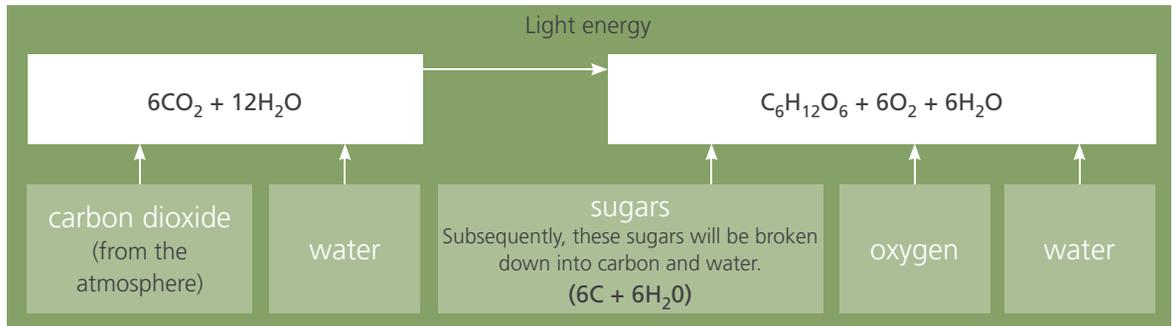# Photosynthesis - Grow your own water?

We are all familiar with the idea that plants catch sunlight and use that energy to make carbohydrates. However vaguely we refer to it, we are also aware that there is a chemical formula which describes this process.

It goes like this:

Light energy

$$6CO_2 + 12H_2O \longrightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$$

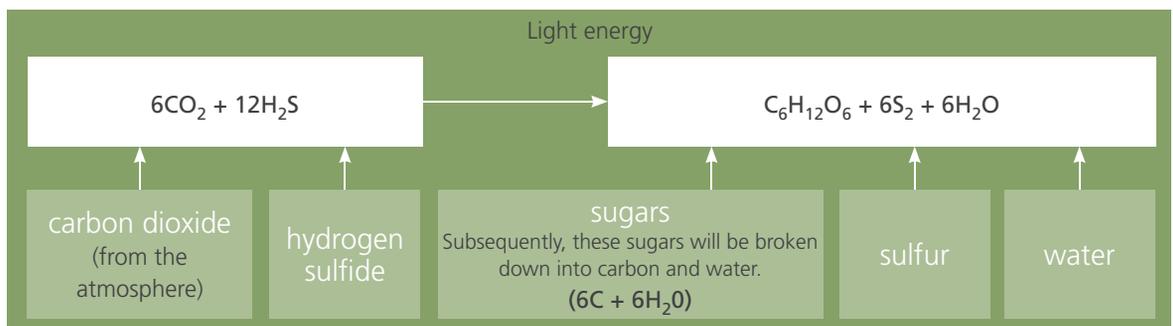| carbon dioxide (from the atmosphere) | water | sugars — Subsequently, these sugars will be broken down into carbon and water. $(6C + 6H_2O)$ | oxygen | water |

All of our perceptions of what photosynthesis is and does comes from this basic formula.

For example we all equate photosynthesis with Carbon Dioxide being breathed in and oxygen being breathed out during the day by green plants. We are all taught this basic premise early in our school years.

Most farmers are also very aware that plants don't grow unless there is water present. This concept is also reflected in the basic formula for plant "growth" which photosynthesis underpins. Water is used during photosynthesis in green plants – without it, they can't make sugars.

However this view of photosynthesis needs a bit of revision. Green plants are not the only organisms which perform this important function. There are also a very important group of organisms living in soil and in water who catch sunlight and make sugars. Most importantly these organisms do it differently. Have a look at the formula for Bacterial photosynthesis below:

Light energy

$$6CO_2 + 12H_2S \longrightarrow C_6H_{12}O_6 + 6S_2 + 6H_2O$$

| carbon dioxide (from the atmosphere) | hydrogen sulfide | sugars — Subsequently, these sugars will be broken down into carbon and water. $(6C + 6H_2O)$ | sulfur | water |

This formula has several important differences. While there is still capture of Carbon Dioxide, there is no Oxygen breathed out. Similarly, there is no need for water to start the process. And most importantly, there is a manufacture of water. Water is a by-product of this reaction.

The UN Food and Agriculture committee has recently released studies showing that Bacterial Photosynthesis (which is what is described in this second formula) accounts for 20% of all energy captured on the earth. That amounts to a lot of water! So when you think of photosynthesis in future, think of this second formula too – and take some time to consider how we might grow these obviously symbiotic organisms with our plants. They make the same sugars but they also make water which our plants all need.