

What are cereals?

Cereals are the grain or seeds of cultivated grasses; the main cereals are wheat, rice, oats, corn (maize), rye and barley. The grains of barley, oats and rice are covered with a protective husk which must be removed before they can be used for food. Wheat, corn and rye do not have this protective husk.

Stages of processing wheat

1. Growing and harvesting.
2. Primary processing: cleaning, milling.
3. Secondary processing: mixing, slicing, proving and baking.

Growing wheat in the UK

UK growers produce 14-15 million tonnes of wheat each year, supplying approximately 5 million tonnes to the British milling industry, and also exporting to millers overseas.

Most wheat grown in the UK is winter wheat and is sown on two fifths of arable land. This is planted in the autumn, generally between September and November. Harvesting takes place between August and September and removes the grains from the plants.

Varieties of wheat

Different varieties of wheat are suited to different types of flour. Key considerations are:

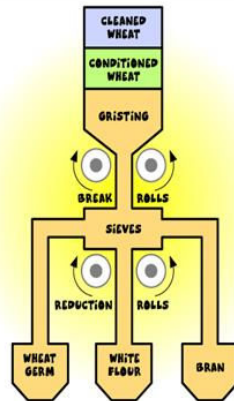
- achieving the right technical standards in relation to the grain protein content;
- making sure it is kept free of insects, other pests and potential harmful contaminants;
- protecting the environment by ensuring correct usage of fertilizer and plant protection products, if necessary.

Parts of a wheat grain

- Bran layers consist of four separate layers: the pericarp; testa; nucellar layers and aleurone cells.
- Wheat germ contains elements of the young wheat plant, providing vitamins, protein and oil.
- Endosperm is the potential white flour. When milled, the endosperm fractures along the cell walls, and separates from the bran layers.

The process of milling

- The harvested grain is delivered to the mill, where it is cleaned and conditioned.
- The wheat is blended with other types of wheat to make different kinds of flour – this is called 'gristing'. The grist is passed through a series of fluted break rolls, rotating at different speeds, designed not to crush the wheat but shear it open to separate the white inner portion from the outer skins.
- The fragments are then separated by the sieves and the white particles are channeled through a series of smooth 'reduction' rolls for final milling into white flour. The outer skins are now blended to make different types of flour.
- The percentage of the grain used in producing flour is known as the extraction rate, which in turn affects the nutritive value of the flour milling.



The process of malting

To make malt, cleaned barley, water, air and heat are needed. The main stages are:

1. steeping - typically takes 48 hours and the grain is covered in water 2 to 3 times. At the end of steeping, the grain will contain 45% moisture;
2. germination - over the next 4-5 days, the grain is encouraged to grow under controlled conditions;
3. kilning - uses kilns for warm air drying to stop the germination process and reduce the moisture content of the grain by 43%.

Different types of flour

- White – usually contains 75% of the grain and most of the bran and wheatgerm are removed.
- Brown – usually contains about 85% of the original grain and some of the bran and wheatgerm are removed.
- Wholemeal – made from the whole wheat grain.
- Malted wheatgrain – brown or wholemeal flour with malted grains added after milling.
- Wheatgerm – white or brown flour with at least 10% made up of wheatgerm added during milling.
- Strong – contains a higher gluten content to make a range of different breads, pizzas and crumpets.
- Plain – contains a lower gluten content and used to make biscuits, pastry, sauces, pancakes, batters and Yorkshire puddings.
- Self-raising – baking powder is added as part of the milling process and mainly used to make cakes and scones.

Around the world there are flours which are not made from wheat. Some of the less common types include flour made from coconut, potato, peas and chickpeas. Other grains such as rye, oats and spelt are also used.

Wheat flour (apart from wholemeal) is fortified with iron, thiamin and niacin, and all flours (except wholemeal and some self-raising varieties) with calcium. It is a legal requirement to fortify flour in the UK. 85% of flour in the UK is milled from wheat that is grown in the UK.

What makes bread?

- Flour contains a protein called gluten, which is formed from two classes of proteins, gliadins and glutelins, which are commonly found in grains, such as wheat, rye and barley. Once water is added a dough is created.
- Yeast, a microorganism, is a leavening ingredient added to dough to start fermentation and which makes bread rise.
- Salt helps the proving stage to tighten the gluten strands and adds taste.
- Warm water is needed as if it is too cool, the yeast won't multiply and if it is too hot (over 43°C) the yeast will be killed.

Tasks

1. Investigate and produce a report on UK wheat farming.
2. Create a display to explain the stages of making bread.

Key terms

Arable land: Land able to be ploughed and used to grow crops
Contaminants: Unwanted substances that lower the quality of the grain
Extraction rate: Percentage by weight that is 'extracted' from the whole grain to make flour
Grist: The blend of wheat used to make flour
Kilning: Process of drying that generates both flavour and colour in the malt
Plant protection products: Used by farmers to protect crops from insects and diseases, e.g. pesticides.
Proving: The process where the dough is rested to allow the yeast to ferment and produce gas bubbles which help the dough to rise.

What is rice?

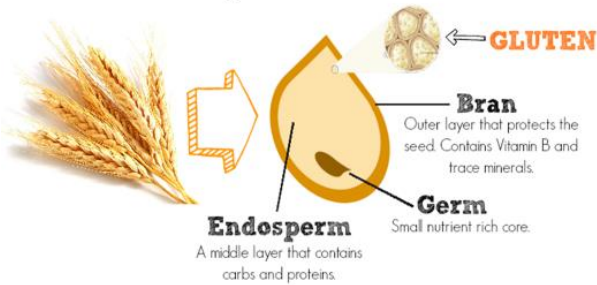
Rice is a short-living plant that requires a substantial amount of water when growing. When farming rice, the fields are flooded and then drained before harvest. The rice, once harvested, is known as a paddy grain. The paddy grains are sent to a mill to be threshed and turned into grains of rice for cooking.

There are more than 40,000 varieties of cultivated rice said to exist. These can be divided into three groups:

- long grain – all purpose and can be used as an accompaniment e.g. basmati;
- medium grain – used in risottos and puddings as it is creamy when cooked e.g. Arborio;
- short grain – used to make sushi and puddings as it tends to be stickier when cooked e.g. bomba.

Food Preparation and Nutrition

Anatomy of a Grain



The Protein Gluten

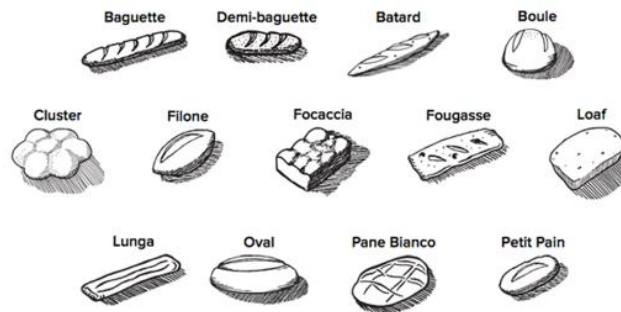
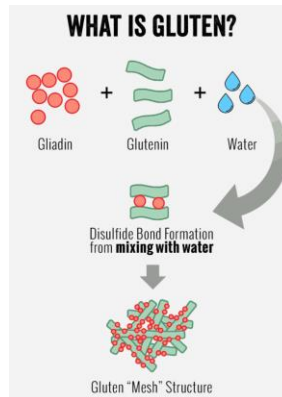
- Gluten allows dough to stretch and rise.
- Gluten is the protein that is found in wheat flours (those made from wheat, barley and rye).
- Gluten forms when water is mixed with flour to make dough.
- Molecules of gluten are coiled this means they stretch giving dough elasticity.
- Dough's are kneaded to 'work' the gluten.
- The more you work a dough the longer, stronger and 'stretchier' a dough will get.

Yeast

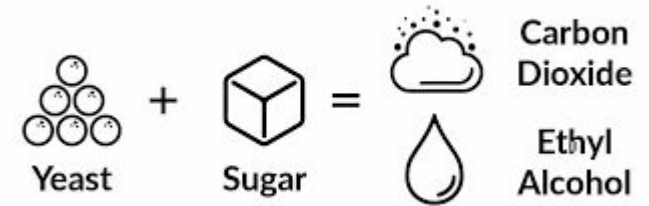


- Yeast is a biological raising agent used in the production of bread dough.
- It's a microorganism that cause fermentation a process that releases alcohol and carbon dioxide.
- Dough's that contain yeast are often proved (left in a warm place to allow fermentation to take place).
- This stage is important because its when the carbon dioxide is released and trapped in the dough which causes it to rise.
- Fermentation stops during baking as the yeast is killed.
- When the dough is baked, the carbon dioxide expands, causing the bread to rise even more – any alcohol produced by the yeast evaporates at this stage.

Different Breads From Different Cultures



- **Fermentation** is a chemical change that happens in vegetable and animal substances. For thousands of years people have used fermentation to make bread, wine, beer, cheese, and other foods.
- Fermentation often happens through the work of tiny living things called yeasts, bacteria, and mold. These living things create substances called enzymes. The enzymes break down food into chemicals.
- When bakers add yeast to bread dough, the yeast breaks down the sugars in the dough. While this happens, carbon dioxide gas is released. The escaping carbon dioxide makes the bread rise.



- When winemakers add yeast to grape juice, the yeast changes the juice's sugar into alcohol. Beer is another drink made through the fermentation caused by yeast.
- People eat many other fermented foods. Cheese comes from milk or cream that has been fermented by bacteria. Soy sauce is made from fermented soybeans. As meat ages it becomes more tender. This is also due to fermentation.
- In addition, scientists use fermentation to make certain drugs and vitamins. The drug penicillin is made through fermentation caused by mold.

Shaping Dough

- Shaping dough is important because it helps develop the gluten but it also allows your bread to be presented in an appealing way.
- Fats and oils that you may add to dough changes not only the taste but particularly the texture of dough.
- Often baking tins can be used to shape dough's in traditional ways.
- Equally attractive dough's can be achieved by working dough into shapes using your hands.
- Many dough shapes which are iconic are achieved by using your hands such as plaits, bagels and croissants.