Environmental Management Key Terms:

Agriculture and the Environment

Soil 1: Composition	**Typical composition:** 25% air, 25% water, 5% organic matter, 45% minerals **Particle size:** sand, silt, clay **Plants need** minerals (e.g. N, P, K, Mg, calcium), anchorage, H2O and O2 around roots to grow. **pH** is usually determined by parent rock/water flows. For plants to absorb most nutrients soils need to be pH neutral, but some need more acid/alkaline soils. Some fertiliser = lower pH,, limestone = higher pH.	Soil 2: Organic Content	The organic matter comprises of living plants, animals, microorganisms, and their remains. **Organisms that breakdown organic matter:** earthworms, fungi, bacteria **Role of organic matter:** - increase water-holding capacity - increase air spaces in soil - increase the number of decomposing organisms - prevents the loss of mineral nutrients
Weathering	The process that causes rock to be broken down into smaller particles. **Physical weathering:** often caused by frost, heat, water, ice and wind **Chemical weathering:** can be from CO2 combining with H2O to form carbonic acid - acid rain. Biological weathering: plant roots growing in cracks of rock, animals walking over rocks	Soil 3: Loam	A soil that is a mixture of sand, silt and clay, combining the best properties of each. Characteristics of soil that vary with particle size: - water-holding capacity - ability to warm up - air spaces - water drainage - ease with which to cultivate - ability to retain nutrients - risk of erosion
Erosion	The movement of rock and soil fragments to different locations.	Agriculture	The cultivation of animals, plants, and fungi for food and other products used to sustain human life. **Type of agriculture depends on:** - climate - culture - technology - economics **Pressures on food production:** increasing population; climate change and farmable land; increases in expectations of standards of living; demands on water
Organic	Derived from living organisms.	Subsistence Farming	The cultivation and production of food to meet the needs of the farmers and their families. - Little surplus food - Any surplus is usually bartered for other things the family need or cash - Farmers aim to grow everything they need.
Irrigation	The supply of water to a crop by the grower	Commercial Farming	The cultivation of products with the main focus of selling them for cash. - Vast bulk/all of main crop is sold for cash - Often use technology to increase yield/ lower costs of production - Farmers aim to buy what they need from the money they gain through selling their crops.

Arable Farming	The production of crops from land.	World Hunger	Possible solutions: - reduce population - grow more staple crops over others - Greater food equality - Eat less meat - Grow more resilient/productive crops techniques to improve
Pastoral Farming	Farming that focuses on breeding and rearing livestock.	The Green Revolution	Advances made in farming technology, techniques and crop seed varieties during the 1950s and 1960s that led to significantly increased agricultural production. **The key elements of the revolution included:** - Use of the latest technological and capital inputs - adoption of modern scientific methods of farming - use of high yielding varieties (HYV) of seeds - proper use of chemical fertilisers - consolidation of land holdings - use of various mechanical machineries.
Mixed Farming	Farming that practices both rearing livestock and growing crops	Maximising Crop Yield	• Crop Rotation - growing different types of plants in different plots each year - pro: can harvest crops at different times, if one fails another might be ok, reduces diseases in soil and crops, reduces pests, keeps soil healthy, con: can't always afford to leave a field fallow, not all crops have same financial or nutritional value • Fertilisers - pro: increase nutrients in soil, con: pollute water • Irrigation
Extensive Production	Farming that is spread over a wide area and uses fewer resources per metre of land.	Legumes	Plants (members of the pea family) that contain nitrogen-fixing bacteria in their roots to produce a source of nitrates.
Intensive Farming	Farming that aims to maximise the yield from an area using a large amount of resources.	Fertiliser	A chemical or natural substance added to soil to improve its fertility. **Organic:** derived from natural sources - manure, composed plant material, bone meal, hooves, horns, dried blood etc. - cheaper is a mixed farm **Inorganic:** made within a factory to a formula - easier to store and transport than organic, as less bulky, more pleasant to handle, exact level of nutrients are easier to control, cheaper if an arable farm. **Quick acting:** works quick, but easily leached out **Slow acting:** no need to reapply, but plants have to wait

Irrigation 1	The supply of water to land or crops in order to aid growth. Can't be polluted or with too much salt. **Lack of water:** stops photosynthesis, and nutrients cannot be absorbed **Source/Store:** rainwater harvesting (field run-off, building run-off), reservoirs, underground supplies, lakes, rivers. **Transport:** channels (cheap and wasteful), pipes (expensive and technical know-how needed)	Weed	**A plant growing in an inappropriate place.** Cons: - competes with crop for light, water and nutrients - Affects the purity of the crop for sale - Can be poisonous to livestock or humans - can make cultivation difficult - clog machinery - can block drainage systems with excessive growth - can be source of pests/diseases - looks untidy - affects tourism
Irrigation 2	**Methods:** • Sprinkler systems (easy, cover large area, quick, imprecise (wind, evaporation), soil can be 'capped') • Clay pot systems (simple, little evaporation, precise, impractical for small, non-permanent plants, large labour costs) • Trickle drip (precise, automated, efficient use of water, expensive to install/maintain, difficult to move, easily blocked) • Flood irrigation (cheap, covers large area quickly, inefficient, damages soil, weeds also benefit)	Herbicide	**A chemical used to control weeds** Spray (imprecise, fast acting) or granules (more precise, act when dissolved in water). **Pro:** clears big area fast, **Cons:** indiscriminate - kill everything apart from he crop, can ruin local ecosystems **When to spray?** Sun: scorching leaves with droplets acting as a lens Wind: blows spray off course Rain: leaching Some crops can only be sprayed at certain times of growth/year.
Transpiration	The movement of water up plants and its subsequent loss as water vapour from their leaves	Pest	An animal that attacks or feeds on a plant
Water Conservation in Agriculture	Technology: assess current H2O content in soil, weather forecasts, research on plant growth (and when water is needed most) Reduce water loss: shelter from wind and sun, covering ground polythene, compost or mulch.	Pesticide	A chemical used to control pests, but also, less accurately, used as a collective term to describe pest and disease killing animals. Farmer may need PPE. Residue left on plants can be dangerous to consumers. Can have a negative effect on local ecosystems and food webs - biomagnification.
Mulch	A natural or artificial layer on the soil surface used to reduce water evaporation and weed growth.	Incesticide	A chemical that kills insects

Disease	A pathogen (fungus, bacterium or virus) that attacks a plant	Mechanisation	**The introduction of machines in a process/activity** **Pros:** - reduces labour needed - therefore costs - can cultivate wetter soils extending the season - 1 machine + attachments = multiple jobs done **Cons:** - Making big fields for machinery destroys natural vegetation, habitats and food webs. - Initial outlay is very expensive - Farm machinery uses fossil fuels - Large machines/tyres compact soil - Can cause unemployment
Pathogen	A collective name to describe disease-causing organisms (bacteria, fungi and viruses	Selective Breeding	**Traditional method used for improving the performance of crops and livestock, through only 'breeding' from certain animals/plants that possess the 'correct' characteristics.** **Pros:** • proven to improve production **Cons:** • outcomes are not predicable • a continuous process • slow
Fungicide	A chemical used to control fungal diseases	Genetic Modification	Taking DNA from one species and writing that into the genetic code of another species to 'modify' it. Pros: • faster results than selective breeding • Can make disease/pest/herbicide resistant, higher yielding/nutritional value, longer shelf life plants • Reduces use of pesticides • plants can grow in inhospitable areas Cons: • Unknown long-term impact • Genes might get into wild plants if they interbreed • Impact on local food webs is pest resistant plants
Alternatives to pesticides	**Biological Control:** Using natural predators to control the number of pests attacking a crop. **Pros:** - No chemicals - no residue, PPE, impact on ecosystems or biomagnification - No need to reapply - predators breed - Predator controlled by pest numbers **Cons:** - slower than chemicals - Pest might breed faster than predator - predator might prefer eating other creatures/move - might impact local ecosystems/food weds	Controlling Farming Environment	• Shade for cattle • Field windbreaks • Removing trees to maximise light • Greenhouses (including polytunnels) • Technology within greenhouses - sensors or labour to control moisture, light, temperature etc.
Alternatives to herbicides	**Cultural Controls:** hand weeding/hoeing - effective, targeted, gentle on soil but high labour demands **Weed Barriers:** black plastic sheeting or mulch to smother weeds **Flame Guns:** burning off the tops of plants **Cons:** can be less effective more expensive results not as predictable labour intensive slower results can be season specific, so harder to manage	Greenhouse	A building made of glass or similar transparent material that is used to manage the environment for plant growth.

Growing Blueprint	The growing requirements of a crop throughout its life, which a grower can use to maximise the yield.	Excess Fertiliser	• Eutrophication • Change in soil of pH, affecting plants ability to take up nutrients • Osmosis is reversed so plants lose water and become 'scorched' • Leaching - impact on local water - blebby syndrome (skin tissues low in oxygen) • Excessive foliage growth, so plants can't support themselves, attract pests and diseases, and are less likely to flower.
Hydroponics	Growing plants in water; this technique is often used in conjunction with a growing blueprint. Pros: • no need for soil, so no weeds/pest/diseases in soil • can be done anywhere and easy to harvest • an intensive system that can produce high yields • efficient: water recycled, perfect mix of nutrients • No pollutants released into environment Cons • Expensive to set up, lots of technology/expertise needed • Only suitable for a small production area • disease spreads quickly through water. • plants die quickly if conditions/nutirents are not perfect	Irrigation 3	Too much leads to: - damage of soil structure - lack of air pockets/ compacted, waterlogged soil - death of plant roots - waterlogged - loss of nutrients - leaching - soil erosion - run-off taking soil particles with it - soil capping - salinisation - makes soil cultivation difficult
Resistance	The ability of a living organism to survive when exposed to a toxic chemical (such as an antibiotic, pesticide or herbicide) Can occur through regular/over-use of chemicals.	Soil Capping	**The forming of a hard surface crust in the top 1 to 10 mm of bare cultivated soils**. Caused by heavy rainfall/water droplets (irrigation) on exposed bare land. The surface structure of the soil breaks down under the continual pounding of the water droplets. Air pockets are lost, and when the surface dries, the soil becomes hard and compact, making it harder for plants to grow through the soil, or for new water to permeate through the ground.
Eutrophication	A sequence of events starting with enrichment of water by mineral nutrients or organic matter that leads to excess algae. This stops light reaching the bottom, preventing other plants from photosynthesising and making O2. As the algae dies and rots, it releases CO2 further reducing oxygen levels in the water and it leads to the death of the other animals.	Salinisation	When the salt content of soil has increased to such levels that it becomes toxic to many plants making the land unusable for agriculture. **It can occur through:** **Over irrigation;** when the ground is waterlogged, the salts from deep in the soil can move up. The water starts to evaporate away in high temperatures, leaving the salts behind in very high concentrations. **Dams;** Rivers like the Nile used to flood annually, washing fresh water down into the Med. Dams prevent the flooding, meaning salt from the Med can move back up the Nile .
Osmosis	The process by which mineral molecules pass through a semi-permeable membrane from a weaker solution to a more concentrated solution to make the concentration of the mineral the same on both sides of the membrane	Desertification	The process by which fertile land becomes a desert

Soil 6:
Erosion

Loss of topsoil = loss soil fertility = loss of plant growth = loss of new organic mater re-entering the soil = desertification

- loss of habitats
- eroded soil/silt blocks water courses - shallow but wider rivers; flooding; poor water quality; new stagnant lagoons = mosquitos; covered aquatic plants can't photosynthesise (reducing O2)
- can't grow crops/graze livestock = famine/ malnutrition = displaced farmers = migration = increasing competition for fertile land (war)/urban slums/migrant camps

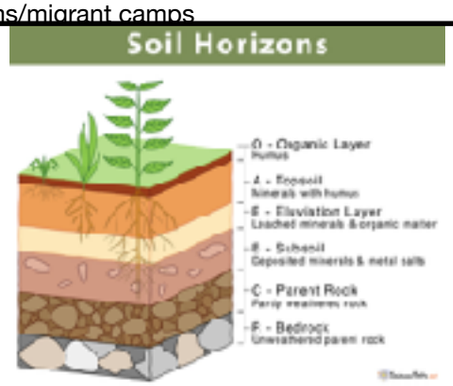
Terracing

The artificial development of flat areas (for growing crops) in a sloping terrain.

Good for rice

Soil 4:
Horizons

(https://www.sciencefacts.net/wp-content/uploads/2020/12/Soil-Horizons-Layers-Diagram-Chart.jpg)



Reducing Erosion 1

- **Terracing**
- **Contour Ploughing**
- **Bunds**
- **Windbreaks**
- **Cover crops** - a crop planted to manage soil erosion, fertility and quality.
- **Vegetative cover** - prevents wind/rain erosion, and can add nutrients, e.g. clover (legume family)
- **No-till farming** - farming without tilling the soil (tilling - ploughing without turning the soil)
- **Adding organic matter** - improves soil structure
- **Multi-layered cropping**

Soil 5:
Top Soil

Top soil is the most fertile soil horizon:

- Structure allows most root growth; water and air,
- Contains organic matter (sense darker than other layers) and so also large quantities of nutrients

Top soil can be eroded through:

- removal of natural vegetation
- over cultivation
- overgrazing
- wind erosion
- water erosion - heavy rain; rain water run-off; gulley erosion

Contour Ploughing

A technique where furrows caused by ploughing follow the contours of the land

Good for all gradients

Famine

A lack of access to food, often over a large area.

Bund

An embankment constructed around the edge of an area to reduce the loss of a liquid (such as water) - often like a terrace with a 'lip', making a pool when filled with water.

Good for rice.

Malnutrition

Not having enough of the correct nutrients to eat, causing ill health.

Windbreak

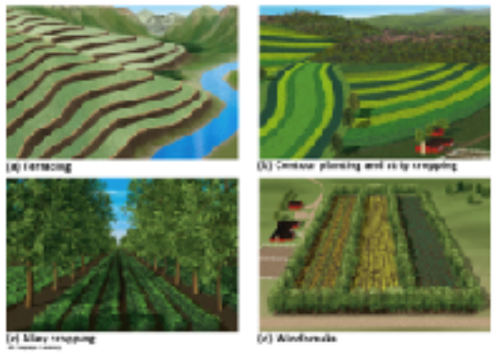
A permeable barrier, made of either living vegetation or artificial material, used to reduce the impact of the wind on an area.

Natural windbreaks:

- provide habitats for insects and animals, and help frontal crop pests
- Roots will help hold soil if area is prone to erosion by run-off.

Reducing Erosion 2

(https://quizlet.com/360189585/soil-conservation-flash-cards/)



Organic Fertiliser

Bulky organic fertilisers: animal manure, composed crop remains

- they release nutrients slowly - reduces risk of eutrophication
- already present on mixed farms - using waste products saves on disposal cost, minimal transport costs associated with them
- No energy required for their manufacture
- Improves soil structure

Reducing Erosion 3

(https://www.thinglink.com/scene/781484466697666562)

Managed Grazing

- Prevents over grazing
- Ensures sufficient grazing - prevents scrubland plants from establishing
- Maintains appropriate soil fertility
- Maintains good drainage

Multi-layered Cropping

Growing more than one crop in an area,
Alley cropping: rows of trees between other plants - windbreaks, shade for other crops, habitat for crop-pest predators, leaves = organic matter.
Mixed cropping: multiple types of plant in same space e.g. intercropping - efficient nutrient use, reduced plant-height competition, deep/shallow root system plants together, sturdy plants support unstable crops, produces a crop for profit if main crop is still maturing (plantation) or one crop fails
Crop rotation: fewer pests/diseases, better soil, nutrients used more effectively.

Crop Rotation

A planned rotation of crop plants between different fields or plots.
Pros:

- reduces risk of pest and diseases
- efficient use of cultivation techniques
- efficient use of nutrients, including livestock eating old crop residue
- multiple crops stops over-supply of any one crop
- A least one crop should do well in a season
- A wider diet if a subsistence farmer
- Natural fertilisers for soil: legumes/animals

Intercropping

The technique of growing other crops between the rows of a main crop, maximising the use of nutrients and water.

Plant Varieties

Created through selective breeding and genetic modification.

- Reduced pesticide use
- Resistance to certain diseases
- Drought resistant varieties
- Shorter cropping cycles (= 2+ crops/year)
- Herbicide resistant (GM created only)
- Extended harvest seasons

Sustainable Agriculture

The aims of sustainable agriculture include:

- meet the needs of the population for agricultural produce
- making efficient use of non-renewable resources
- supporting the natural ecosystem and mimicking natural processes with farming techniques
- sustaining the economic independence of farmers

To do this, environmentalist need to understand: soils (nature, nutrients, erosion); different types of farming system and impacts; how yields can be improved and impacts, farmers/envornments/locals needs etc.

Rainwater Harvesting

The collection of rainwater, for example from he roofs of buildings, and storage in a tank or reservoir for later use.