Using the spreadsheet Rabbits\_2023.xlsx, answer the following:

1. Does the addition of density dependence affect the decision?

If we assume density independence, the optimal solution is to allocate all the funding to fencing (and improve adult survival). If we assume density dependence, the decision changes. So, the model uncertainty (not knowing what model is correct) is *decision-relevant uncertainty*.

1. What is the optimal allocation of the budget under the density dependent model?

If we assume the model with negative density dependence only (i.e., no depensation), the optimal solution is to allocate 31% of the budget to habitat restoration (and thereby improve reproduction) and the remaining 69% to fencing (and thereby improve adult survival).

1. Does the addition of depensation affect the decision?

At N(A) = 800, depensation does not affect the decision. That is, the decision is the same as under the model with negative density dependence only.

1. At what point does depensation affect the decision?  Hint: change values for N(A) in cell S4: the population size at which the Allee effect kicks in

Depensation begins to affect the decision at N(A) > 1000. When depensation is present and habitat restoration isn’t contributing to increasing the breeding rate, the breeding rate declines linearly from 2 at N = N(A) to 0 at N = 0. However, if we are above N(A), the breeding rate will increase from a minimum of 2 to a maximum of 5 as the proportion of funding for habitat restoration increases from 0 to 1. As we set N(A) to larger and larger values, an increasingly large amount of our budget will optimally be allocated to fencing (rather than habitat restoration) because we need to improve survival to get the population above the threshold. Once N(A) > 1275 or so, we would optimally allocate all funding to fencing. If we set N(A) = 800, the population never experiences these conditions (because initial population size is 1000).