

Summary

Topic 5 - Soil systems and terrestrial food production systems and societies

Subject	Year	Start date	Duration
Environmental Systems & Societies	IB1, IB2	Week 1, February	3 weeks 12 hours

Course Part

Core

Description

This topic may be particularly appropriate for considering big questions A, B, E and F

Curriculum

Aims

Acquire the knowledge and understandings of environmental systems at a variety of scales

Apply the knowledge, methodologies and skills to analyse environmental systems and issues at a variety of scales

Appreciate the dynamic interconnectedness between environmental systems and societies

Value the combination of personal, local and global perspectives in making informed decisions and taking responsible actions on environmental issues

Be critically aware that resources are finite, and that these could be inequitably distributed and exploited, and that management of these inequities is the key to sustainability

Develop awareness of the diversity of environmental value systems

Develop critical awareness that environmental problems are caused and solved by decisions made by individuals and societies that are based on different areas of knowledge

Engage with the controversies that surround a variety of environmental issues

Create innovative solutions to environmental issues by engaging actively in local and global contexts

Objectives

Demonstrate knowledge and understanding of relevant

facts and concepts

methodologies and techniques

values and attitudes

Apply this knowledge and understanding in the analysis of

explanations, concepts and theories

data and models

case studies in unfamiliar contexts

arguments and value systems

Evaluate, justify and synthesise, as appropriate

explanations, theories and models

arguments and proposed solutions

methods of fieldwork and investigation

cultural viewpoints and value systems

Engage with investigations of environmental and societal issues at the local and global level through

evaluating the political, economic and social contexts of issues

selecting and applying the appropriate research and practical skills necessary to carry out investigations

suggesting collaborative and innovative solutions that demonstrate awareness and respect for the cultural differences and value systems of others

 Syllabus Content

Topic 5: Soil systems and terrestrial food production systems and societies

5.1 Introduction to soil systems

Significant ideas:

The soil system is a dynamic ecosystem that has inputs, outputs, storages and flows.

The quality of soil influences the primary productivity of an area.

Knowledge and understanding:

The soil system may be illustrated by a soil profile that has a layered structure (horizons).

Soil system storages include organic matter, organisms, nutrients, minerals, air and water.

Transfers of material within the soil, including biological mixing and leaching (minerals dissolved in water moving through soil), contribute to the organization of the soil.

There are inputs of organic material including leaf litter and inorganic matter from parent material, precipitation and energy. Outputs include uptake by plants and soil erosion.

Transformations include decomposition, weathering and nutrient cycling.

The structure and properties of sand, clay and loam soils differ in many ways, including mineral and nutrient content, drainage, water-holding capacity, air spaces, biota and potential to hold organic matter. Each of these variables is linked to the ability of the soil to promote primary productivity.

A soil texture triangle illustrates the differences in composition of soils.

Applications and skills:

Outline the transfers, transformations, inputs, outputs, flows and storages within soil systems.

Explain how soil can be viewed as an ecosystem.

Compare and contrast the structure and properties of sand, clay and loam soils, with reference to a soil texture diagram, including their effect on primary productivity.

5.2 Terrestrial food production systems and food choices

Significant ideas:

The sustainability of terrestrial food production systems is influenced by sociopolitical, economic and ecological factors.

Consumers have a role to play through their support of different terrestrial food production systems.

The supply of food is inequitably available and land suitable for food production is unevenly distributed among societies, and this can lead to conflict and concerns.

Knowledge and understanding:

The sustainability of terrestrial food production systems is influenced by factors such as scale; industrialization; mechanization; fossil fuel use; seed, crop and livestock choices; water use; fertilizers; pest control; pollinators; antibiotics; legislation; and levels of commercial versus subsistence food production.

Inequalities exist in food production and distribution around the world.

Food waste is prevalent in both LEDCs and more economically developed countries (MEDCs), but for different reasons.

Socio-economic, cultural, ecological, political and economic factors can be seen to influence societies in their choices of food production systems.

As the human population grows, along with urbanization and degradation of soil resources, the availability of land for food production per capita decreases.

The yield of food per unit area from lower trophic levels is greater in quantity, lower in cost and may require fewer resources.

Cultural choices may influence societies to harvest food from higher trophic levels.

Terrestrial food production systems can be compared and contrasted according to inputs, outputs, system characteristics, environmental impact and socioeconomic factors.

Increased sustainability may be achieved through:

- altering human activity to reduce meat consumption and increase consumption of organically grown and locally produced terrestrial food products

- improving the accuracy of food labels to assist consumers in making informed food choices

- monitoring and control of the standards and practices of multinational and national food corporations by governmental and intergovernmental bodies

- planting of buffer zones around land suitable for food production to absorb nutrient runoff.

Applications and skills:

Analyse tables and graphs that illustrate the differences in inputs and outputs associated with food production systems.

Compare and contrast the inputs, outputs and system characteristics for two given food production systems.

Evaluate the relative environmental impacts of two given food production systems.

Discuss the links that exist between socio-cultural systems and food production systems.

Evaluate strategies to increase sustainability in terrestrial food production systems.

5.3 Soil degradation and conservation

Significant ideas:

Fertile soils require significant time to develop through the process of succession.

Human activities may reduce soil fertility and increase soil erosion.

Soil conservation strategies exist and may be used to preserve soil fertility and reduce soil erosion.

Knowledge and understanding:

Soil ecosystems change through succession. Fertile soil contains a community of organisms that work to maintain functioning nutrient cycles and that are resistant to soil erosion.

Human activities that can reduce soil fertility include deforestation, intensive grazing, urbanization and certain agricultural practices (such as irrigation and monoculture).

Commercial, industrialized food production systems generally tend to reduce soil fertility more than small-scale subsistence farming methods.

Reduced soil fertility may result in soil erosion, toxification, salination and desertification.

Soil conservation measures include soil conditioners (such as organic materials and lime), wind reduction techniques (wind breaks, shelter belts), cultivation techniques (terracing, contour ploughing, strip cultivation) and avoiding the use of marginal lands.

Applications and skills:

Explain the relationship between soil ecosystem succession and soil fertility.

Discuss the influences of human activities on soil fertility and soil erosion.

Evaluate the soil management strategies of a given commercial farming system and of a given subsistence farming system.

ATL Skills

Approaches to Learning



Thinking

- In this unit, we will

ask students to formulate a reasoned argument to support their opinion or conclusion

give students time to think through their answers before asking them for a response

reward a new personal understanding, solution or approach to an issue

ask open questions

set students a task which required higher-order thinking skills (such as analysis or evaluation)

build on a specific prior task

help students to make their thinking more visible (for example, by using a strategy such as a thinking routine)

require students to take an unfamiliar viewpoint into account when formulating arguments

ask questions that required the use of knowledge from a different subject from the one you are teaching

include a reflection activity

make a link to TOK



Social

- In this unit, we will

have students work in small groups

allocate, or ask students to allocate among themselves, different roles in a classroom discussion or activity

have students peer assess their group performance or process

support students in resolving a conflict in a team

give a group assessment task

give students feedback on how they worked as a group

have students discuss their understanding of a text or idea among themselves and come up with a shared understanding

provide an opportunity for students to analyse the impact of their behaviour on the class or on a group performance

encourage students to consider alternative points of view or to take the perspective of others

provide opportunities for students to make decisions



Communication

- In this unit, we will

ask students to explain their understanding of a text or idea to each other

construct a task around the use of different vocabulary and examples when speaking to different audiences

have students give an oral presentation without reading from their notes

ask students to monitor and check the quality of their writing

construct a task so that students practise their listening skills

assess or give feedback on speaking or writing concisely

provide opportunities for students to read and understand different types of texts

encourage or require students to plan a response before they begin

ask students to formulate arguments clearly and coherently

encourage all students to contribute to discussions



Developing IB Learners

☆ Learner Profile



Inquirers



Knowledgeable



Thinkers



Communicators



Risk-takers (Courageous)



Reflective