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Impact of tree planting configuration on canopy interception and soil hydrological properties: Implications for flood mitigation in silvopastoral systems

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Compaction of upper soil layers by intensive sheep grazing has been connected with increased local flood risk in silvopastoral systems. A 12 week field study was conducted at the Henfaes Research Station near Bangor, Wales to compare two silvopastoral configurations, trees planted in fenced off clumps and trees planted evenly spaced, in terms of canopy throughfall, soil water infiltration and soil bulk density. The study's aim was to characterize the potential of these tree planting configurations to reduce local flood risk. The study site (Henfaes) was established in 1992 on 14 ha of agricultural land and is part of the Silvopastoral National Network Experiment sites that have been set up across the UK to examine the potential of silvopasture and agroforestry on UK farms. Automated throughfall gauges were installed in each silvopastoral treatment along with a similarly designed control gauge located in the grazed control pasture. Soil water infiltration and bulk density were measured 20 times in a stratified random design for each treatment and the control. Soil infiltration capacity in the clumped configuration was significantly higher than in the even spaced configuration and control pasture. The clumped configuration had mean infiltration capacity 504% greater than the control pasture and 454% greater than the even spaced configuration. Canopy interception was higher in the clumped trees than in the evenly spaced trees. Average canopy interception was 34% in the clumped treatment and 28% in the evenly spaced treatment. Soil bulk density was lower in the clumped configuration than in the control pasture and evenly spaced configuration. Results suggest that in silvopastoral systems the clumped tree configuration is more likely to reduce local flood risk than the evenly spaced tree configuration due to enhanced infiltration and increased canopy interception.