

Section 15.3 Questions

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Understanding Concepts

- (a) Technologies could include irrigation, tilling techniques, fertilizers, pesticides, greenhouses to extend growing seasons. The use of technology in any given area of the world tends to increase food production.

(b) Soil quality can be influenced by crop rotation, use of organic versus chemical fertilizers, irrigation, and drainage techniques. The quality of soil can be improved with fertilizers and improved drainage techniques. These can increase food production. Poor soil quality can decrease food production. Soil degradation occurs in areas where people rely on wood for fuel. Deforestation exposes the soil beneath trees. This can lead to leaching of nutrients from the soil, creating nutrient-poor soil that is not useful for crops. If crops are continuously planted and harvested on such soil, organic matter and more nutrients are stripped from the soil. The soil can also erode as it is exposed to wind and it can become waterlogged as well. In some situations, the soil can become excessively salinized.

(c) Climate can be used in warm, wet regions. Regions with warm, wet conditions have very little trouble producing foods. In dry, cold areas, however, food production is an issue. Many crops and animals cannot survive harsh weather, both hot and cold extremes, and they cannot live without ample water supplies. Irrigation, greenhouses, and plant genetics can overcome cooler or drier climates.
- Energy pyramids show the relative amounts of energy that could be transferred to humans from different food sources. From energy diagrams we can see that plants provide much more energy to humans than animals do. When humans consume plants, they receive 10% of the energy available from the plants. However, if humans consume animals that consume plants, they only receive 10% of the energy available from the animal, which is 10% of the energy available from the plant, or 1% of the energy available from the plants.
- Many types of animals can graze on lands that are too dry, steep, or rocky for crop cultivation. Sheep, goats, and other domestic animals can thus increase the amount of food energy available to humans through meat and milk production.

Applying Inquiry Skills

5.

Type of ecosystem	Primary productivity (J/m ² /year)	Energy available to primary consumers (J/m ² /year)	Energy available to secondary consumers (J/m ² /year)
Tropical rainforest	38 000	$38\,000 \times 10\% = 3\,800$	$3\,800 \times 10\% = 380$
Temperate grassland	9200	$9200 \times 10\% = 920$	$920 \times 10\% = 92$
Open ocean	5000	$5000 \times 10\% = 500$	$500 \times 10\% = 50$