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## Food & Climate

### Basics

#### What are the effects of climate change on plants?

**Increased carbon dioxide levels in the atmosphere as a result of climate change will alter global temperatures and rainfall amounts. These factors will influence how well plants grow and affect food production.**

#### Increases in temperature

Higher temperatures cause heat stress in plants. This means they grow less and produce less crops. In some cases, the plants do not reproduce at all since excessive heat causes sterility of the pollen (the masculine reproductive part of the flowers).

A temperature increase may be beneficial in areas which are very cold at present. For example, in Siberia or Northern Europe it may, in the future, be possible to grow crops for longer periods of the year.

Changes to our climate are happening more quickly now than they have ever done before in the geological past. Plants will have to adapt to new climate conditions more rapidly than they have ever had to do so before.



1. Maize fields. Picture by Ana Iglesias.

Images of corn fields in Zimbabwe during normal weather and during a drought period. Compare these first two photographs with the third picture of a corn field in the USA. Its really easy to see just how dependant the crop yield is on geographical location.

#### Reduced rainfall - Drought

Water availability directly affects the growth of plants and how much crop they produce. The pictures above show corn fields in Africa under normal weather conditions and during drought when nothing grows. In most parts of Africa there is not enough water even in normal conditions for high crop yields. In contrast, in the USA, corn is grown with enough water and difference in crop growth between the continents can be clearly seen.



2. Flooded fields. Picture from Ana Iglesias.

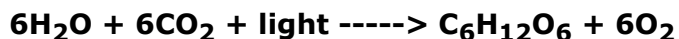
This photograph shows a clear line between land which was and wasn't flooded. Until the soil dries out, nothing will grow in the area which was flooded.

Increased rainfall without flooding may be beneficial in very dry areas and allow limited crop growth.

So changes in temperature and precipitation patterns as a result of climate change are likely to be bad for large areas of the world but may increase crop production in other regions. However, one of the likely outcomes of climate change is also an increase in the severity of rain storms and droughts and both of these are likely to have large and devastating effects on agriculture.

### Increases in carbon dioxide levels in the air

The increase in atmospheric carbon dioxide (CO<sub>2</sub>) levels resulting from fossil fuel combustion has a fertilising effect on most plants since CO<sub>2</sub> is needed for photosynthesis (the biochemical mechanism of plant growth). Photosynthesis converts carbon dioxide and water into the simple sugar glucose and emits oxygen, making it possible for animals to live on Earth. Sunlight is the energy that powers this reaction. The basic equation of the process of photosynthesis is:



**O<sub>2</sub>** is oxygen **CO<sub>2</sub>** is carbon dioxide **C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>** is glucose

Scientific experiments have shown that increasing atmospheric CO<sub>2</sub> levels leads to an increase in plant growth. The photograph shows scientists investigating the effect of increased CO<sub>2</sub> levels on wheat growth.

You might think, therefore, that increases in CO<sub>2</sub> emissions from fossil fuel combustion are a good thing for crop growth. However, the negative effects of climate change are usually much larger than the positive ones.



3. Scientists measuring the effect of CO<sub>2</sub> on crops. From The Free-Air CO<sub>2</sub> Enrichment Project (FACE). USDA.

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