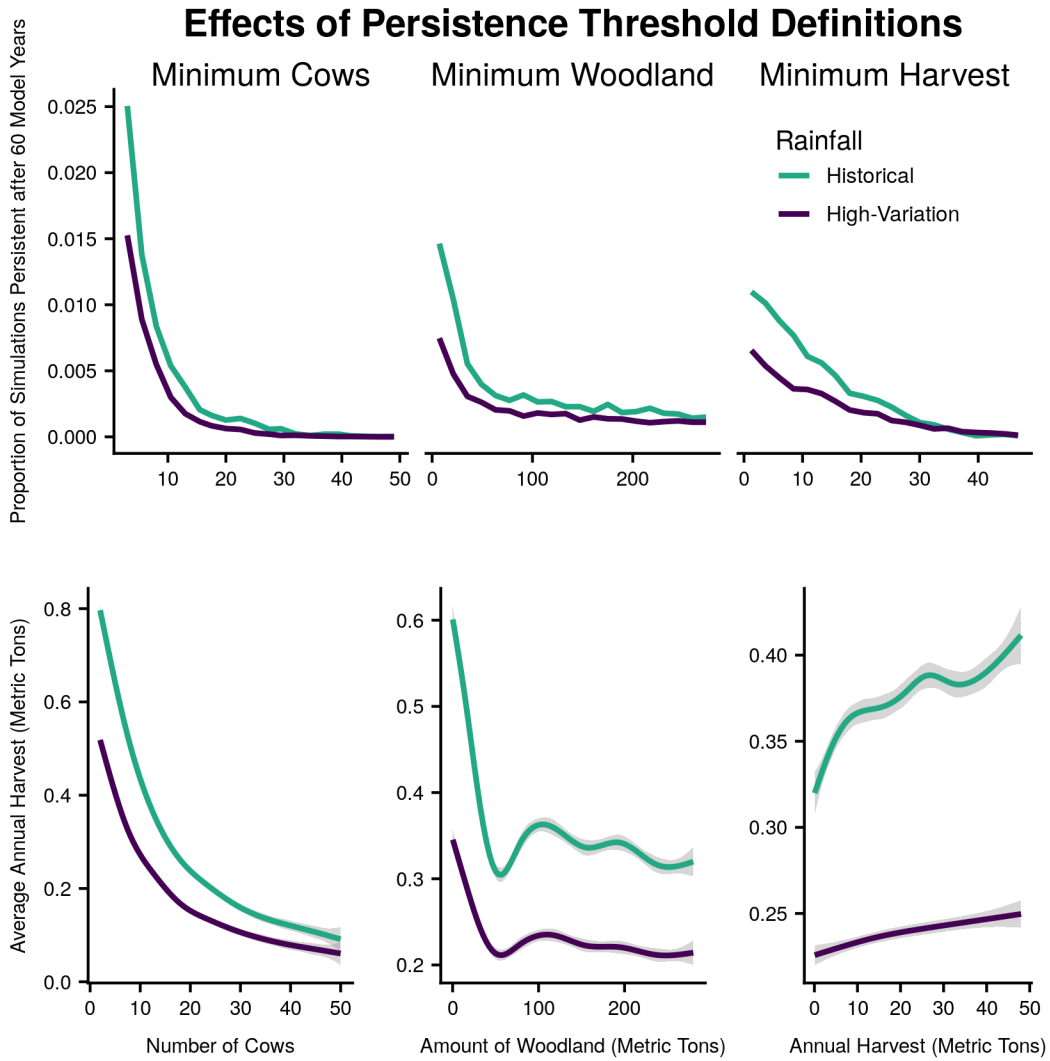
Appendix 4. Effects of differing persistence thresholds on the two outcome variables (persistence and annual average harvest).

Figure A4.1: Proportions of model runs that successfully lasted 60 years (top) and the average annual harvest of these models (bottom), as influenced by randomly chosen persistence thresholds (ranging from biological minima to community-chosen minima). Proportions are calculated for 20 different bins of each threshold, and a Generalized Additive Model smoothing spline is used to show the trend in average annual harvest (gray bands show 95% credible intervals). Each column shows the effects of the minimum threshold for cows (left), woodland biomass (center), and harvest (right) Models using the historical rainfall time-series are shown in light green, with high rainfall variation scenarios shown in dark blue. High rainfall variation models have consistently worse outcomes.



Note that the persistence rates are much lower for this analysis (which includes ten permutations of the simulation dataset with differently selected random persistence thresholds for each, resulting in 960,000 simulations for each of the two rainfall scenarios) than the previous analyses (which only included the 96,000 runs per rainfall scenario and used biologically minimal persistence thresholds). This analysis also averages over all categorical management interventions.

The thresholds differed in how quickly they caused models to fail: model persistence was highest for low cow minimum thresholds (as high as 2.5%), but this decreased rapidly, as opposed to the definition of the woodland minimum, which had lower initial persistence (1.5%) at the biological minimum, but then models remained persistent over a wider range of woodland thresholds, with persistence never falling to zero. Crop thresholds began the lowest of all (around 1% of models persisted all 60 years, even with a biologically minimal threshold definition), and decreased much more slowly than the other two thresholds, eventually reaching zero at Muonde's desired threshold of 48 metric tons per year. Cows are thus more expensive, ecologically, to maintain at a higher quantity, which is consistent with their position at a higher trophic level (subject to the efficiencies associated with consumption of a resource).

The average annual harvest is less for simulations with higher required amounts of cows and woodland, but this tradeoff is strongest for cows, while increasing the woodland threshold has the greatest impact at low thresholds: above roughly 100 metric tons, requiring more woodland does not drastically change the amount of harvest. As the harvest amount required for persistence increases, the average harvest increases as well because the persistence thresholds eliminate the models with smaller average harvests.