Grapevine disease simulation

Here we have simulated the spread of a disease through a grape vineyard. The grey area represents uninfected grapevines. Grey squares turn green when they become infected.

The spread of the disease is determined by 3 parameters:

1. The dispersal parameter (α) determines how far the pathogen is likely to spread from one vine to another
2. The vine-to-vine spread parameter (β) determines the rate at which a new vine becomes infected if it comes into contact with the pathogen
3. The external infection rate (ε) determines the rate at which vines become infected from sources outside the vineyard.

Questions for exploration

1. Modify the value of each parameter. Which one seems to affect disease spread the most?
2. Which combination of parameter numbers produces clumps or clusters of disease?
3. We study Pierce’s disease of grapevines—a disease spread by insect vectors. What combination of parameter numbers do you think would simulate a vector-borne disease?