

Save your Spuds game

In this game there are four different weather conditions:



You have to decide:

1. Resistant or Susceptible Potatoes?

You will need to decide whether you want to invest in resistant potatoes or susceptible potatoes. If there's high risk of disease, you could benefit from resistance but if there's a low disease risk, you might want to save your money by buying susceptible potatoes.

2. Spray or not spray?

You also have to decide whether you want to spray fungicides by spinning the 'weather wheel', which gives a forecast for the month and a corresponding disease risk. If you don't spray when there's a high risk of disease, you could end up losing a lot of your potato crop!

Weather Conditions

Plant pathogens require specific conditions to spread and infect plants. For instance, most fungi and bacteria require moisture.

Each year, weather conditions vary, and so do the numbers of plant pathogens. For example, if there is more rain one summer, this could favour the spread of plant pathogen *Phytophthora infestans* and cause higher levels of the plant disease it causes: potato late blight.

Potato late blight

Under certain weather conditions, potato late blight can destroy whole fields of potatoes in just two weeks. Spraying fungicides can help to control the disease, but these are expensive and so it's vital to spray them when they'll be the most effective, e.g. when the weather conditions are favourable for the pathogen to infect.

Which conditions?

The ideal conditions for infection:

- Humidity: very high (above 90%) for more than 15 hours.
- Temperature: around 15°C at night and around 25°C in the day.

Why?

P. infestans produces mobile spores called zoospores when temperatures are around 15°C. Zoospores spread when humidity is high and there is enough moisture around for them to swim over plants and infect. At the optimal temperature of around 25°C, zoospores form tubes to penetrate and infect plants. Temperatures above 30°C are too hot and reduce pathogen growth.

Prevention is key

It's really difficult to get rid of a pathogen once it's inside a plant and so preventing infection is key. Farmers use weather forecasts to predict when plant disease levels might be higher and so prompting them to spray fungicides to try to prevent infection.

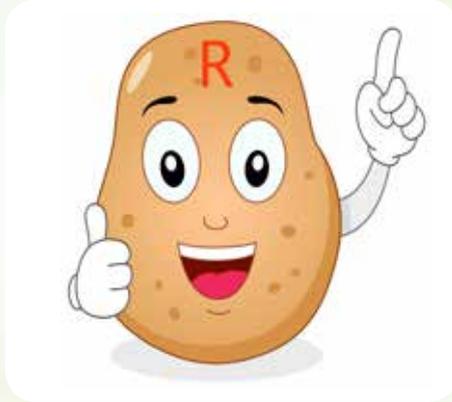
Choose your spuds

Farmers decide which potatoes they want to grow; some potatoes are able to resist potato late blight disease better than others.

Resistant 'R' Potatoes

Resistant potatoes have receptors, which are able to recognise the *P. infestans* pathogen. Once they've recognised the pathogen, they prevent it from infecting and causing disease.

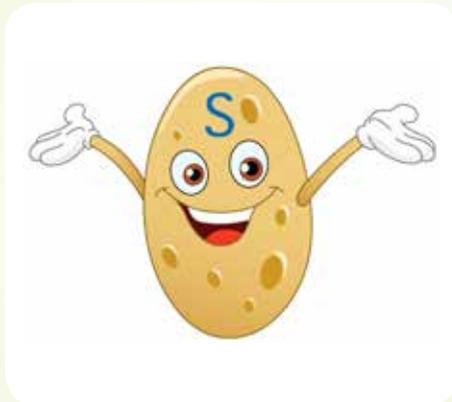
These resistant potatoes tend to be more expensive. In the game, it costs £3000 for 5 tonnes of resistant seed potatoes.



Susceptible 'S' Potatoes

However most UK potatoes lack the receptors and are not able to recognise *P. infestans*. This means the pathogen is able to infect and cause disease.

Susceptible potatoes tend to be cheaper than resistant potatoes. In the game, it costs £2000 for 5 tonnes of susceptible seed potatoes.



What else is going on?

Growing resistant potatoes can reduce the need to spray fungicides. However, although a potato is resistant to late blight disease, it can still be susceptible to other devastating pathogens, including nematodes, bacteria, oomycetes and fungi. Unfortunately, there are also many different strains of *P. infestans*, and so it's difficult to produce a potato which is resistant to all strains.

Spraying

Farmers can spray fungicides to try to protect their potatoes from potato late blight disease.

What are fungicides?

Fungicides are chemical compounds used to kill and/or prevent the growth of fungi and their spores.

P. infestans is an oomycete, which is a fungus-like organism and uses the same mechanism to infect plants. This means fungicides can be used to prevent *P. infestans* infection.



When are they used?

Farmers decide when to spray fungicides, depending on weather conditions, which help to predict the levels of *P. infestans* risk. When fungicides are sprayed there should be a reduced level of disease.

Benefits

Spraying fungicides when they're needed, can help save lots of potatoes from late blight disease and help boost profits.



Costs and risks

Spraying fungicides when they're not needed means less profit for the farmer. In the game spraying fungicide costs £350 per spray.