ABM output indicators computing

Assumption 1 cell = 1 ha

Indicator	values	formula	ref
Agricultural production (crop yield)	20 t/ha perenial crops 9 t/ha crops	Cell type*associated value	Vannier et al 2022
Agricultural production (livestock yield)	380 t/ha intensive pasture 150 t/ha extensive pasture	same	Vannier et al. 2022
Carbon stock (CO2eq)	25 t/ha exotic forest 8 t/ha natural forest	Setup value = (cell type*associated value)*cell age Tick value = (Cell type*associated value) + previous value	
Greenhouse gas emissions (CO2eq)	95 CO2eq/ha annual crop 90 CO2eq/ha perennial crops 480 CO2eq/ha intensive pasture 150 CO2eq/ha extensive pasture	(Cell type*associated value)	
Profitability ($)	50000 $/ha artificial 2000 $/ha annual crop 15000 $/ha perennial crop 4000 $/ha intensive pasture 1400 $/ha extensive pasture 1150 $/ha exotic forest	(Cell type*associated value)	
Landscape diversity	Shannon index	(Chat GPT request) `to calculate-shannon-index` `  let values-list [my-value] of patches` `  let total-patches count patches` `  ifelse total-patches > 0 [` `    let frequency-list map [count patches with [my-value = ?]] unique-values values-list` `    let probabilities map [? / total-patches] frequency-list`	Shannon Diversity Index: Definition & Example - Statology

		`` ; Compute Shannon Index set shannon-index - sum (map [? * ln(?)] probabilities)] [set shannon-index 0 ; If there are no patches, set Shannon Index to 0] print (word "Shannon Index: " shannon-index) end ```	
Contiguity index (describe the landscape in 1 value indicating how well or not is the landscape clustered or heterogeneous)		``` to calculate-contiguity-index let contiguity-index 0 ask patches [let neighbors-with-same-value neighbors with [my-value = [my-value] of myself] ifelse any? neighbors-with-same-value [let weighted-contiguity sum [1 / distance myself] of neighbors-with-same-value set contiguity-index contiguity-index + weighted-contiguity] [; Handle case when there are no neighbors with the same value set contiguity-index contiguity-index + 0]] set contiguity-index contiguity-index / (count patches) print (word "Contiguity Index: " contiguity-index) end ```	(P5) Contiguity Index (fragstats.org)
Pollination	Concerns the scrub and crops (annual and perennial) cells. Value = the number of cells where pollination service is delivered / number of crop cells (annual + perennial)	Simplest way consists in analysing the presence of scrub cell within the neighbourhood (500m = 4cells) of a crop patch (perennial or annual). Report 1 if yes and 0 if no. Add the number of cells=1 and divide by the total number of crop cells (annual and perennial)	Inspired from Richards et al

Bird habitat suitability	Concerns the perennial crops and forest (exotic+natural) cells. Value= the number of cells where the habitat quality is ok for native birds (like Kereru) / total number of cells	Simplest way consists in analysing all concerns cells: is this cell surrounding by at least 19 patches of LU 4, 8 or 9 ? Report 1 if yes and 0 if no. Add the number of cells=1 and divide by the total number of cells.	Inspired from Richards et al