

Food Chains and Farm Animals

Human food chains and energy efficiency

Humans are at the top of the food chain.

Here is an example:



When we eat toast we are at the top of a very short food chain. We are absorbing energy which a wheat plant originally absorbed from the sun in **photosynthesis**.

If we eat meat, we are at the top of a longer food chain:



When we eat chicken we obtain energy from the chicken which obtained it from the wheat which in turn absorbed it from the sun.

However, we only get a small amount of that energy. This is because energy gets used up at each stage of a food chain (see box below).

You aren't everything that you eat!

You may have heard the term "You are what you eat." Luckily, this is not entirely so!

In a lifetime, the average human will eat several tonnes of food. Happily, no-one gets to weigh that much!

What happens to it all? Firstly we don't digest everything. Half of it ends up going down the toilet. In other words we **egest** it as faeces.

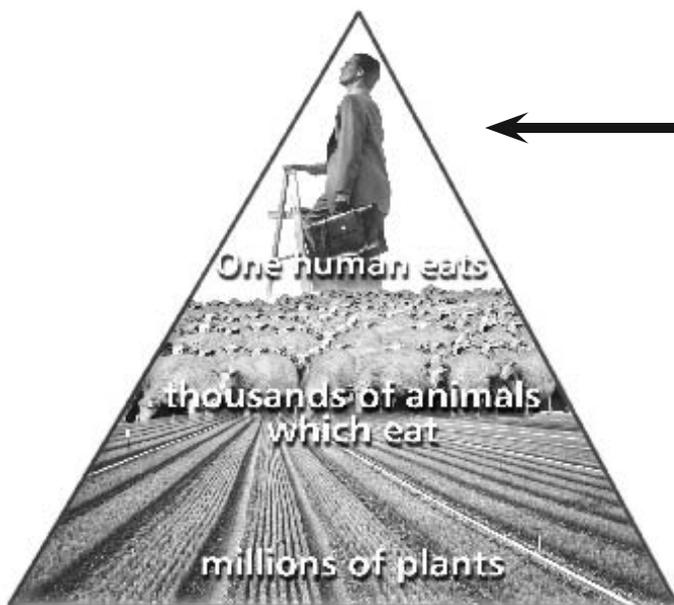
Most of the rest we use for energy, maintaining our bodies, keeping warm, exercising and so on. This food is changed by **respiration** into carbon dioxide and water which we **excrete**, for example by breathing. The **energy** is ultimately lost as **heat**.

Only a tiny proportion is retained in our body as muscle, bones and other tissues.

It is a similar story with animals. Less than 30% of what an animal eats ends up as meat. The rest is disposed of by **excretion** or **egestion**.

If you want to feed as many people as possible, it is therefore more efficient to eat plant foods like cereals, fruit and veggie-burgers than animal foods like meat, milk and eggs.

Meat production can be made more efficient by keeping the animals more intensively. However, some people feel this is cruel to animals. In the next two pages we will consider this.



Human pyramid of numbers

The human pyramid of numbers

In your lifetime, if you eat meat, you are likely to consume 1000 chickens, 45 turkeys, 30 sheep, 20 pigs*, 4 beef cattle*, the life's work of 35 laying hens and of one dairy cow. This is over a thousand animals, and each will have consumed hundreds or thousands of plants. Most people also consume thousands of fish. This idea is shown in the diagram of the pyramid of numbers.

People make many choices about their food. For example, you can eat the cheapest meat, pay extra for free-range or organic meat, or you can go vegetarian.

These choices make a difference to the efficiency of food production. They also make a difference to the welfare of a very great number of animals.

**Unless for religious reasons you don't eat pork or beef.*

Reducing energy loss

Farm animals, like chickens and pigs, use up a lot of the food they eat. They use it for energy, for exercise, to keep warm and to maintain their bodies. In addition, much food is also wasted in their faeces. This means that only a small amount of their food is turned into meat or eggs. Can we reduce the amount of energy they need?

The animals can be kept warm by crowding them into sheds. They can be prevented from exercising by confining them into cages. If they are bred to grow faster, they can be killed younger and use less energy living and maintaining themselves.

All of this would leave more energy to make meat and eggs. We could produce them more cheaply. However, some people think it is cruel to treat animals like this. Read the examples below, and see what you think. Tick the box underneath each example to express your opinion.

The battery cage



Around 80% of the eggs produced in Britain in the year 2000 came from hens kept in cages. Up to five hens can be kept in a cage and up to 15,000 cages in a shed. The cage prevents exercise and the crowding keeps them warm. This reduces the amount of food they need and helps to keep eggs cheap.

Is it right to keep hens like this? In a cage, they cannot stretch their wings, scratch around for food, take a dustbath or lay their eggs in a nest.

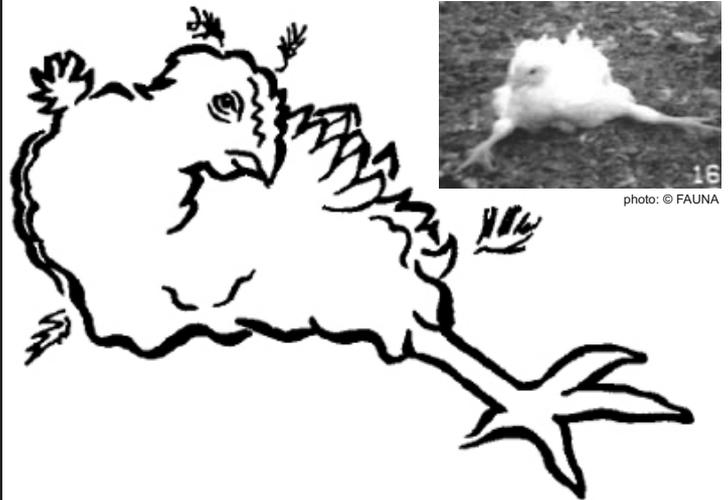
(The battery cage is to be banned throughout the EU, but not until 2012).

My opinion of the battery cage

-3 -2 -1 0 +1 +2 +3

Totally unacceptable Totally acceptable

Selective breeding of broiler chickens



This broiler chicken has been selectively bred to grow very fast. He will reach slaughter weight in about 6 weeks. This is twice as fast as it is normal for chickens to grow.

Halving the length of the chicken's life means that it will need less energy to maintain itself, keep warm and exercise. Crowding them into sheds also keeps them warm.

Broiler chickens have been bred to grow so fast that their legs cannot always keep up. This results in difficulty standing or walking. They may also find it difficult to eat or drink. One chicken in three may suffer pain as a result of growing too fast, and up to 2% can end up unable to walk at all.



My opinion of the selective breeding of broiler chickens

-3 -2 -1 0 +1 +2 +3

Totally unacceptable Totally acceptable

Food Chains and Farm Animals

Can alternatives to intensive farming be efficient?

Vegetarian and vegan diets

Vegetarians don't eat meat or fish. Vegans are vegetarians who don't eat any animal products including milk and eggs.



It takes less land to feed a vegetarian because they live lower down the food chain. Less food energy gets used up by animals. People also go vegetarian because they don't want to kill animals or because they think intensive farming is cruel. Others believe it is a healthier diet, with a lower risk of heart disease and some cancers.

A vegetarian diet can supply all nutritional needs. It is one way of increasing the efficiency of the food chain.

My opinion of vegetarian and vegan diets



My opinion of eating free-range and organic meat, milk and eggs



Free-range and organic meat, milk and eggs

Free-range animals use more energy. They need it for exercise and for keeping warm. If they grow more slowly, and live longer, they will use more energy for body maintenance.

Yet people want to buy free-range meat, milk and eggs because they believe this is kinder to animals. They would like animals to have longer lives. They also want to buy organic foods, produced without the use of artificial fertilisers or pesticides, for the sake of the environment.

Can a free-range or organic diet be made efficient? Some people address this problem by eating less meat, whilst making sure that what they do eat is kinder to animals and to the environment.

Eating grass-fed meat and milk

Chickens and pigs are normally fed on grains and other crops. It would be more efficient if these were directly fed to people.

Cattle and sheep are grazing animals which eat foods like grass. This means that they can be kept free-range on land that isn't used to grow food crops, eg the Welsh hills. Productivity is not very high, but the animals are eating grass that we wouldn't eat!

(Cattle are usually fed some grain as well – this is not an efficient way of producing meat).

My opinion of eating grass-fed meat and milk



Test your opinions

What do you think about the following? 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

- Keeping pregnant sows (pigs) in sow stalls in which they cannot turn around
- Becoming vegetarian
- Selectively breeding cows to produce more milk
- Keeping hens in battery cages
- Eating less meat
- Selectively breeding chickens to grow faster for meat production
- Keeping meat chickens free-range
- Eating grass-fed free-range lamb
- Genetically engineering pigs to grow faster and leaner
- Producing meat organically
- Using fertilisers and pesticides to increase crop production



Sow stall.
This system is illegal in the UK, but widely used in other countries.

Test your knowledge of food chain terms

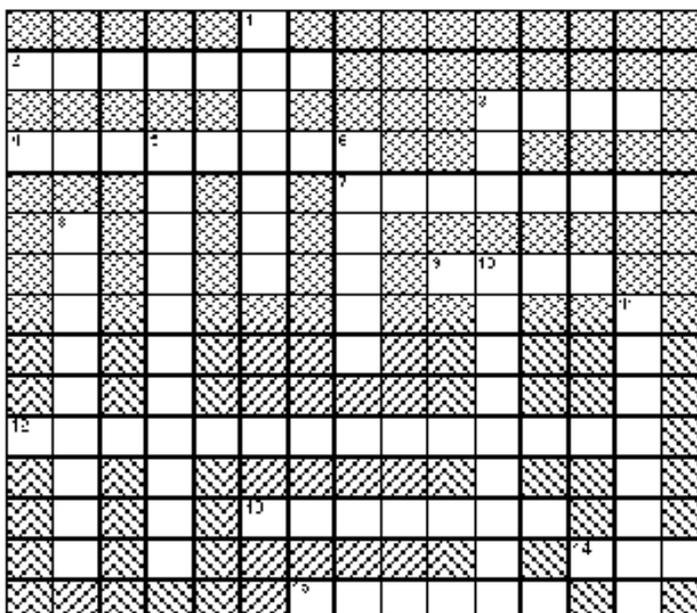
(hint – words in bold in the text are likely to appear!)

Across

- 2) _____ chicken - kept in cage (7)
- 3) If animals are kept _____ they use less energy to generate heat (4)
- 4) Farm animals use more energy, but are healthier, if they are allowed to do this (8)
- 7) Pyramid of _____ shows how populations get smaller along a food chain (7)
- 9) Energy is lost from the food chain in this form (4)
- 12) Process by which plants make food (14)
- 13) _____ of biomass shows loss of matter along a food chain (7)
- 14) Female pig (3)
- 15) Energy passes along food _____ (6)

Down

- 1) Chicken kept for meat (7)
- 3) Inter-connected food chains make up a food _____ (3)
- 5) Process by which energy is released from food (11)
- 6) Gradually used up as it passes through a food chain (6)
- 8) Obtaining oxygen and excreting carbon dioxide (9)
- 10) Disposal of wastes made in respiration and other body processes (9)
- 11) Disposal of faeces (8)



BSE - a disease spread by the food chain

Cattle are naturally vegetarian animals. It was found that they could grow more efficiently if they were fed some meat. Beef was included in the feed. When BSE developed, it quickly multiplied in an ever-cycling food chain. More than 170,000 animals became infected, and the disease spread to people. Should meat ever have been fed to a vegetarian animal?

