GPS TRACKING OF SHEEP TO INVESTIGATE SHELTER AND SHADE USE IN RELATION TO WEATHER CONDITIONS.[1]

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In Australia inclement weather contributes to losses of new-born lambs and recently-shorn sheep. Provision of forced shelter has been observed to reduce lamb losses by up to 10 percent and when given a choice, ewes preferentially seek shelter on offer for a period of approximately two weeks post shearing (Alexander et al. 1980). Given significant sheep losses can occur during adverse weather conditions a better understanding of sheep use of shelter and/or alternative ways of attracting sheep to shelter are needed.

This paper reports on the results of deploying GPS collars on sheep on a commercial property in the Northern Tablelands region of NSW Australia, (latitude: 30.99°S, longitude: 151.59°E, elevation: 1060-1151 m MSL) with the aim of understanding the relationship between local climate and topography and sheep preference for shelter during pregnancy. In this work, two 20+ ha field designs were evaluated. Field A comprised of perimeter shelter belts (3-4 rows of native trees) and individual, free-standing trees (lone trees) within the field. Three classes of shelter; "Lone Trees", "Exterior Shelter" and "Remainder of Paddock" were ascribed to this field. Field B comprised of perimeter shelter belts, a single, internal shelter belt ('boomerang' shape) and a number of free-standing trees. Four shelter classes; "Lone Trees", "Interior Shelter", "Exterior Shelter" and "Remainder of Paddock" were ascribed to this field. Over two shearing and lambing seasons a random sample of 5 ewes from each of the two flocks of 200-300 ewes (ranging from 2 to 5 years of age) were fitted with GPS collars providing continuous (43-51 days) observations of the ewes' movement and proximity to shelter in spring (September and October). GPS collars recorded individual animal location every 10 minutes. Weather stations and temperature loggers were strategically located throughout the fields to provide localized hourly measures of temperature, wind speed and precipitation during the two observation periods. Daily minimum and maximum temperature ranged between -6 and 27°C respectively. Nights were generally still and frost was common, days were often sunny and windy; hourly wind speed reached a mean maximum of 49.6 km per hour. Strong westerly winds prevailed; northerly and southerly winds were unusual. The mean annual rainfall for the two years was 724.8 to 795.4 mm, mostly falling in the summer and winter months. The region experiences warm summers; rain and sleet are not uncommon in early spring, and winters occasionally have light snow and are cool enough to inhibit plant growth markedly for about 4 months.

As field utilisation was similar each year, the decision was made to combine the data from both years for analysis. GPS records were converted into the spatially-based livestock residency index (LRI) (Trotter et al. 2010) and the proportion of residency times within a radius of 25 m of each shelter class was determined during 1900-0400h night camping; 0500-1100h morning grazing and 1200-1800h afternoon grazing time intervals (**Figure 1**).

[1] D.B. Taylor, D.A. Schneider, W.Y. Brown, I.R. Price, M.G., Trotter, D.W. Lamb and G.N. Hinch. (2010) "GPS tracking of sheep to investigate shelter and shade use in relation to weather conditions". Proceedings of the 10th International Conference Precision Agriculture (ICPA) 2010, Denver, Colorado, USA, p. 247-248.

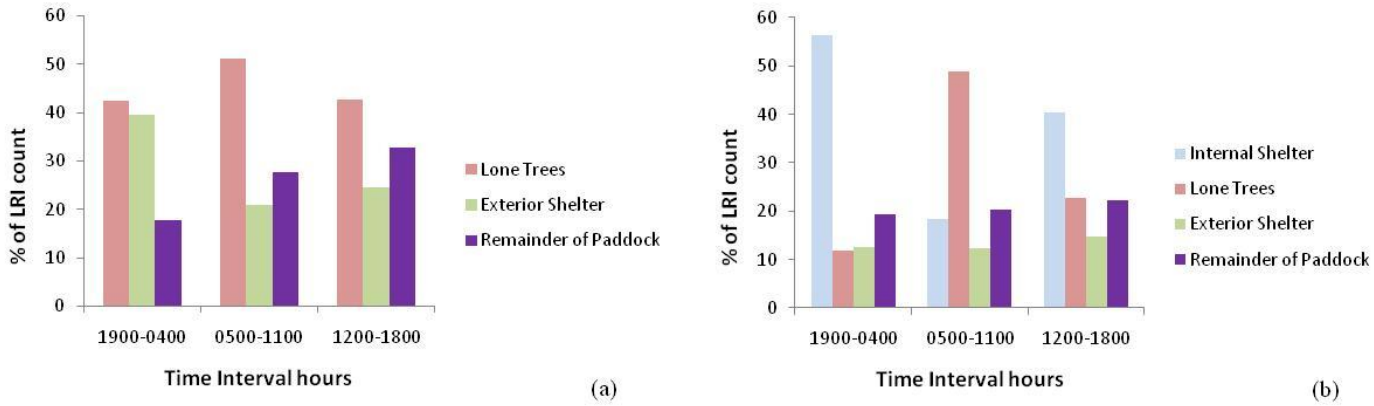

Figure 1. Percentage of the total livestock residency index (LRI) counts within 25m of the specified shelter class for (a) Field A, and (b) Field B.

During night camping and where the choice of an internal shelter belt was provided (Field B), sheep were observed to spend more time in the vicinity (0-25m) of interior shelter belts (56%) than free-standing trees (12%). In Field A where only internal trees (43%) or perimeter shelter belts (40%) were available, a slight preference for the free-standing trees was observed. During daytime, shade-seeking behaviour indicated an increase in preference for individual, internal trees in both fields compared to night-time camping. Night camping also used interior shelter or free-standing trees which could be associated with predation prevention; however, the tree canopies would also reduce heat loss form radiation which may be of more importance to the sheep than wind protection provided by the exterior shelter belts.

These results suggest sheep prefer to manoeuvre in and around shelter and freestanding trees provided within a field rather than huddle against exterior shelter belts provided along fence lines. The effects of local climatic temperature 'extremes', wind direction, altitude and diurnal movements on daytime and night time preferences are also expected to play a role in the observed shelter-seeking behaviour and these data are currently being analysed.

Alexander G, Lynch JJ, Mottershead BE & Donnelly JB. (1980). "Reduction in lamb mortality by means of grass wind-breaks: results of a five-year study". *Proc. Australia Society Animal Production* **13**, p 329-332.

Trotter MG, Lamb DW, Hinch G, Guppy C. (2010) "Global Navigation Satellite Systems (GNSS) livestock tracking: system development and data interpretation". *J. Animal Production Science*. In Press

* Poster Presentation