



## SESSION 4

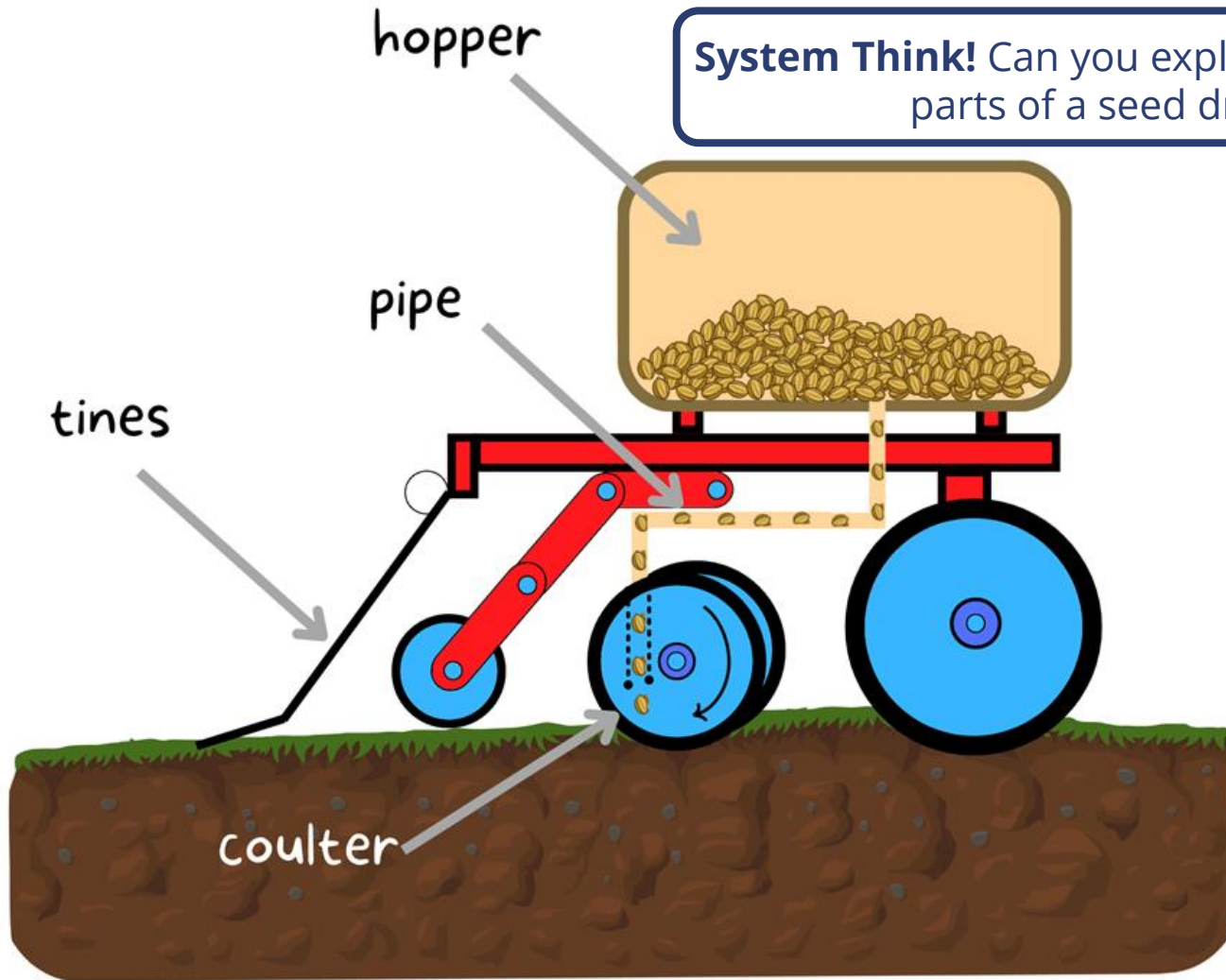
How can we engineer solutions to protect the soil?



# Which is which?



**System Think!** Can you explain how the component parts of a seed drill make up the system?

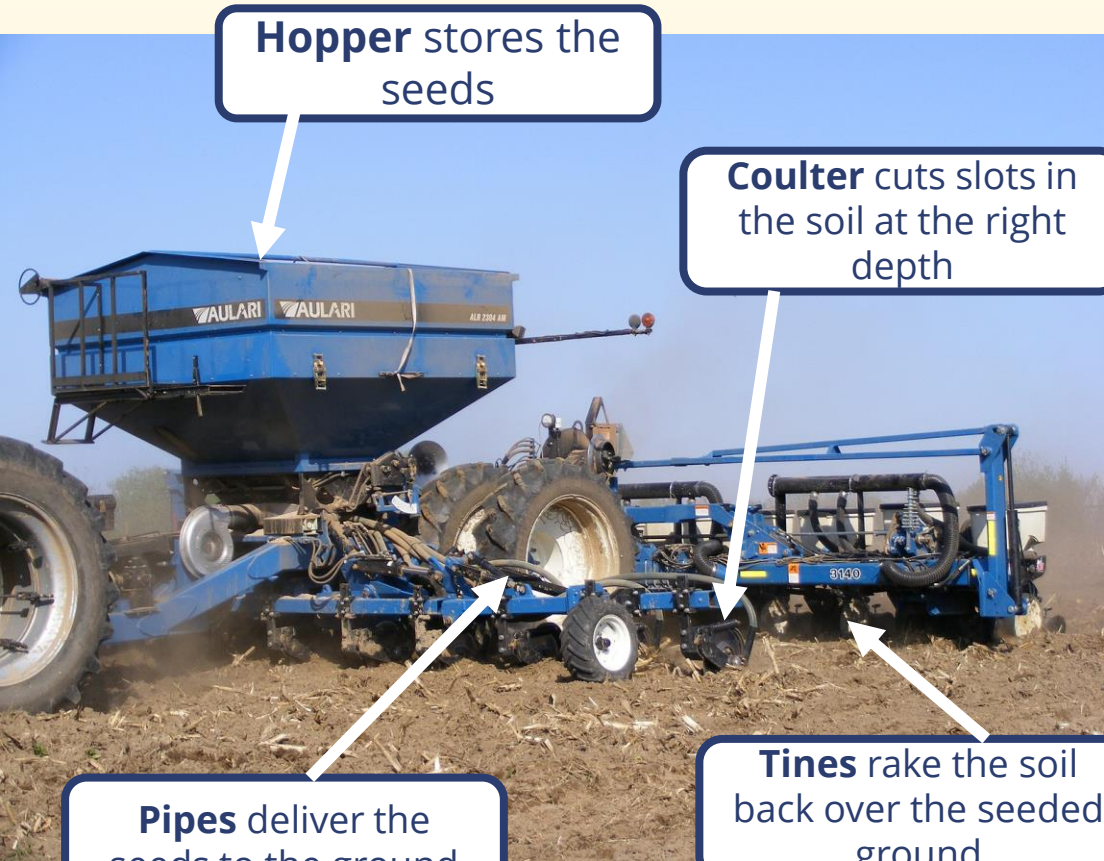


**Hopper:** Stores the seeds to be planted above the rest of the machine so that the force of gravity helps them fall through to be planted.

**Pipe:** A shoot for the seeds to travel through, from the hopper to the soil.

**Coulters:** Cuts a slot in the soil at just the right depth for the seeds to fall into.

**Tines:** Always at the back of the seed drill to rake the soil back over the soil when the seeds are dropped.



**Hopper** stores the seeds

**Coulter** cuts slots in the soil at the right depth

**Pipes** deliver the seeds to the ground

**Tines** rake the soil back over the seeded ground

# How do arable farmers sow seeds?

**Seed drills:** are pulled behind tractors and cut a trench in the soil. They drop seeds into the trench and then cover them over with soil.

**Why might the soil on top be good for the seeds to grow?**

# Soil Saver Challenge

What's the farmer's problem?

"I need to sow my seeds evenly without compacting the soil too much, as this can mean the plants don't grow as well."



## The engineering design task

Can you find a way to make a simple seed dropping device which helps the farmer to solve his compaction problem?

Farmers use special machines called seed drills to make sure that the seeds are planted evenly. These machines can be very heavy and cause the soil to become compacted which can make it hard for a plant's roots to reach enough oxygen and water. The heavier the machinery the more likely that compaction will happen. Your challenge is to come up with an idea for a lightweight alternative.

## Available resources:

For wheels & axles - cardboard, straws, dowel, skewers;  
For the body and hopper - tissue box, cardboard tubes, plastic bottles/box;  
For the seeds - seeds/ice marbles/beads;  
Other useful materials:  
corrugated cardboard, craft sticks, paper cups, masking tape, glue, scissors, rubber bands.

## What is the design brief?

Use drawings and/or 3D models to create a prototype of a seed dropping device that reduces the chance of soil compaction.

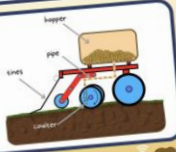
Your design will need to meet the following criteria:

- Seeds should be dropped automatically (not by hand)
- It should touch the ground when seeds are being dropped
- Should be operated by only one person
- Seeds should be dropped or 'planted' in a straight line
- Seeds should be a similar distance apart

## Top tips to get started:

Think about the component parts of a seed drill system:

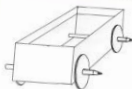
- What does the hopper and pipe do?
- What could you use for these parts of the system?
- Where will you have seed storage?
- What will stop seeds falling out?



## Background information:

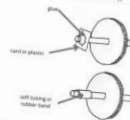
How will you make a moving vehicle?

There are different ways to fix wheels.



You could use pencils, chopsticks, dowelling or skewers as axles.

Placing your axles through a straw can help stop the wheels rubbing.



Wheels can be attached to the axle with card, plastic, tubing, glue or rubber bands.

Think about the system used in a seed drill. How could you adapt your vehicle so that it drops seeds as it moves along?

If you are stuck for ideas take a look at the [Soil Saver Challenge Get Yourself Unstuck Guide](#)

## Glossary:

**Seed Drill** - a device used to sow seeds for crops by positioning them in the soil and burying them to a specific depth while being dragged by a tractor.

**Hopper** - stores the seeds to be planted above the rest of the machine so that the force of gravity helps them fall through to be planted.

**Pipe** - a shoot for the seeds to travel through, from the hopper to the soil.

**System** - a set of related parts or components that work together to produce an outcome.

**Axle** - a rod on which one or more wheels can rotate, either freely or be fixed to and turn with the axle.

**Axle holder** - the component through which an axle fits and rotates.

## More information and inspiration!

Take a look at these videos of other people's solutions to the problem to get some ideas:

- [Loop Roll Roller](#)
- [Tissue Box Tractor](#)

## Want to take it further?

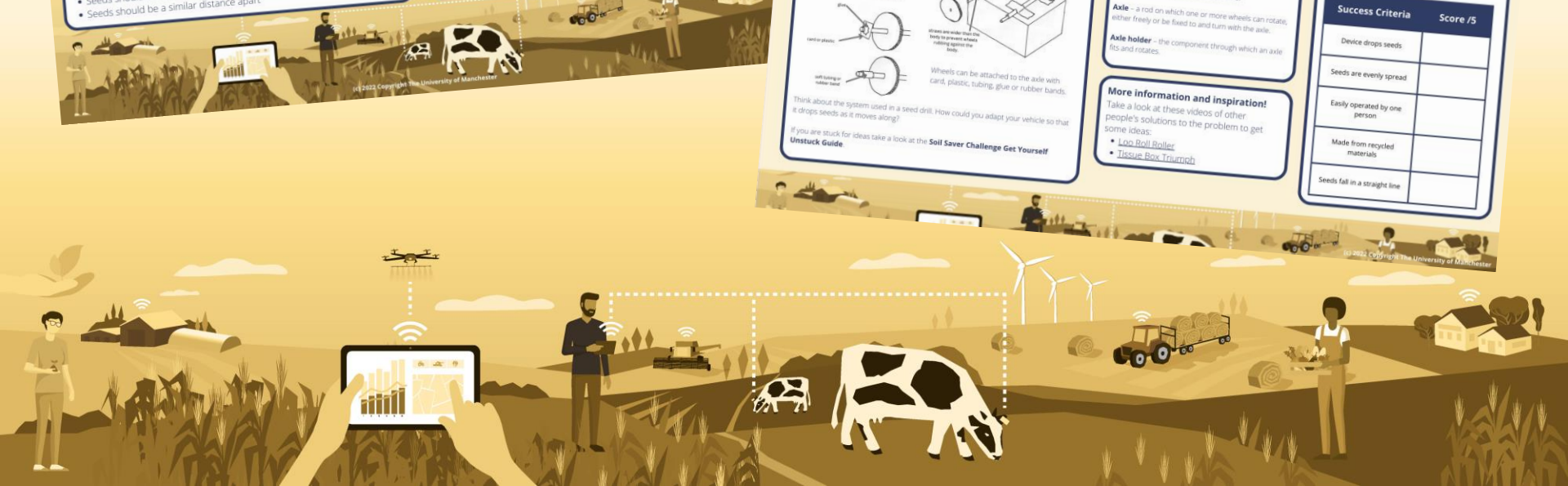
Can you consider how you can improve your machine to:

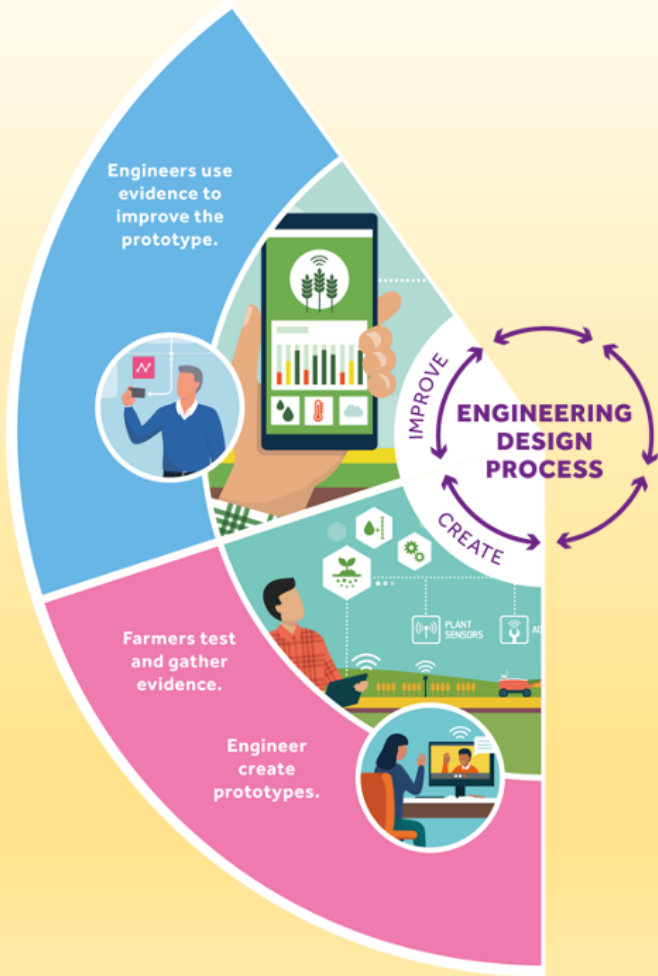
- hold more seeds?
- drop seeds further apart?
- plant larger seeds?

## How well did you do?

Use the problem-solving score card to evaluate how well you performed in this design and make/create task?

Success Criteria	Score /5
Device drops seeds	
Seeds are evenly spread	
Easily operated by one person	
Made from recycled materials	
Seeds fall in a straight line	





Today we have been working like an engineer by **creating and improving** a prototype seed dropper to reduce the problem of soil compaction.

# Can adapt your prototype to meet these farmers' needs?

I NEED THE SEED DROPPER TO HOLD LARGER SEEDS.



I NEED THE SEEDS TO BE DROPPED FURTHER APART.



I NEED THE SEED DROPPER TO CARRY MORE SEEDS.



# SOIL DEFENDERS

