globals [ill-deaths total-deaths]
turtles-own [  
  energy ;; for keeping track of when the turtle is ready to reproduce and when it will die of starvation  
  sick ;; for keeping track of turtle health  
  time-sick ;; time in ticks since last becoming sick  
]
to setup  
clear-all  
setup-patches  
setup-turtles  
reset-ticks  
end

to setup-patches  
  ask patches [ set pcolor green ]  
end

to setup-turtles  
  create-turtles number ;; uses the value of the number slider to create turtles  
  ask turtles [  
    setxy random-xcor random-ycor  
    set color yellow  
    set sick false ;; initially healthy  
  ]  
  ask one-of turtles [set color red set sick true] ;; select a turtle at random to be sick  
end
to go  
  if ticks >= 500 [ stop ] ;; stop after 500 ticks  
  move-turtles  
eat-grass  
check-disease  
check-death  
reproduce  
regrow-grass  
tick ;; increment the tick counter and update the plot  
end

to move-turtles  
  ask turtles [  
    right random 360  
    forward 1  
    set energy energy - 1 ;; when the turtle moves it looses one unit of energy  
  ]
to eat-grass
  ask turtles [ 
    if pcolor = green [  
      set pcolor black  
      ;; the value of energy-from-grass slider is added to energy  
      set energy (energy + energy-from-grass)  
    ]
    ifelse show-energy?  
      [ set label energy ] ;; the label is set to be the value of the energy  
      [ set label "" ] ;; the label is set to an empty text value  
  ]
end

to reproduce
  ask turtles [ 
    if energy > birth-energy [ 
      set energy energy - birth-energy ;; take away birth-energy to give birth  
      hatch 1 [ set energy birth-energy ;; give this birth-energy to the offspring  
        set sick false ;; born healthy  
        set color yellow  
      ]  
    ]
  ]
end

to check-death
  ask turtles [ 
    if energy <= 0 [ 
      set total-deaths total-deaths + 1  
      die ] ;; removes the turtle if it has no energy left  
  ]
end

to regrow-grass
  ask patches [ ;; 3 out of 100 times, the patch color is set to green  
    if random 100 < 3 [ set pcolor green ]  
  ]
end

to check-disease
  ask turtles [ 
    ifelse sick [ ;; if sick  
      set time-sick time-sick + 1  
      if time-sick >= illness-length [ 
    ]
  ]
set ill-deaths ill-deaths + 1
set total-deaths total-deaths + 1
die]]
[ ;; if not sick
let x min-one-of other turtles in-radius 3 [distance myself]
if (x != nobody) and ([sick] of x) []
set color red
set sick true
set time-sick 0]]
]
end