

## Hydroponics – KS3

### Researching different ways to grow food crops without soil

**Aim:** Pupils design and test their own hydroponics systems to grow salads or herbs.

Aquaponics, Aeroponics and hydroponics are all systems that use water to grow crops commercially:

- **Hydroponics:** (substrate hydroponics) growing plants without soil but in an inert substrate such as rockwool or gravel with aerated water pumped through the substrate OR (solution hydroponics) roots suspended in flowing nutrient solution, with or without a wick
- **Aeroponics:** nutrient solution sprayed onto roots
- **Aquaponics:** combination of aqua culture and hydroponics - breeding fish in water which is also used to grow crops

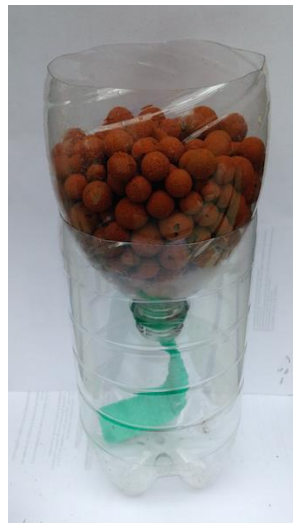
#### Activity:

Pupils research the benefits of hydroponics for commercial growing – for example, it's cleaner (doesn't use soil); more intensive; plants can grow underground with LED lighting (e.g. in old railway tunnels); plants are easier to crop and distribute.

- Make a simple DIY wick system - without any kind of pump. It will rely on capillary action of the growing medium and a wick to feed the roots.
- Cut a clear plastic bottle in half and invert the top half as shown to create a reservoir and growing chamber.
- Insert a wick - test different types of wick in each bottle.
- Fill the growing chamber with growing medium – again, test different types of medium in each bottle.
- Sprinkle a few seeds into the growing medium.
- Water from the top with a nutrient solution - ideally use filtered water.
- Monitor pH and nutrient levels as the seeds grow.

#### Experimentation:

- Cover the bottom of one bottle with foil or black plastic to reduce algae growth, leaving one uncovered to show the difference. Whilst algae doesn't affect growth rates, it looks unsightly, and in pumped systems it can clog up the works.
- Test different support system substrates for roots, ensure there are opportunities for data collection and analysis.
- Experiment with different pH levels: it should be at around 6.5. Most tap water is around 7-8 range, but hard water means more minerals which makes the water more alkaline. Use pH up/down solutions to get the pH right (or baking soda/lemon juice for less reliable method). If the pH is too high or low the roots cannot take up the available nutrients. In your simple system just check the pH; in more complex systems you can measure nutrient levels and mineral content.
- Take daily 'time lapse' photos to record growth and then prepare a short time lapse video of the results.



#### Resources

- Transparent 2l plastic bottle
- Wicks: cotton cloth, old t-shirt, old sock
- Substrate: clay pellets, pea gravel, rockwool, perlite, even small Lego bricks!
- pH testing papers or kit
- Seeds: basil, lettuce, peas etc.

#### More springboards:

- Learning Springboard: Geography – Floating Farms in Bangladesh
- Pappus downloadable resources:
- RHS Hydroponic system
- Growing crops with hydroponics
- Recycled self-watering device

#### Key vocabulary:

Hydroponics, aquaponics, aeroponics  
Substrate, wick, capillary action

#### Success Criteria

- ✓ I can explain how technology, such as hydroponics, can impact on farming, daily life and the wider world.