The value of alpacas in reducing newborn lamb-fox predation: a preliminary survey

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Abstract: The economic contribution to the sheep industry from using alpacas as watch-lambs is estimated to be significant. However there is no well documented studies of this issue. Magazine articles and anecdotal evidence offer contradictory evidence about the value of using alpacas as guardians for newborn lambs, protecting them against fox attacks. The preliminary analysis for this paper is taken from an experiment conducted at two sheep farms in rural NSW where the sheep flocks were organised as "*experimental* and *control*" groups with and without alpacas respectively. Results were obtained using overall weaning percentages for each mob of sheep. Inferential statistical techniques including t tests for groups with unequal variances have been used to determine the level of effectiveness of alpacas as newborn lamb protectors. The statistical significance of the result was evident at 2.5% level of significance ($\alpha = 0.025$). While the experimental results are encouraging showing that the presence of alpacas in the sheep paddocks constrained lamb-fox predation by 13%, more research needs to be conducted to ratify the results with larger samples and in multiple environmental and management systems. Also it is recommended that alpaca:ewes ratios and behavioural inter-relationships between the species should be evaluated. A thorough economic analysis of the overall benefit of developing integrated grazing systems using alpacas and sheep should be conducted.

Keywords: alpacas, watch lambing, sheep farming systems

Introduction

Canine attacks on newborn lambs are a problem for sheep farmers, causing substantial economic losses to the sheep industry (D Pixley 2004, pers. comm., 7 April 2004). Anecdotal evidence has indicated that alpacas have an effect on reducing the losses caused by such attacks when placed within sheep flocks (B Richardson, 2004, pers. comm., 23 April 2004). The newborn lamb predators are foxes, wild dogs and domestic dogs (canines) that attack the ewes during the lambing season, often-killing lambs and severely injuring the sheep (Jenkins, 2003). The current literature regarding the use of alpacas as herd protectors is primarily focused on llamas, in American conditions. Research on using alpacas as herd protectors on Australian farms is limited, primarily anecdotal and not quantitative.

Therefore the purpose of this project is to fill gaps in the existing research by generating quantitative evidence on the benefits of using alpacas as herd protectors on Australian farms. A business analysis of the financial position and cost: benefit ratio will provide additional information validating the viability of introducing alpacas as lamb protectors.

Objectives

The broad objective of this study was to examine the use of alpacas as newborn lamb protectors.

The specific objectives of this project are:

- to determine the efficiency of alpacas as protectors of newborn lambs
- to evaluate the economic viability of introducing alpacas as newborn lamb protectors into flocks of lambing ewes
- to identify limiting factors to the use of integrated alpaca:sheep grazing systems; and,
- to explore unidentified issues of this new sheep management system.

Review and interaction

Alpacas are South American camelids. They are hardy, intelligent and have strong herding instincts (Richards, 2002). It is their dislike of canines, ability to bond with domestic livestock and protective instincts that have identified alpacas as potentially useful livestock guardians (Jenkins, 2003). Traditionally alpacas in South America have several uses, as a source of meat, fibre, skins and organic fertiliser. The most recent use for alpacas is as guards for livestock and poultry (Jenkins, 2003). The species guarded by the alpacas does not seem to matter, once the alpaca has established a paddock as 'their territory' and bonded with the livestock or poultry they are to protect, they work hard to ensure the paddock is clear of canines (Jenkins, 2003). Alpacas and llamas keep sheep and lambs together, patrol constantly and remain alert. Putting two mature alpaca wethers in with ewes a few weeks before lambing and leaving them there until weaning can solve the problem of lamb losses to foxes (Bell, 2004).

An opposing view is presented by Martin Evans, the past President of the Alpaca and Llama Association of New Zealand; Evans (2004) suggests that alpacas have no guarding ability whatsoever and have never been used for this purpose. Insley (2004) offers many other opposing opinions regarding the use of camelids as lamb protectors. Insley (2004) states that alpaca's instincts are similar to sheep and therefore are usually terrified of canines.

Limited research has been conducted into the use of alpacas as herd protectors with the majority being focused on American conditions specifically involving llamas rather than alpacas (Richardson, 2004 pers. comm.). A United States Department of Agriculture study found that in the first year of a llama trial, stock losses were halved. In the second year there was no statistical difference, but that was a low-stock loss year (Chester, 2004). Tumbarumba Shire Feral Animal Working Group has recently placed two alpacas on a property outside Tumbarumba as a part of a program tackling the wild dog and fox problem in the region (Chester, 2004). As a part of the trial the group will continue to carry out a trapping and baiting program in the region (Chestor, 2004). 'Jandon Park' a property near Molong, NSW, has been using alpacas as lamb protectors since 2000, however owner and manager of 'Jandon Park' Gordon Blowes, is unconvinced as to the effectiveness of the alpacas (Balogh, 2004).

Alpacas are managed similarly to sheep. They need vaccination against clostridial disease and regular drenching, their toenails may require occasional trimming and they should be shorn annually (Jenkins, 2003). Alpacas are smaller than llamas weighing 50-70kg and reaching a height of 1.4 metres. They seem to be good guards for livestock especially against foxes but "their ability to chase canines may be hampered by their abundant fleece, and their wooly faces might partially obscure their vision", reducing their efficiency in early detection of canines advancing on a flock (Jenkins, 2003). Alpacas are normally gentle towards humans and other animals that are not seen as threatening (AAA, 2002).

The alpacas defence against attack by canines such as dogs and foxes is to chase them away or run the animal down and stamp on it with its forelegs (AAA, 2002). Alpacas are usually very quiet, however will emit a piercing alarm scream when aroused to potential danger (AAA, 2002). Alpacas bonded to sheep always keep their distance, they will only make physical contact if forced to e.g. during yarding (Richardson, 2002). Alpacas do not shed their fibre and so the risk of cross contamination into wool clips is very low (Richardson, 2002).

The risk of disease infection across from alpacas to sheep is also minimal (AAA, 2002). Alpacas need to receive a 5 in 1 chlostridial disease vaccination each year and when run with sheep should be given the same drenches for internal parasites (AAA, 2002). While alpacas are highly resistant, they can contract bovine Johne's disease (BJD), they do not contract ovine Johne's disease (OJD) (Richardson, 2002). Alpacas are environmentally friendly, in respect of damage to the surface of the ground because of their low hoof pressure (39kPa) compared with other live stock (sheep, 82kPa and cattle, 185 kPa)(Charry, Kemp and Lawrie, 2001).

The NSW Department of Primary Industries have conducted preliminary studies into the used of non-canine livestock guardian animals (LGA) (Jenkins, 2003). This preliminary study consisted of a producers' survey to determine the level of interest into the use of LGA's; however it did not focus on alpacas (Jenkins, 2003).

This issue of livestock production and protection is considered critical for the development and growth of both alpaca and sheep industries in Australia. A number of sources were consulted to complete an exhaustive review of prior knowledge, however the current research on this aspect of alpaca management is limited.

Materials and methods

Two farms with breeding sheep enterprises were selected for this study. Farm 1 was at the University of Sydney, Faculty of Rural Management located in Orange NSW (33 23S, 149 08E). Farm 2 was "Mossgiel" located in Ivanhoe NSW (32 54S, 144 18E). Both properties splited their lambing ewes into flocks identified as control and experimental flocks. Farm 1 had two flocks of approximately 300 lambing ewes, Farm 2 had four flocks of approximately 1,500 lambing ewes. The flocks were not situated directly adjacent to each other, with at least a space of 2 ha in between each flock.

Previous anecdotal evidence has suggested that having alpacas near each other is ineffective, as the alpacas tend to keep close to each other rather than staying with the sheep (Richardson, 2004 pers. comm.). Two male-wether alpacas were placed with the experimental flocks of lambing ewes though the number was reduced to one alpaca for the experimental flock on farm 1. B Richardson (2004 pers com), Clearview Alpacas Braidwood NSW, has suggested that if any more than two alpacas are used with each flock of sheep, the alpacas will stay together and ignore the sheep. Six alpacas were provided for the purposes of this research project, (two from the University of Sydney and four from the Southern Region Australian Alpaca Association).

At the end of the lambing time (October 2004) at lamb marking, both farmers recorded the number of lambs marked within each flock. These records were used to determine the overall lamb survival percentage for each flock of ewes. Using the data acquired during lamb marking, descriptive and inferential statistical techniques were applied to determine the efficiency of alpacas as newborn lamb protectors at the sites evaluated. The selected inferential statistic technique used was the t test for groups with unequal variances.

Results and discussion

Tables 1 and 2 –Appendix1- contain basic information from the experimental farms in terms of ewe inventories, lambs marked and survival percentages. An initial observation of these results indicates that there was a consistently higher survival rate on both farms in the flocks where the alpacas and ewes shared the paddocks.

Table 3 –Appendix 1-shows the computer results of the inferential statistic method, i.e. t-test for samples with unequal variances. The hypothesis being tested (i.e. H_1) is that *there is a difference between the means of the sample groups*. A two-tailed test has been used.

The null hypothesis was that the mean of control groups equals the mean of experimental groups; or that the difference between means is equal to zero.

$$H_0: \mu_1 = \mu_2 \text{ or } \mu_1 - \mu_2 = 0$$

Therefore the alternative hypothesis was that the mean of control groups does not equal the mean of experimental groups or that the means difference does not equal zero

$$: \mu_1 \neq \mu_2 \text{ or } \mu_1 - \mu_2 \neq 0$$

The t-tests have indicated that at a critical "t" value of ± 2.7765 the means of the two sample groups are significantly different with $\alpha = 0.025$ or confidence level = 0.975 (i.e. 97.5%).

The *t*-test for samples with unequal variances indicates that the null hypothesis should be rejected. This indicates that the difference in means of the two sample groups is significant and therefore it can be statistically concluded that the alpacas are effective as newborn lamb protectors.

The methods of this experiment indicated that the sample groups were selected entirely at random and throughout the lambing period both groups were located on similar pastures with similar paddock conditions. In this regard many external variables appear to be taken into consideration and the results can be deemed to be reasonable at a 97.5% confidence level. However other immeasurable external variables may be influencing the results and the limitation of the sample is recognized when comparing it to the overall sheep population. These external variables may cause more lamb deaths that the alpacas have no impact on, these deaths could be caused by frosts, sickness or abandonment of the lamb by the ewe. The manager of the experimental farm 1 reported that over the period of the trial any lamb carcasses within the control flock were eaten or moved within a few days. Lamb carcasses in the experimental flock were left undisturbed. This observation indicates that there were lambs dieing due to external factors not considered in this analysis. In spite of having available carcasses for consumption the foxes were unable to invade the alpaca's territory.

The manager of the experimental farm 2 reported that one pair of alpacas stayed in one sector of the paddock for a quite noticeable period of time. At shearing time they were shorn and after this they tended to follow the lambing ewes more. Since the alpacas were not familiar to the territory this indicates that the alpacas might have been wool blind, so where choosing to stay near the water source rather than with the flocks of sheep. This observation links to Jenkins' (2003) comments relating to the "wooly faces" obscuring the alpacas vision.

Preliminary highlights

Using an aggregate marginal analysis as per data contained in Table 4 - Appendix 1 - it is possible to indicate that this experiment produced a marginal increase in the flocks using alpacas as having 12.83% more weaned lambs. In simple terms, translating this value to a real farm situation indicates that on the farms under study the foxes killed around 13 lambs out of each 100 lambs born. Alternatively the physical effect on weaning percentage because of the incorporation of alpacas to the sheep breeding system was +12.83%.

In spite of these encouraging results it is necessary to emphasise that this is only a preliminary exercise to gather objective evidence about the value of alpacas as lamb watchers. Since the generalization of the results is limited - in spite of the strong statistical significance (i.e. CL = 97.5% or α = 0.025) - due to the limited sample size and not considering multiple environmental and management systems, the authors considered the results to be preliminary at this stage. More work needs to be done to undertake economic analysis of the effect on sheep grazing systems incorporating alpacas.

Moreover it is necessary to indicate that there is a need to study behavioural issues of the species as well as to test different ewe: alpaca ratios to gain a better overall understanding of the implications of alpacas as newborn-lamb protectors.

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Appendix 1: Raw data and Calculations

Table 1 Experimental farm 1 - The University of Sydney, Orange Campus NSW

Flock	Number of Ewes	Number of Lambs Marked	Survival Percentage
Control	239	178	74%
Experimental	251	198	78.8%

Table 2 Experimental farm 2 – "Mossgiel", Ivenhoe NSW

Flock	Number of Ewes	Number of Lambs Marked	Survival Percentage
Control	1,509	1,071	71%
Control	1,480	1,007	68%
Experimental	1,509	1,207	80%
Experimental	1,495	1,286	86%

Table 3. t-test for differences in means for lamb survival rates

Hypothesised Difference	0%
Level of Significance	0.05
Experimental Group	
Sample Mean	81.33333333
Sample Size	3
Sample Standard Deviation	4.163331999
Control Group	
Sample Mean	71
Sample Size	3
Sample Standard Deviation	3
Population 1 Sample Degrees of Freedom	2
Population 2 Sample Degrees of Freedom	2
Total Degrees of Freedom	4
Pooled Variance	13.16666667
Difference in Sample Means	10.33333333
t-Test Statistic	3.487772493
Two-Tailed Test	
Lower Critical Value	**-2.776450856**
Upper Critical Value	**2.776450856**
***p*-Value**	**0.025173674**
Reject the null hypothesis at a confidence level of 97.5%	

Table 4 Marginal Aggregate Analysis of Weaning Lamb Rates

Group	No of ewes	Weighted weaning % control groups	Weighted weaning % experimental groups
Control Farm 1	239	239 x 0.74 = 178.86	
Control1 Farm 2	1509	1509 x 0.71 = 1071.4	
Control2 Farm 2	1480	1480 x 0.68 = 1006.4	
Totals for control groups	3228	2254.65	
Experimental Farm 1	251		251 x 0.78 = 198.3
Experimental1 Farm 2	1509		1509 x 0.80 = 1207.2
Experimental2 Farm 2	1495		1495 x 0.86 = 1285.7
Totals for experimental groups	3255		2691
Average Weaning %		69.84%	82.67%
Marginal Increase in Weaning %			**+ 12.83%**