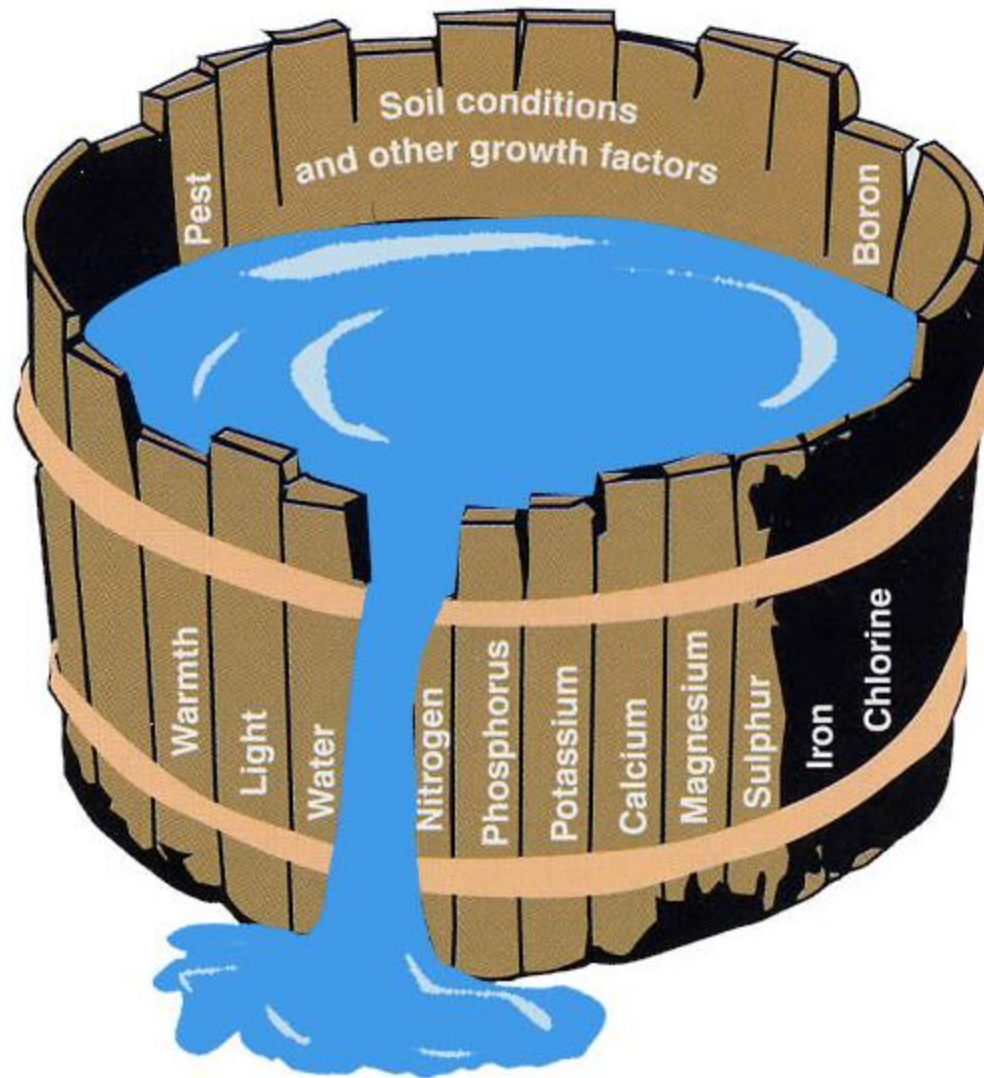


Topic	Limiting factors in photosynthesis	Level	GCSE (or any course for students aged 14-16)
Outcomes	1. Students use a model of a barrel (Liebig's barrel) to understand limiting factors in photosynthesis.		
Information for teachers	Students should have already been introduced to limiting factors and photosynthesis before they meet this analogy model. Present students with Liebig's barrel and then talk through the different features of the model. Students then complete the blank template to help identify analogous and non-analogous features.		

Liebig's barrel illustrating how crop growth is inhibited if one nutrient is in short supply.



Analogy model to explain

Analogue concept:

Target concept:

Analogous parts

Feature 1:

Feature 1:

Feature 2:

Feature 2:

Feature 3:

Feature 3:

Non-analogous parts

How could the model be improved?

Analogy model to explain limiting factors

Analogue concept: filling up a barrel with water is limited by the lowest plank

Feature 1: level of water in the barrel

Feature 2: different planks of wood make up the barrel

Feature 3: the planks of wood have different heights and this limits the water level

Water pours over the edge of the barrel

Planks of wood are fixed and can't easily be changed

How could the model be improved?

Target concept: rate of photosynthesis is limited by the factor that is least abundant. Increasing other factors won't make any difference.

Feature 1: rate of photosynthesis

Feature 2: different factors are needed for photosynthesis e.g. oxygen and temperature

Feature 3: $[O_2]$, light and $[CO_2]$ can be at different amounts. This limits rate of p.syn.

Process only happens in the day

Levels of light, oxygen and carbon dioxide change frequently.

Analogue parts

Non-analogue parts