

# Tractors and Harvesting

## Introduction

These materials are intended to provide lesson ideas for Science and Literacy. The ideas and materials are suitable for children at KS1 and KS2 although some differentiation will be necessary for the youngest children. In particular, younger children will not be able to follow the written instructions on the pupil sheets. However, they should be able to manage the practical activity with support. The materials focus on some problems farmers might face at harvest time.

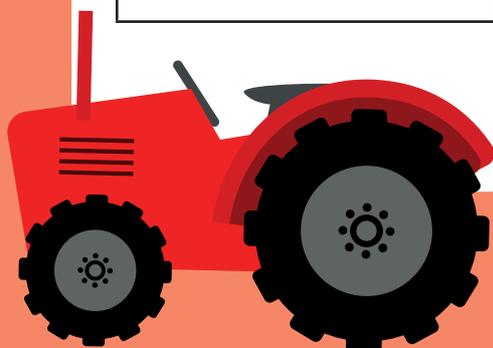
## Project overview

Stage	Time	Overview
1: Main presentation	10-15 mins	A presentation describing harvesting crops, field size, the importance of hedgerows and tractors.
2: Investigation work	40-120 mins	Children investigate the effect tractor tyre diameter and tractor weight have on soft ground through modelling. The children use balls of different diameters to model different tractor tyre diameters. They use a weighted board to model different tractor weights.
3: Tractors of the future	40-120	Children use ideas from the presentation and outcomes from the investigation coupled with creative thinking to imagine how tractors of the future might be like.

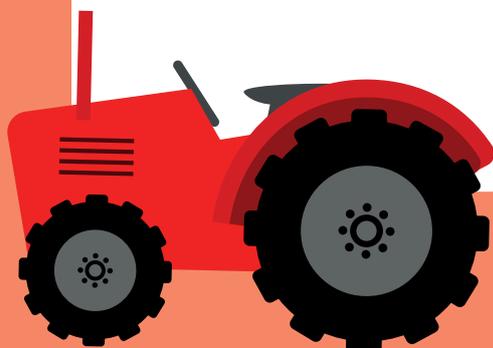
## Presentation notes

These notes also appear on the PowerPoint 'notes' pages.

Slide 2: Harvest time	Children may not be familiar with the idea of harvest time. You may need to explain that most crops are planted in the springtime and grow throughout spring and summer. Most crops are harvested in late summer or early autumn.
Slide 3 Potatoes and pea harvesting	The top picture shows a tractor and potato harvester. Crops such as potatoes and carrots do not need to be harvested with urgency. For example, potatoes may be harvested as new potatoes in April or May. Alternatively, they may be left in ground until late August if they are to be kept in store throughout the Winter. On the other hand, pea plants all ripen at the same time and need to be harvested straight away, otherwise the peas become dry and hard. The bottom picture shows a specialised pea harvester.



Slide 4: Daylight hours	Daylight hours have a significant impact on farming. There are many jobs that are difficult or impossible to do in the dark. Long daylight hours in the summer and early autumn often mean long working hours for farmers. In the winter, farmers must do some jobs in the dark which can be difficult or dangerous.
Slide 5: Tractors	The tractor on the right is a Massey-Ferguson tractor from around 1960. It has no cab for comfort (or roll-bar for safety). It was two-wheel drive with rear tyres about 1.2 m in diameter. It would typically pull a two-share plough. The tractor on the left is a modern John Deere tractor with a cab. It is a four-wheel drive tractor with rear tyres about 2.2 m in diameter. It is pulling a seven-share reversible plough. It can pull a larger plough at a higher speed than an older, smaller tractor.
Slide 6: Fields	Some flat areas in the UK such as Lincolnshire and the Lancashire coastal plain have large fields that suit larger tractors and machinery. Farms in upland areas often have sloping ground. They often have smaller fields, tractors and machinery.
Slide 7: Hedgerows	Hedgerows provide a habitat for insects and birds and increase biodiversity. Hedgerows also act as windbreaks and provide farm animals with shelter. Many farmers are now replanting hedgerows now their importance has been recognised.
Slide 8: Different tractor designs	As farm tractors become larger and heavier, they can be more prone to sinking in soft ground. Caterpillar tracks and double wheels are two ways in which tractor weight can be spread.
Slide 9: More ideas	Powerful lights allow farmers to do some kinds of work at night. There are many specialised tractors for different jobs. For example, the green tractor (bottom right) is a crop sprayer which can ride above tall crops. It cannot do other jobs. The small yellow tractor has an arm for excavating.
Slide 10: What about tractors of the future	This slide introduces the creative thinking task in which children imagine how tractors of the future might be like.



## Investigation activity

Suggested equipment and materials:

Balls of different diameters (e.g. tennis ball, squash ball, netball), tray filled with dry sand, wooden board (about 60 x 15 cm), 1 kg weights, dustpan and brush, 30 cm ruler.

Activity overview:

In this activity, children investigate the effect tractor tyre diameter and tractor weight have on soft ground through modelling. Begin by explaining that they will use a ball to model a tractor tyre, and weights on a board to model the weight of the tractor.

Show how to roll the ball using the board and to observe the 'track' left by the ball in the sand. There are several investigation activities the children could now do. For example, you could get them to:

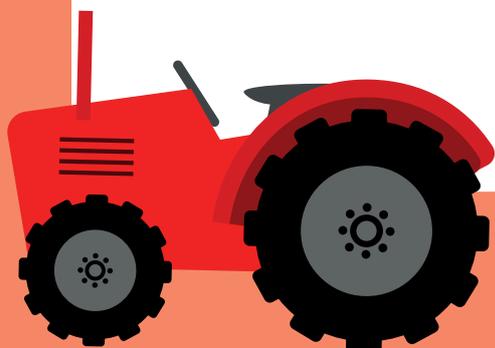
- Ask a question they would like to answer by investigation;
- Work out a way to compare results, e.g. by measuring the depth of the track;
- Predict the effect of changing the weight on the board on the depth of the track;
- Plan an investigation to test how changing the weight on the board affects the depth of the track;
- Predict the effect of changing the diameter of the ball on the depth of the track;
- Plan an investigation to test how changing the diameter affects the depth of the track;
- Carry out one of the investigations;
- Collect and present data; and
- Draw conclusions, relating their findings to tractor design.

Safety guidance:

Be aware that the board may tip to one side and the weights may slide off. It would be better for children to carry out the investigation on the floor to avoid weights falling a long distance.

Literacy activity:

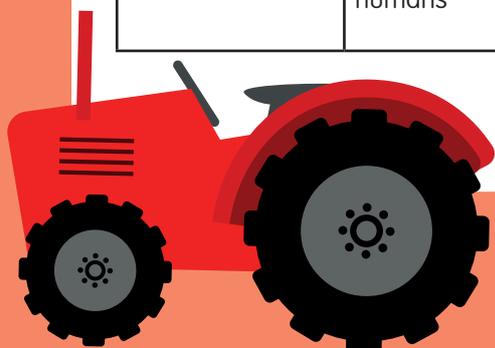
Children could present their findings as a letter or a presentation to inform tractor designers about the importance of tractor weight and wheel size.



## Possible links to the English National Curriculum

Stage/subject	Topic	National Curriculum statements
KS1: Science	Y1: Seasonal changes	<ul style="list-style-type: none"> <li>Observe changes across the four seasons.</li> <li>Observe and describe weather associated with the seasons and how day length varies.</li> </ul>
	Y2: Living things and their habitats	<ul style="list-style-type: none"> <li>Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.</li> <li>Identify and name a variety of plants and animals in their habitats, including micro-habitats.</li> <li>Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.</li> </ul>
	Y2: Plants	<ul style="list-style-type: none"> <li>Observe and describe how seeds and bulbs grow into mature plants.</li> </ul>
	KS1 Working Scientifically	<ul style="list-style-type: none"> <li>Asking simple questions and recognising that they can be answered in different ways.</li> <li>Observing closely, using simple equipment.</li> <li>Performing simple tests.</li> <li>Identifying and classifying.</li> <li>Using their observations and ideas to suggest answers to questions.</li> <li>Gathering and recording data to help in answering questions.</li> </ul>

LKS2 Science	Y3: Plants	<ul style="list-style-type: none"> <li>Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.</li> <li>Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant.</li> <li>Investigate the way in which water is transported within plants.</li> <li>Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</li> </ul>
	Y3: Animals including humans	<ul style="list-style-type: none"> <li>Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat.</li> </ul>
	Y4: Living things and their habitats	<ul style="list-style-type: none"> <li>Recognise that environments can change and that this can sometimes pose dangers to living things.</li> </ul>
	Y4: Animals including humans	<ul style="list-style-type: none"> <li>Construct and interpret a variety of food chains, identifying producers, predators and prey.</li> </ul>



	LKS2 Working Scientifically	<ul style="list-style-type: none"> <li>Asking relevant questions and using different types of scientific enquiries to answer them.</li> <li>Setting up simple practical enquiries, comparative and fair tests.</li> <li>Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.</li> <li>Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.</li> <li>Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.</li> <li>Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.</li> <li>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.</li> <li>Identifying differences, similarities or changes related to simple scientific ideas and processes.</li> <li>Using straightforward scientific evidence to answer questions or to support their findings.</li> </ul>
UKS2 Science	Y5: Living things and their habitats	<ul style="list-style-type: none"> <li>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.</li> <li>Describe the life process of reproduction in some plants and animals.</li> </ul>
	Y6: Evolution and inheritance	<ul style="list-style-type: none"> <li>Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</li> </ul>
	UKS2 Working Scientifically	<ul style="list-style-type: none"> <li>Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.</li> <li>Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.</li> <li>Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.</li> <li>Using test results to make predictions to set up further comparative and fair tests.</li> <li>Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.</li> <li>Identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>
KS1-KS2: 6.3: Language and literacy		The writing they [pupils] do should include narratives, explanations, descriptions, comparisons, summaries and evaluations: such writing supports them in rehearsing, understanding and consolidating what they have heard or read.

