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Sheep as forest managers: Management of young forest stands by grazing sheep

Source: Michael Der Herden (EFI) & Joana Amaral Paulo (ISA)

Sheep are often used in landscape management and conservation, for example for preserving the open structure of traditional rural landscapes and biotopes. However, sheep can even be set to work in modern-day commercial forest management. In forest management, most stands need tending or pre-commercial thinning 10-20 years after stand establishment. These early forest operations usually do not give any financial return to the forest owner but they do improve the future growing conditions for the remaining trees. However, often these early thinning operations are neglected because they are expensive and the forest owner has to wait many years before he or she can see the benefit of the investment. Sheep grazing can save costs on early thinning operations while providing at the same time many other benefits. Even quite young spruce or pine seedling and mixed forest stands can be grazed by sheep. In this system, the farmer or forest owner can do less tending of young forest stands and the first thinning can be delayed which saves costs on forest operations.

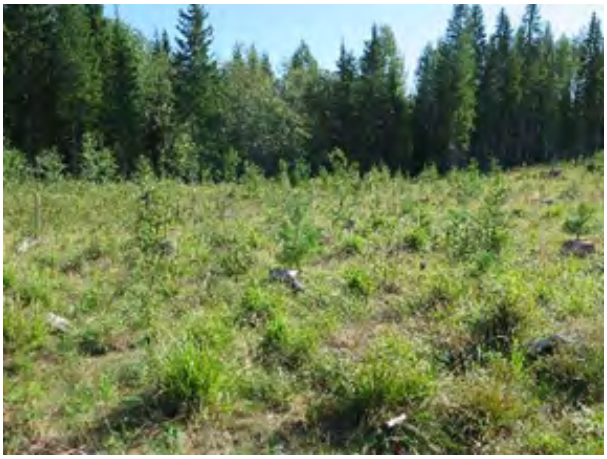

Figure 1. Regenerating Scots pine stand a couple of years after clearcutting. Sheep eat the grass and browse the deciduous trees but leave the young pines in peace. (Credits: Michael den Herder)

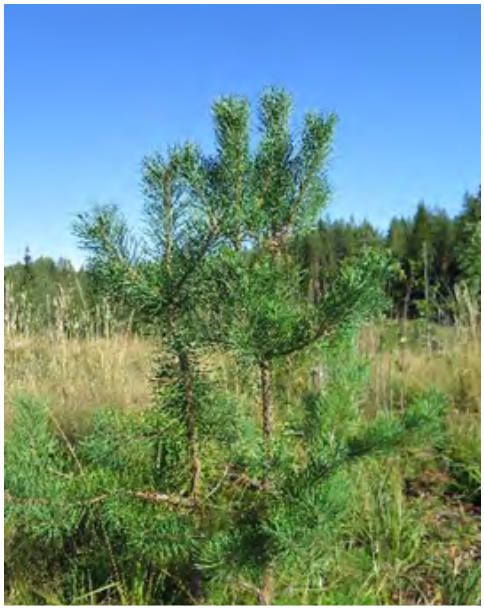

Figure 2. At appropriate stocking densities, sheep rarely damage pine seedlings (Credits: Michael den Herder)

Sheep are natural-born forest managers as they like eating willow, rowan, aspen and alder. These tree species are normally removed during tending and thinning of forest stands. Due to their particular feeding strategies (e.g. Castro and Fernández-Núñez 2016), when kept at appropriate stocking rate, sheep will leave the commercially more valuable forestry trees such as pine and spruce largely untouched. The appropriate stocking rate differs for different types of pasture and varies from 0.2-4 ewes per hectare (e.g. forest pasture: 0.2-1 ewe ha-1, wood pasture: 1.5-2.5 ewe ha-1, shore meadow: 2-4 ewe ha-1, dry meadow: 1.5-2 ewe ha-1, fresh meadow: 2-2.5 ewe ha-1) (Syörinki 2007). At too high stocking rates (ex: 7 – 10 ewe ha-1) (Anderson *et al.* 1985), sheep may also start eating pine and birch (leaves, needles and bark), but at an appropriate stocking rate, and when there is enough other deciduous browse and grass available, they will leave pine and spruce trees in peace.

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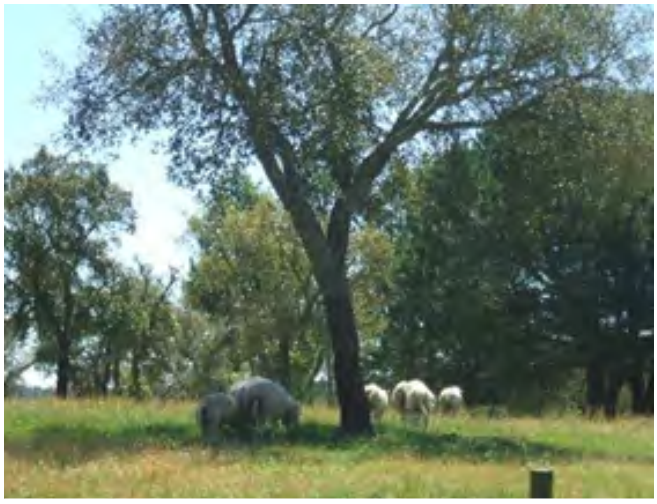

Figure 3. Sheep grazing in a cork oak montado in Portugal. (Credits: Joana Amaral Paulo)

Birch is browsed by sheep but in Finland birch regenerates in most cases quite abundantly anyway, so at least in more productive forests there shouldn't be a problem with birch regeneration. But, of course this is site dependent, and when practicing forest grazing you have to keep an eye on it to ensure that there is still sufficient natural regeneration. This concern is transversal to other silvopastoral systems, for example in montado and dehesa stands in the South of Europe covered mainly by cork and holm oak species. In these systems, recent scientific literature shows that limiting the quantity of livestock up to 0.40 Livestock Units per hectare (LU ha-1) (Arosa *et al.* 2017) and promoting a 5-year grazing period exclusion enhances shrub diversity and tree regeneration and establishment (Listopad *et al.* 2018), both crucial to maintaining sustainable oak populations.

There are not many studies giving advice on the most appropriate grazing stocking rates, which also depends on the productivity of the forest site. There are however many studies from all over the world documenting the practice of forest grazing (Ministry of Forests of British Columbia 2000, Salmon *et al.* 2007, Hjelford *et al.* 2014).

Sheep usually do not browse spruce but if they are kept at a too high stocking rate, it is of course possible. Because of the sheep's feeding preference, it is possible to apply this grazing system even in very young regenerating forest stands. In this system, the farmer saves money on forest tending and pre-commercial thinning operations. Trees harvested during tending and pre-commercial thinning are usually left in the forest to maintain nutrient levels of the site. Grazing can have similar impacts as tending and pre-commercial thinning, but it's a more natural way of managing the forest. Sheep will browse deciduous seedlings and saplings and in this way they simulate natural thinning of the stand. Like this, grazing reduces competition between the trees and has a positive impact on nutrient cyclingwhich is beneficial for the growth of the remaining trees.

Figure 4. Birch stand grazed by sheep. Most of the young regenerating deciduous trees and shrubs are eaten away by sheep saving costs on thinning operations and creating more space for the larger birches to grow (Credits: Michael den Herder)

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There are also other factors that influence tree regeneration. Previous research has shown that light to intermediate grazing can reduce vole abundance (den Herder *et al.* 2016, Schieltz & Rubenstein 2016). Reduced vole abundance is beneficial for tree regeneration as vole populations at high densities are able to wipe out whole annual cohorts of tree seedlings. However grazing shouldn't be too high densities because in addition to problems with tree regeneration, vole populations can be totally wiped out which will have a detrimental impact on birds of prey.

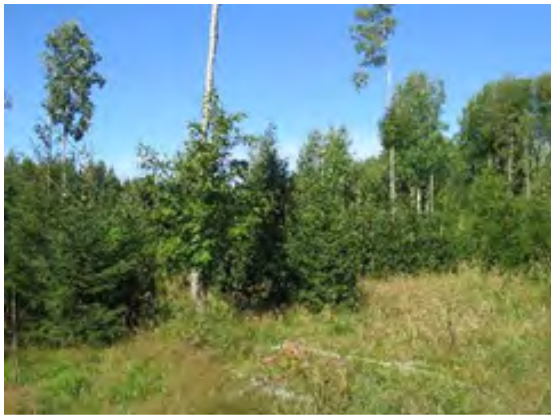
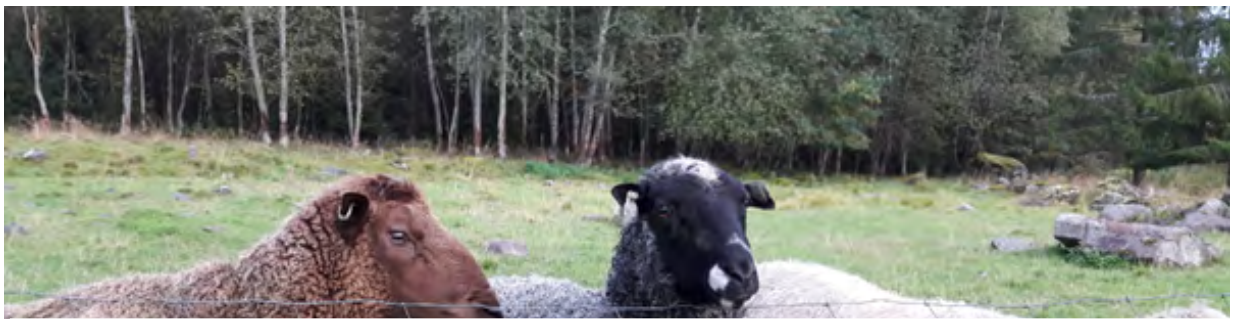


Figure 5. Young spruce forest grazed by sheep (Credits: Michael den Herder)

Other advantages are that the sheep have access to shade on hot summer days. Even in northern Europe, prolonged periods of very hot weather are expected to become more frequent in the near future and therefore it is important that the animals have access to shade. Another advantage is that in most cases no suplementary feeding is needed. Even in this year's extremely dry summer in Finland, Otto Makkonen, a sheep farmer from Savonranta, didn't need to buy any additional food for the sheep, as there was plentiful natural forage available. Because of the dry summer, the grazing season ended in mid-September, which is two weeks earlier than in previous years. Nevertheless, the system seems quite resilient against the impacts of climate change and Otto Makkonen didn't experience serious problems due to the exceptional summer drought.

There are more examples of how sheep grazing can be used in landscape and forest management. In southern Europe and dry parts of the US, sheep and goats are used to keep fire prone vegetation low in fire breaks. With ongoing climate change, forest fires are an increasing threat both in these region and also in northern Europe. In Finland, sheep are already used to keep the vegetation low under power lines and farmers can receive compensation for this service. Another efficient way of using sheep in landscape management is grazing on ski slopes, for example as practiced in the ski resort of Tahkovuori in southern Finland. Ski slopes are very hard to manage as it is difficult and dangerous to work with heavy machines on steep slopes, and in addition this kind of operation creates a serious erosion risk. Sheep are a very efficient in managing ski slopes. Ski slopes are managed in a more natural way, it creates much safer working conditions, there are opportunities for recreation and sustainable meat production and the sheep help to create more scenic landscapes.



Finn sheep (Suomen lammas) grazing under a power line. This is one option for making land use more efficient: it limits space that would otherwise be lost. (Credits: Michael den Herder)

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References

Anderson, G. W., Hawke, M., Moore, R. W., 1985. Pine needle consumption and bark stripping by sheep grazing annual pastures in young stands of widely spaced Pinus radiata and P. pinaster. Agroforestry Systems 3:1, 37–45. https://doi.org/10.1007/BF00045737

Arosa, M.L., Bastos, R., Cabral, J.A., Freitas, H., Costa, S.R., Santos, M., 2017. Long-term sustainability of cork oak agro-forests in the Iberian Peninsula: A model-based approach aimed at supporting the best management options for the montado conservation. Ecological Modelling 343, 68–79. https://doi.org/10.1016/j.ecolmodel.2016.10.008

Castro, M., Fernández-Núñez, E., 2016. Seasonal grazing of goats and sheep on Mediterranean mountain rangelands of northeast Portugal. Livestock Research for Rural Development 28: 5, p. 1-13. http://www.lrrd.org/lrrd28/5/cast28091.html

den Herder, M., Helle, S., Niemelä, P., Henttonen, H., Helle, T., 2016. Large herbivore grazing limits small mammal densities in Finnish Lapland. Annales Zoologici Fennici 53, 154–164. https://doi.org/10.5735/086.053.0404

Hjeljord, O., Histøl, T., Wam, H.K., 2014. Forest pasturing of livestock in Norway: effects on spruce regeneration. Journal of Forestry Research 25, 941–945. https://doi.org/10.1007/s11676-014-0487-5

Listopad, C.M.C.S., Köbel, M., Príncipe, A., Gonçalves, P., Branquinho, C., 2018. The effect of grazing exclusion over time on structure, biodiversity, and regeneration of high nature value farmland ecosystems in Europe. Science of The Total Environment 610-611, 926–936. https://doi.org/10.1016/j.scitotenv.2017.08.018

Ministry of Forests of British Columbia, 2000. Sheep grazing in Forestry. Silvicultural Note 26. Available online at: https://www.for.gov.bc.ca/hfp/publications/00127/SN26.pdf

Salmon, O. et al., 2007. Forest Grazing: Managing your Land for Trees, Forage, and Livestock. Utah Forest Facts. Extension of the Utah State University. Available online at: https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1312&context=extension_curall

Schieltz, J.M., Rubenstein, D.I., 2016. Evidence based review: positive versus negative effects of livestock grazing on wildlife. What do we really know? Environ. Res. Lett. 11, 113003. https://doi.org/10.1088/1748-9326/11/11/113003

Syörinki, R. 2007. Maisemalaiduntaminen - Opas käytännön toteuttamiseen [in Finnish: Landscape grazing – a guide to practical management]. Maa- ja metsätalousministeriö, available online at: https://www.laidunpankki.fi/attachments/text_editor/140.pdf

Other useful materials on forest grazing:

Grazing bank (Laidunpankki), information on natural grazing in Finnish:
https://www.laidunpankki.fi/sivu.tmpl?sivu_id=242

Links to some Finnish farms practicing forest grazing:

- Vaahermäen tila: http://vaahermaki.blogspot.com/
- Sammallahden tila: http://www.sammallahdentila.fi/
- Putkisalon kartano: https://www.putkisalo.fi/putkis/index.php