Manaaki Whenua
Landcare Research

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TE WHARE WĀNAKA O AORAKI

The effect of hill country topography on subterranean clover development

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Background

- Subterranean clover (*Trifolium subterraneum L.*) is a valuable component of regenerative agricultural systems. This legume naturally regenerates from seeds set in previous seasons, which eliminates the need for re-sowing because it maintains a seed bank of 'hard' seeds. The ability to avoid drought by producing dormant seeds and burying them, ensures survival and persistence (Moss et al. 2022).
- Subterranean clover provides high-quality (ME and crude protein) biomass during late winter and early spring and fixes atmospheric nitrogen. This contributes to nitrogen cycling, and pasture productivity.
- We quantified subterranean clover life cycle at multiple scales to optimize the use of subterranean clover for animal productivity given the importance to both local and nationwide pasture productivity and persistence in hill country landscape.

Keywords: Grassland, legume, microclimate, phenology, regeneration

Methods

Phenological events in complex hill country topography were evaluated on a nationwide aspect map raster of the slope direction of each cell created from a digital elevation model (DEM) using GIS. Aspect is the compass direction that a slope faces which determines microclimate, vegetation, and soil erosion of a hill country terrain.

Slopes were classified as warm (north, northeast, northwest, west) and cool (south, southeast, southwest, east) aspects. The assessment included the areas above 15 degrees because the aspect effects on relatively flat areas were minor. The vegetative (fourth trifoliate leaf, V6) and reproductive (50% plants flowering, R3) phenophases were quantified by considering a mean value estimated (expressed as Julian days) from a 45-year timespan (1972-2017) for late flowering cultivars.

Regressions were derived from field observed data and published datasets (AgYields, 2023).

Only sowing periods occurring in a decreasing photoperiod direction (autumn to winter) were considered (Guo et al. 2022).

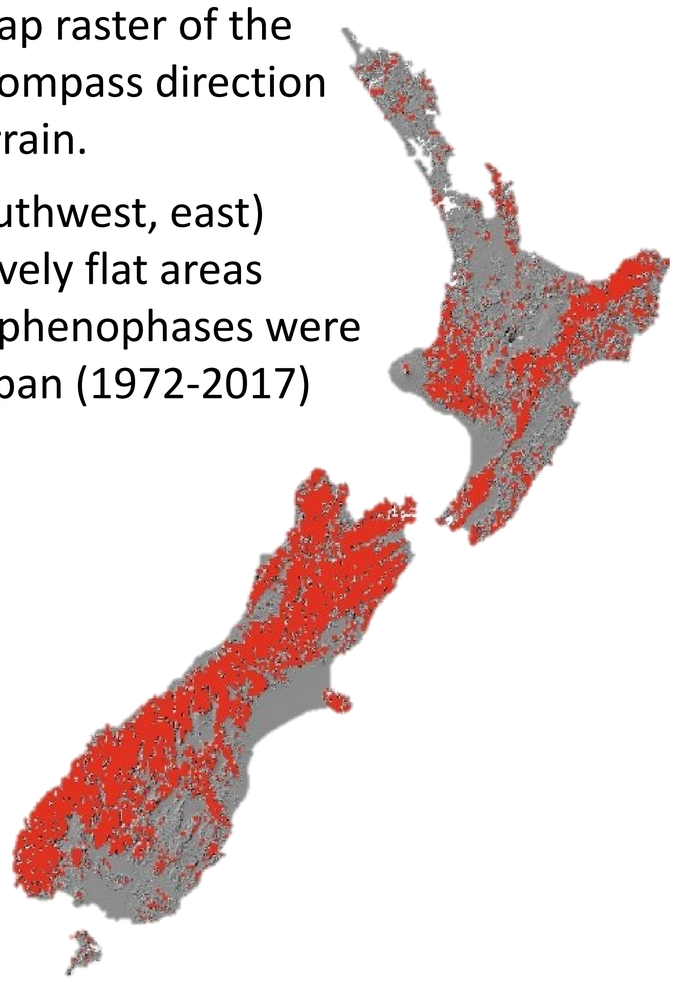


Figure 1. New Zealand map displaying the selected hill country zones. The red pixels represent the >= 15-degree slopes.

Results

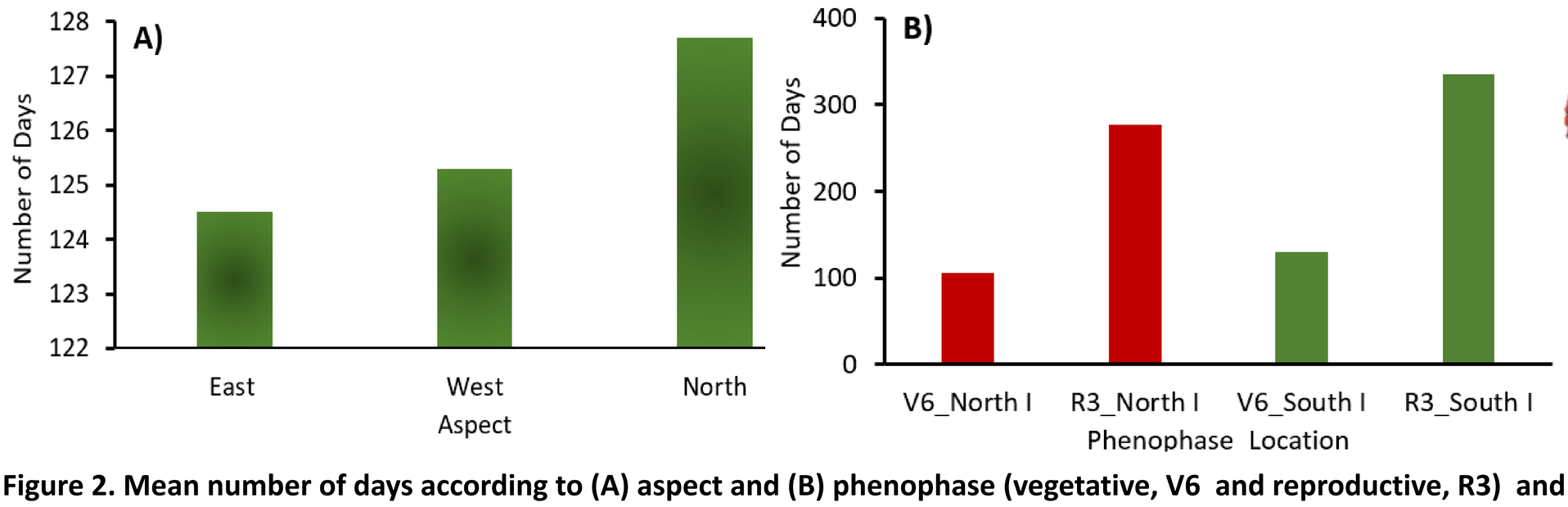
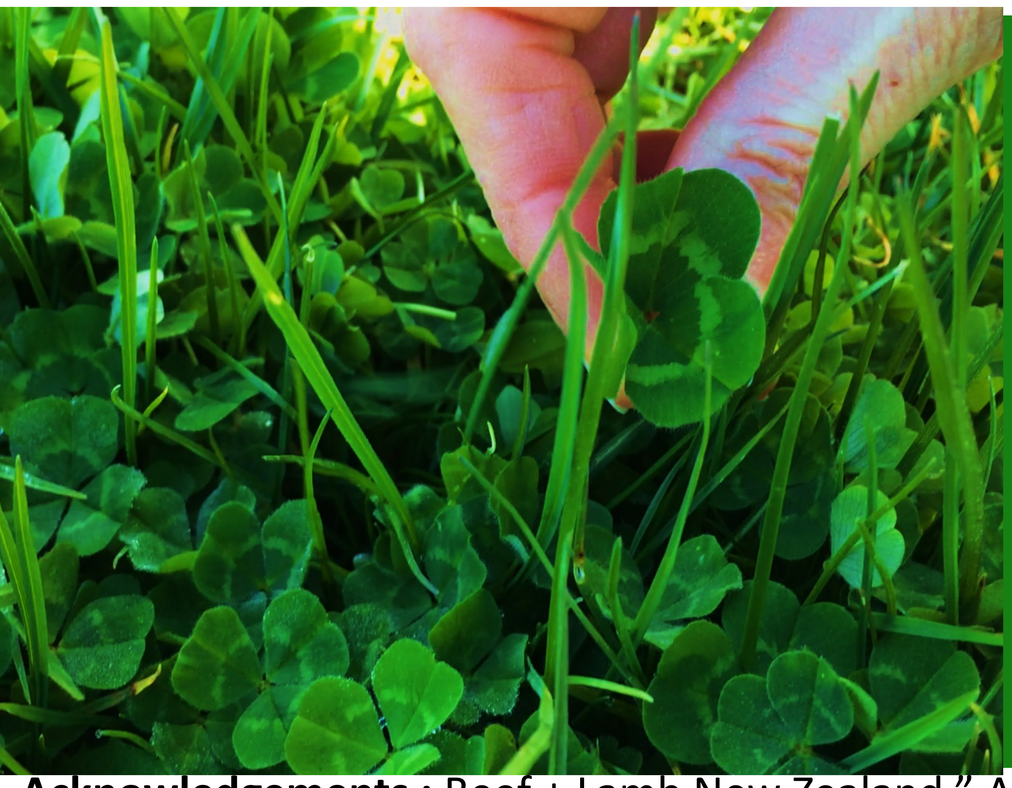


Figure 2. Mean number of days according to (A) aspect and (B) phenophase (vegetative, V6 and reproductive, R3) and location (North and South Island).



Conclusions

- Late maturity cultivars grown in the north slopes had a longer vegetative phase (127.7 ± 15.26 days) than those grown in east and west slopes. On the northern aspects of the North Island plants reached V6 and R3 about a month earlier than in the southern aspects of the South Island.
- Understanding how subterranean clover phenological development changes with aspect can assist agronomic management decisions on a catchment or farm level.
- It ensures that forage of higher quality and yield can be integrated on hill country farm systems and allows farmers to make informed decisions around pasture management for more resilient and longer lifetime pastures.

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