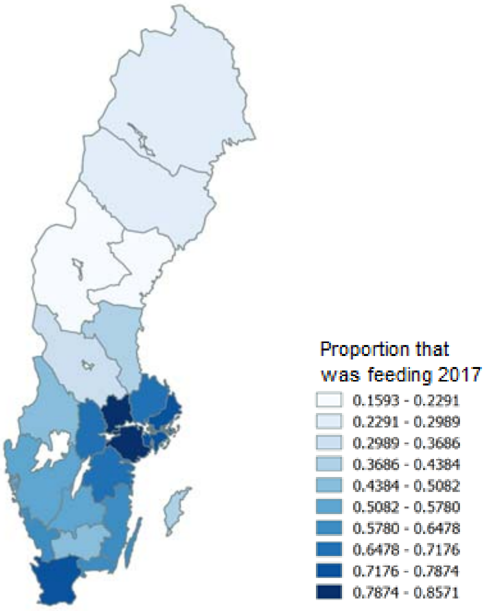

Fig 10. Geographical differences in the proportion of respondents that were feeding in 2017.

Greatest amount of fodder was distributed in Södermanland both in 2013 and 2017, followed by the county of Skåne (Fig. 11).

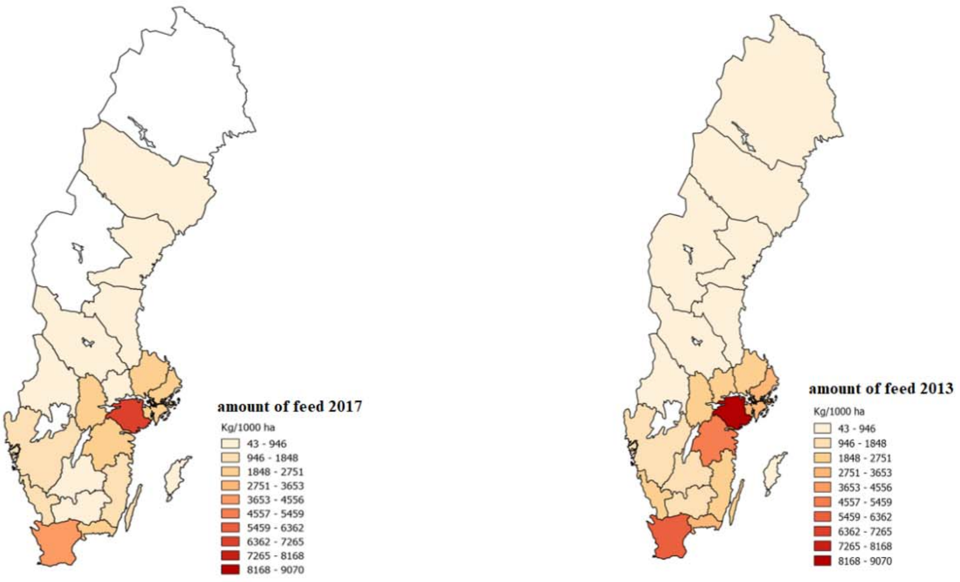

Fig 11: Average amount of supplementary fodder per hunter in each county in 2017 and 2013 (kg/1000 hectares)

Skåne County dominated the use of root crops in 2017, followed by Södermanland and Västmanland. Södermanland, and its surrounding areas, dominated the use of silage in 2017. Södermanland also dominated the use of grain in 2017, followed by Skåne, Halland and alongside Stockholm.

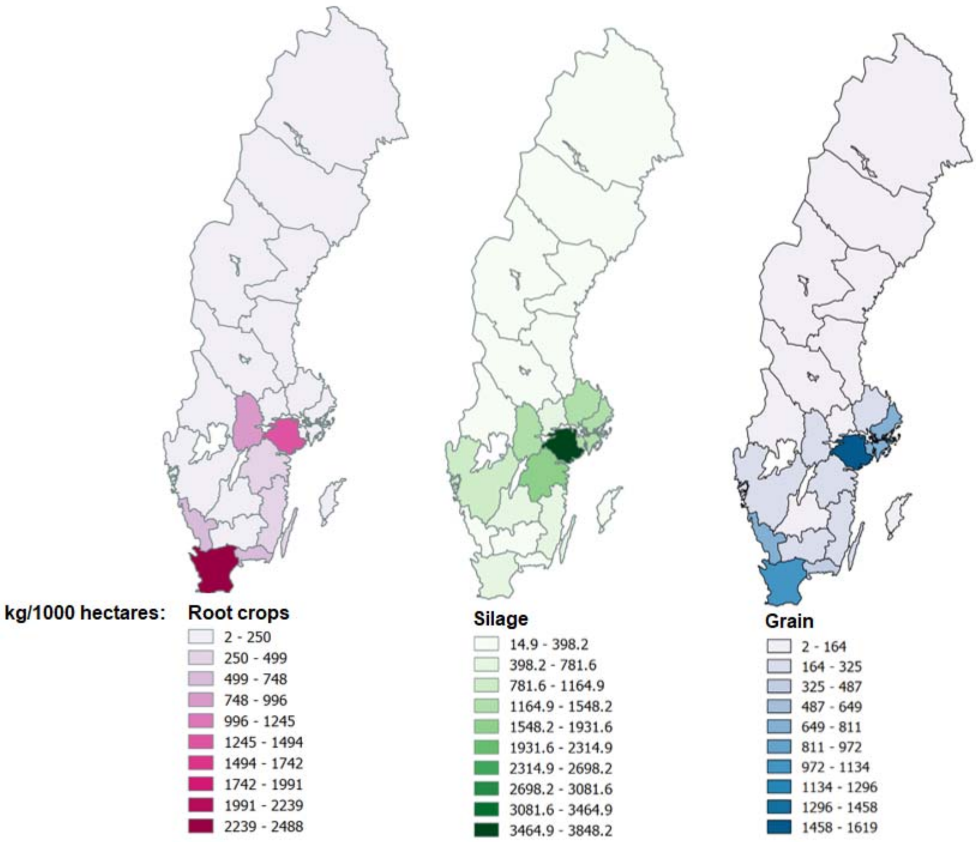

Fig 12: Average amount of root crops/silage/grain used 2017 (kg/1000 hectares).

Discussion

Yearly differences

My results showed that the proportion of hunters that were feeding wildlife were significantly higher in 2013 than in 2009 and 2017. Also, the average amount of fodder used per hunter and year, as well as the average cost per hunter and year, was significantly higher in 2013 than in 2009 and 2017.

Ossi *et al.* (2017) found that the use of supplemental feeding corresponded to the winter conditions, meaning that a possible explanation to the significantly bigger extent of feeding in 2013 could be the difference in winter conditions between the years. According to Sweden's Meteorological and Hydrological Institute (SMHI), the snow depth was deeper during the hunting year of 2012-13, than during the hunting year of 2016-17 (SMHI, 2013; SMHI, 2017). However, an accurate study of winter conditions for each year is required for further knowledge. Unfortunately, no data for snow depth during the hunting year of 2008-09 was available, making it difficult to draw any conclusions regarding correlations between snow depth and supplementary feeding.

The proportion of feeding was significantly higher in 2013 than in 2017, as well as the average cost that respondents spent on feeding. Former studies have also shown that both the proportion of respondents that fed game, and the average cost that respondents spent on feeding, increased with the number of established species in the area (SOU 2014:54). However, more studies are required to understand the cause and effect of supplementary feeding, as it is quite difficult to determine whether it is fed in more ungulate dense areas - or if the ungulate populations are denser, consequently due to the feeding.

My analysis shows that root crops was the most commonly used fodder in 2009 and that its use was significantly higher in 2009 than in 2013. Silage bales was the most commonly used fodder in 2013, and a continuous increase in the use of silage in correlation with a continuous reduction in the use of root crops could be seen in 2017. Further studies should include harvest statistics for crops, since the choice of fodder probably varies with what is grown and what is available in that certain period.

Differences between stakeholder groups

A significantly higher proportion of hunters than farmers/forest owners were supplementary feeding, which is consistent with my first prediction. However, my analysis showed that all three stakeholder groups (hunter, farmer, and forest owners) which were supplementary feeding, agreed that the main reason for feeding wildlife was to increase survival and that the least important reason was to simplify hunting. This did not support my prediction that there are differences regarding main reason for feeding ungulates among different stakeholders. Nor did it fully agree with my prediction that the aim of farmers and forest owners is to divert the game from their land, while the hunters seek the opposite.

My results show that hunters were more interested in reducing damage than farmers and forest owners. One possible reason for this might be that farmers and forest owners do not believe that feeding reduces damage, as much as the hunters believe it does, and may choose other methods for reducing the damage, such as hunting, fencing or selectively choose crops/plants that are not damaged by the game to the same extent. However, my results show that hunters were less interested in reducing suffering, than farmers and forest owners. One possible explanation for this might be that many hunters believe that game should be regulated through hunting and would rather keep the population at a sustainable level by hunting, than by feeding.

Geographical differences

My analysis showed that supplemental feeding was more common in the southern and central parts of Sweden, than in the northern parts, extending from approximately 80 per cent in the central and southern parts of Sweden, compared to approximately 20 per cent in the northern parts. As the use of supplementary fodder correlates with the number of established species in the area (SOU 2014:54), a possible explanation is the much higher game densities and composition of ungulate species in the south. According to my analysis, the geographical variations were also applicable to the amount of food used; rather small amounts of fodder were used in areas north of Mälardalen. These analyzes supported my third hypothesis that there are considerable geographical differences in supplementary feeding.

The geographical differences could also be seen in the choice of fodder. My analysis (2017) showed that root crops were the most commonly used fodder in Skåne, whilst silage bales were the dominating fodder in Södermanland. The choice of fodder varies with the species aimed to feed (SOU 2014:54), and it is possible that the choice of fodder may depend on the species established in the certain area, which in turn likely affects what species are intended to benefit.

Furthermore, the choice of fodder probably varies with what is grown in the area, future studies should take these parameters into account.

Further research

I did not include whether the hunters were landowners or whether the farmers/forest owners were engaged in both agriculture/forestry, and hunting, in my study. Splitting the stakeholder groups might provide additional understanding of individual attitudes, but my aim has been to understand how the different stakeholder groups behave.

All comparisons between years (2009, 2013, 2017) and stakeholder groups (hunters, farmers, forest owners) in my study were made with the assumption that each county had the same influence on results, regardless of the number of respondents in a certain county. For more accurate results, future studies should use weighted numbers to avoid low-rate counties receiving a inappropriate impact.

Conclusion

The geographical differences were similar during the hunting year of 2016-17, to the hunting year of 2012-13, and the feeding is still concentrated to the central and southern parts of Sweden, probably due to the higher game densities in those areas. Still, I found that the extent of feeding was lower during the hunting year of 2016-17, than during the hunting year of 2012-13, regarding the proportion that fed, the amount of fodder used and its average total cost. The snow depth was deeper during the hunting year of 2012-13 than during the hunting year of 2016-17, which is a possible explanation as the winter conditions affect the use of feeding stations.

A transition from a major use of root crops during hunting year of 2008-09, to a greater use of silage bales during the hunting year of 2012-13 and 2016-17, can be seen across the country. Although, the geographical differences were noticeable also in the choice of fodder, as the choice of fodder probably varies with what is grown in the area. For example, root crops dominated the supplementary feeding in Skåne, whilst silage bales dominated the feeding in Södermanland.

Using fodder to manage game was more common among hunters than among forest owners and/or farmers. However, regardless which stakeholder group, the main reason for feeding wildlife was to increase survival rate of game.

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Appendix

1. Have you/your hunting team been supplementary feeding game during the past 12 months on you main hunting ground?

- ☐ No
- ☐ Yes

If yes,

	0-200 kg	201-500 kg	501-1000 kg	1-5 ton	5-10 ton	>10 ton
Silage						
Root crops						
Grain						
Other…						

2. If you were supplementary feeding game, what was the objective?

- ☐ Reduce suffering
- ☐ Increase survival
- ☐ Increase reproduction
- ☐ Reduce damage
- ☐ Simplify hunting

3. If feeding – how much money have you spent on supplementary feeding the last 12 months? *If you are part of a hunting team, we only need you to mention your part of the cost.*

I have spent ________________ SEK on fodder

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