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photo: © Colin Seddon

The chickens on the left are egg-laying hens. They have been **selectively bred** to lay lots of eggs, but they grow at a normal rate. Most are still kept in battery cages, though this system is to be banned in 2012. The chickens on the right are broiler chickens. They have been bred for meat. They grow twice as quickly and are usually slaughtered at six weeks old. Most meat chickens are kept intensively in large sheds.

All of these chickens have the same common ancestor. They are descended from the jungle fowl, which can still be found in the wild in the forests of India and South-East Asia. Chickens were first domesticated at least 3400 years ago.

Farmers have been selectively breeding chickens for thousands of years. The basic method is quite simple. If you breed from the hen which lays the most eggs, the chances are that her daughters will also be good layers. This is because the number of eggs which a hen lays is partly controlled by the genes which a hen inherits from her parents. Meat chickens have been selectively bred using the same principle.

Selective breeding has become a complex scientific business. A wild jungle fowl might lay 20-30 eggs in a year. Today's hens each lay over 300 eggs a year on average.

Eggs have become a cheap food, but at a cost to the hen. Even with good food, her bones may be depleted by the calcium she uses to make all those egg shells. Brittle bones are a common problem for hens. Battery hens suffer particularly since a lack of exercise can also weaken their bones.

Our demand for cheap food has caused us to make our farm animals work harder. As we shall see over the next two pages, this is not always good for them.

Casualties of selective breeding

Each year, in the UK, over 30 million day-old chicks are killed at birth. These are the males of egg-laying breeds.

Only hens lay eggs. 70 years ago, these male chicks would have been reared for meat. Today, they do not grow fast or meaty enough to produce chicken meat economically.

Is it right to kill them at birth? Is there an alternative?

Egg production and the hen's environment

A chicken's **environment** is also important. It takes energy to make eggs. However they have been bred, chickens won't lay more eggs unless they are given extra food.

Chickens also lay more eggs when the days are longer. This is an old **adaptation** to encourage the hen to lay eggs in summer when there will be more food for her chicks. Nowadays, lights are kept on in chicken houses for part of the night to increase egg production.

Chickens may be kept in cages, in barns or free-range. Intensive production may be slightly cheaper, but free-range environments like the one on the right can be better for the **welfare** of the birds. How do you think they should be kept?

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This broiler chicken cannot stand. His body has grown too fast for his legs. Soon he will be unable to reach food or water.

Many meat chickens go lame. This is a result of selective breeding for meat. The chicken in the picture above has been bred to grow fast. He has been bred to put on a lot of meat. Unfortunately, his legs have not grown as fast as his muscle.

Some scientists believe that a third of meat chickens suffer pain whilst standing. 2% may end up unable to walk at all. A further 1-2% die of heart problems, since their hearts cannot keep pace with their bodies.

Few animals which have been selectively bred would survive in the wild. This is certainly true of the meat chicken. Broiler chickens which are spared from slaughter often die young.
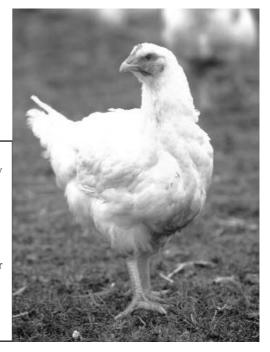
This is a problem for those who wish to breed broiler chickens. To keep the parent birds healthy, they have to be restricted to a quarter of their normal diet while they are growing. They have been bred to be hungry so they grow fast, but to keep them healthy they have to be kept hungry. Is this fair?

Artificial Selection is another name for selective breeding. In the wild, **natural selection** weeds out animals which are not adapted to their environment. Artificial selection may be useful to us, but it may produce animals which are more likely to suffer.

Selective breeding can be used to help to put this problem right. We can breed animals with stronger hearts and legs. Nevertheless, the more we breed animals to be productive, the more they are likely to suffer from the side-effects of working too hard.
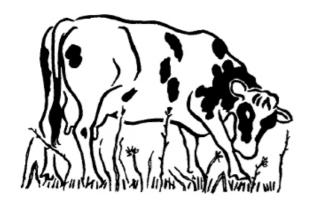
This broiler chicken is being kept free-range. You can buy free-range chicken in many supermarkets. You can also buy free-range chickens from slower growing breeds (it says on the pack that they have lived for at least 80 days, rather than the usual 42).

You will notice that these chickens cost more but, as they grow more slowly, they have lower levels of lameness. Which do you think is more important – cheap meat or healthier animals who are not in pain?

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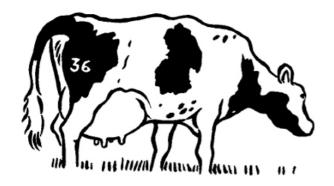advancing
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Cows – bred for meat or milk

The cow above has been selectively bred for meat. She produces enough milk to feed one calf. Her calf will milk her six times per day. She only needs a small udder.

The picture below shows a dairy cow. She has been bred for milk. She has been selectively bred to produce enough milk for ten calves, but her calf is removed from her shortly after birth. Most cows are only milked twice a day.
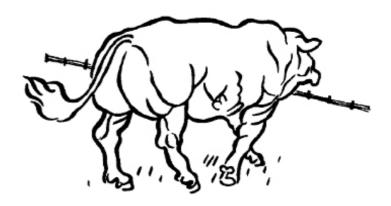

Notice the size of the dairy cow's udder. It may have to carry over 20 litres of milk. Many cows go lame through carrying all this milk.

Producing such a large quantity of milk requires a massive amount of energy. It has been said that the metabolic rate of a dairy cow is equivalent to that of a Tour de France cyclist! This can cause health problems for the cow. Naturally, a cow can live for thirty years, but many dairy cows are in poor health after three or four years of milking and are sent to slaughter because they no longer produce milk economically.

The Belgian Blue

An ancestor of this animal had a **mutation**. This is a spontaneous change in a gene. The mutant gene caused an effect called "double muscling." The animal's large muscles produce a substantial amount of beef.

Both Natural Selection and Selective Breeding depend on mutations which occasionally produce new characteristics which are helpful. **Evolution** through Natural Selection wouldn't happen without beneficial mutations.

The double-muscling gene, however, is not beneficial to the Belgian Blue. It causes difficulties when the Belgian Blue cow is giving birth. The extra muscle gets in the way of her cervix, making it smaller. Meanwhile, the extra muscles make the calf larger. Many Belgian Blue calves therefore have to be born during caesarean operations.

Scientists say that **genetic engineering** techniques could be used to pass the double-muscling gene into other animals like sheep, pigs and chickens.

The Pig

Pigs are descended from the wild boar. Wild boars give birth to litters averaging around five piglets. The modern sow produces 12 piglets at a time. Litters of over 20 have been known.

This can put a strain on the mother. Partly to overcome this, the piglets are removed from their mother at three to four weeks old, much earlier than is natural. This causes stress and health problems for the piglets, but most survive. The mother is able to recover and become pregnant again more quickly. The result is cheaper pork, ham and bacon. It may not be so good for the sow and her piglets.

Selective Breeding of Farm Animals
What do you think? - What do you know?

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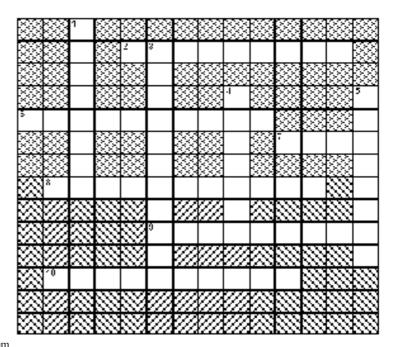
Test your opinions

Use what you have read, and your own knowledge, to decide what you think about the following examples of selective breeding. Tick those you approve of, put a cross by those you disapprove of, and put a question-mark by those for which you would need more information to decide. More information is available from CIWF's Website which you can find via **www.ciwf.org**

- Selectively breeding hens to lay more eggs ☐
- Selectively breeding wheat plants so that you get a larger crop ☐
- Selectively breeding chickens to grow faster for meat ☐
- Genetically engineering pigs to grow faster ☐
- Selectively breeding a prettier rose ☐
- Selectively breeding a Bulldog with a snub-nose ☐
- Selectively breeding Belgian Blue cattle with double-muscling genes ☐
- Selectively breeding people to be better at Science tests ☐
- Selectively breeding an apple tree to be resistant to pests and diseases ☐
- Selectively breeding pigs to produce larger litters of piglets ☐
- Selectively breeding cows to produce more milk ☐

Test your understanding of the terms used in this worksheet

(hint – words in bold in the text are likely to appear!)

Across

2) (with 5 down) _____ _____ produces animals which grow faster, lay more eggs etc. (9)

6) _____ Selection is where people select the genes of animals or plants which are passed on from one generation to the next (10)

7) Inherited from your parents (4)

8) Genetic _____ transfers genes from one species to another (11)

9) _____ happens as a result of Natural Selection (9)

10) An _____ helps an animal survive or reproduce in its environment (10)

Down

1) A spontaneous change in a gene (8)

3) Your characteristics are controlled by your genes and this (11)

4) _____ Selection controls which genes are passed on from one generation to the next without interference by man. (7)

5) (with 2 across) (8)