Using plants

Who needs plants?

Plants are essential for the maintenance of life as it exists on Earth. The key chemical process for growing plants is photosynthesis. Inorganic compounds (carbon dioxide and water) are changed by plants into organic compounds (initially glucose and subsequently many others). So without photosynthesis,

- the energy from the Sun would not be harnessed and made available to all living organisms stored in food molecules;
- the organic molecules used by living organisms would not be synthesised;
- the atmosphere would not contain oxygen and carbon dioxide would not be recycled.

Figure 1 Plants capture energy from the Sun to synthesise organic compounds.

Products from plants

Plants are able to make many useful products. Their ability to harness the energy of sunlight in photosynthesis makes them able to synthesise a wide range of molecules.

Plants make the molecules they need to survive – these chemical reactions are known as basic metabolism and the molecules involved are known as metabolites. But they also make a huge variety of secondary metabolites, molecules that may be of benefit to the plant as a whole, but which are not needed for the survival of the specialised cells that make them. Flower pigments and scents are examples.

Thanks to the many molecules they can synthesise, we use plants as sources of, amongst other things, food, fuel, fibres, medicines, dyes, perfumes, gums and resins, building materials, compost and pesticides.

Ecosystem services

Communities of living organisms and the specific environments where they live form ecosystems. All the other organisms in an ecosystem depend on the plants for their existence. Ecosystems provide many benefits to human populations. The ways in which they support human communities are called ecosystem services. For example, ecosystems

- provide oxygen;
- recycle carbon, nitrogen and many other elements;
- help to stabilise climate;
- protect from drought and flood;
- make available clean drinking water;
- supply crop pollinators.

Figure 2 This tropical rain forest is an ecosystem that is home to a huge variety of living organisms.

Nutrients

The understanding of plant and soil science begins with the understanding of what nutrients plants need and how they are used by the plants.

Nutrients plants obtain from their environment

- provide the elements that are essential to make the molecules that they and we need;
- affect the ability of the plant to transfer the energy that is needed for building molecules.

Healthy, high yielding plants must:

- have adequate supplies of all the essential nutrients that they need;
- be able to extract the nutrients from their surroundings at soil or water-root and air or water-leaf interfaces.

Challenges

Not every plant can make every product. Often a product is restricted to a single type of cell in a specific plant tissue. The challenge to scientists is to use a better understanding of plant and soil science and to be able to control secondary metabolism to increase yields of as many useful products as possible.

Finding out

Which plants provide most of the food for the world's population?

What is the difference between a 'staple crop' and a 'cash crop'?

Which plants may be used as sources of:

- fibres;
- fuel;
- medicines;
- dyes;
- perfumes?