ABM output indicators computing

Assumption 1 cell = 1 ha

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| 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    ; 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 | [Shannon Diversity Index: Definition & Example - Statology](https://www.statology.org/shannon-diversity-index/) |
| 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)](https://www.fragstats.org/index.php/fragstats-metrics/patch-based-metrics/shape-metrics/p5-contiguity-index) |
| 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 |