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Silvopastoral sheep and cattle production systems in pine forest (*Pinus radiata* Don.) located in subhumid Mediterranean rangeland of Chile

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Key words : mediterranean rangeland ,silvopastoral ,pine forest ,livestock

Introduction In the last 25 years , the chilean forest sector has obtained an important development in country rangeland . The increase of forest plantations , mainly with radiata pine (*P. radiata*) and *eucalyptus* (*E. globulus*) , is due to the application of legal procedures and specific technologies for forest promotion . Some forest companies and farmers were considering the alternative of mixed use of pine plantations with livestock .

Materials and methods The study was carried out at Hidango Research Field Station (INIA) , located in the coastal ranges of Chile (34° 06' S L . , 71° 47' W L . , 296 m a s l .) , and considered the productive functioning of two silvopastoral systems : Merino sheep (SSS) : and Hereford cattle (CSS) , based on radiata pine planted in forest aptitude soils (V-VIIe) , between 1983 and 1984 . The initial plant structure of the selected surfaces (SSS : 78.3 and CSS : 119.7 hectares) , established in 1986 and 1988 , was (3 x 3) x 6 m (600 trees/hectare) and (2 x 3) x 6 m (700 trees/hectare) , respectively . The SSS operated in four paddocks . No 1 : subclover and hardinggrass pasture (8.3 hectares) and No 2-4 : annual Mediterranean pasture (23.4 , 23.4 and 23.2 hectares) , using a deferred-rotational grazing system , for 14 productive cycles (february , 1988 : first mating to november , 2001 : last weaning) . The CSS was managed in one paddock by using a continuous grazing system , for 11 productive cycles , which began with the period of mating : november-december / weaning : march , 1988-1990 and ended during the period 1998-2000 . Both sites were characterized by the conditions of soils , climate and vegetation . A systematic measurement of pasture variables , likes dry matter availability , botanical composition and bare soil , allowed to calculate the trend of pastoral value . The animals were weighted and the body condition measured . Daily records of births , lamb and calf , permitted to obtain the rates of birth , fertility , prolificity and weaning . The livestock production (liveweight and wool) per hectare was annually obtained . The carrying capacity was annually calculated and adjusted according to specific restrictions imposed by the production systems . The forest was characterized by annual measurements of tree density , total height , trunk diameter (1.40 m) , height of pruning , length and diameter of canopy . At the end , the forest sites were harvested and wood pieces and timber products were recorded (Squella , 2007) .

Results and Discussion Grazing and trees growth had the highest impact on botanical composition of pastures . The trend of pastoral value changed from regular condition (20.4 points) to very poor condition (9.1 points) in SSS , and maintained poor (14.2 to 11.2 points) in the CSS . The average carrying capacity was 1.47 and 1.53 sheep equivalent/hectare/year (6.2 ewes is equivalent to 1 cow) , respectively . The SSS and CSS produced an average of 37.5 and 33.5 kg of liveweight/hectare/year . The traditional sheep farm ranged from 1.00 to 1.32 sheep equivalent/hectare/year and produce , an average of 25 kg of liveweight/hectare/year (Squella *et al.* , 2005 ; Squella *et al.* , 2006) . The forest was also more productive in the SSS (2,119 inches/hectare) than the CSS (1,875 inches/hectare) .

Conclusions According to natural conditions and management practices , the livestock cycle persist for 14 years in the SSS and 11 years in the CSS . During the study , the SSS was 11.9 and 13.0% more productive in terms of livestock and timber , than CSS .

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