7th Grade: PLANTS

(Interdependence of Plants and Animals, Crops and Pests)

Rational of this unit

Many different forms of life can be seen around us, from wild plant and animal life to crops grown in fields. However, few pupils realise the connection these plants and animals have with one another. The aim of this unit is to build on pupils' knowledge of the plants and animals they have studied by explaining how plants are connected to one another and animals, and at the same time making them aware that this is what maintains balance in the natural world.

Another objective set for this unit is to show that we as humans are recipients of countless benefits from these plants and animals, and to cultivate a mindset valuing their importance. In addition, we shall study the types and effects of pests that harm crops as well as methods of dealing with them.

Objectives: what pupils are expected to achieve in this unit

- Through observation of plants and animals, learn how to investigate nature and discover that the plants and animals around us live by helping one another.
- Understand that in the natural world carbon dioxide and oxygen circulate through photosynthesis in plants and respiration in animals, and that this dynamic power is all energy originating from the sun.
- Understand that living animals in the natural world are related to one another through the food chain, and that this preserves balance in the natural world.
- Understand the types and characteristics of pests that damage agricultural and harvest crops and methods of avoiding such damage. On the other hand, realise that we as humans are recipients of benefits from a great number of plants and animals in the form of food and medicines.
- Develop the desire to take care of nature while understanding that we are preserving an environment that is easy for plants and animals to live by restraining ourselves from throwing away refuse, spreading large quantities of pesticides and deforesting without limit.

（PLANTS／7th grade）

Interrelation of contents of each grade

** The order below is as shown in the syllabus.*

Grade	What to teach (Plants)
1st Grade	• Various plant life inhabiting the region • Main parts of plants • Edible parts of plants
2nd Grade	• Planting seeds • Caring for plants – pulling wild grass and weeds, watering • Various leaves – colour, size, shape and feel
3rd Grade	• Different wild plant life • How plants are useful to man – food, clothing, paper, baskets, furniture, tea, coffee, cocoa, medicine, shade, enclosure and aesthetics
4th Grade	• Varieties of agricultural crops – food crops (grains, pulse, vegetables, fruits, tubers) and crops for profit (farm products used as drinks, fibres and oils taken from grains) • Regional weeds - blackjack, Sodom apples, goosefoot, spiderworts, Mexican marigold and wood sorrel
5th Grade	• Plant classes – green and non-green, flowering and non-flowering plants • Functions of exterior parts of plants – roots, stem, leaves, flowers and fruit • Types of roots – tap roots and fibrous roots
6th Grade	• Parts of the flower • Pollination – meaning and types of transmitters • Fertilisation – meaning and fusion process • Seed parts – monocotyledon seeds and dicotyledon seeds • Seed germination and conditions necessary for germination
7th Grade (This unit)	• Interdependence between plants – supporting other plants, acting as breeding grounds for other plants and providing shade for other plants • Interdependence between plants and animals – plants as food for animals, oxygen given off by photosynthesis of plants and carbon dioxide given off in animal respiration, plants as shelter for animals from heavy rain, animals that help in pollination, plants as medicine and nourishment for animals, and animal waste products being broken down for nourishment of plants • The food chain – meaning and examples • Agricultural crops and pests - the meaning of pests, types of pests, pests which devastate crops growing in fields and pests which devastate storehouses • Influence of pests on agricultural crops – decrease in harvest yields, reduced quality of products, transmitting of diseases to crops and causing sickness in consumers

	• Extermination measures - scaring pests off, setting traps, picking them up, pulling weeds, spraying pesticides, trimming and pruning
8th Grade	• Environmental adaptation of plants – arid and damp regions • Indicators of diseased crops - poor growth; discolouration of growing leaves, ears/heads or stalks/stems; dwarfism; withering and appearance of spots or stripes • Crop diseases and their influences – reduced harvest yield and quality

Before Starting this Unit

Current learning status of the pupils

To this point, pupils have learned the structure and functions of the bodies of animals and plants, as well as how they multiply. However, this unit is their first time studying the intimate connection present in terms of food, habitats and breeding of the plants and animals living around us.

Also, the children should have a good amount of knowledge and experience regarding everyday plants, animals and crops from helping out with the crops, so try to make use of this in class.

It is easy to think that children's learning, including observations, is limited to the classroom. We would like for them to develop a mentality of taking care of plants, animals and nature through activities which make them think for themselves about how to make use of the knowledge they have acquired in growing crops.

Preparatory Notes

- Ideal teaching will include as much outdoor observation as possible and allow pupils to experience for themselves how fun and peculiar the natural world can be.
- Sufficiently warn of all dangers in observations off campus or on a farm.
- Prepare vinyl bags and magnifying glasses for gathering and observation of small animals and plants.

Objectives to be achieved by competency

Interest, motivation, and attitude

1. Taking an interest in what ties together the plants and animals around us as well as the importance of plants as food and medicine for humankind, and willingly making efforts to observe and investigate them.
2. Taking an interest in different types of crops and ways to grow them, and thinking about the damage and extermination of pests that harm crops.

3. Taking an interest in pests that damage storehouses and agricultural commodities, and trying to find ways of lessening the damage they produce.
4. Thinking about balance of the natural world and environmental preservation based upon the connection between living animals.

Scientific thinking and communication activities

1. Ability to discover the interdependence of living animals based on observation of living animals around us, summarise the process leading to this conclusion in a report, and present it.
2. Ability to come up with and present prevention methods for damage from pests observed in crop fields.
3. Ability to explain environmental preservation, connecting it with use of pesticides, deforestation and improper disposal of harmful substances.

Knowledge, understanding, and skills in observation and experimentation

1. Ability to investigate different types of common plants and animals as well as ways to raise them, and based on this, explain how plants and animals live by sharing with one another.
2. Ability to give examples and explain how humans use plants as food and medicines.
3. Ability to give examples and explain the food chain.
4. Ability to explain that interdependence of plants and animals along with the food chain preserve nature's balance.
5. Ability to give examples and explain about the pests that damage grain crops in fields and storage, as well as damage prevention.

Ideas behind the structuring the unit

Studies in this unit are centred upon the ties amongst living animals based upon pupils' studies of plants and animals to this point, as well as the pests that damage field crops and stored crops. Additionally, the unit is structured to give an understanding of the ties between the environment, plants and animals.

The first half of the unit deals with the ties between plants and animals. It starts by having pupils consider ties between plants and animals based on their observations of the plants and animals around them, and then further expands to studies giving an understanding of the importance of the food chain and preserving nature's balance.

In regards to pests and pest control, pupils will learn about crop-damaging pests and the damage they produced based on observation and investigation of field crops, and use what they have learned to also learn about storage pests. Additionally, the unit is then structured to advance into learning about methods of pest extermination.

Unit teaching plan

(13 periods + 2 periods for the Final Unit Evaluation Test)

* The numeric value in parentheses represents the corresponding period (e.g. 1) means the first period).

* *(Evaluation: Knowledge and Skills 1), (Evaluation: Interest 1)*, etc. indicate the points at which teachers can check whether the pupils have attained the goals specified in the section *Objectives based on the viewpoint*.

Sub-Unit	Description
1. Interdependence Between Plants (2 periods)	1) Confirm by observation the connection between plants, such as how there are plants that grow through support from other plants or using shade produced by other plants. *(Evaluation: Interest 1)* 2) Learn that there are plants which grow by spreading their roots on the stalks of other plants, and how plants live by helping one another. *(Evaluation: Thinking and Representation 1, Knowledge and Skills 1)*
2. Interdependence Between Plants and Animals (4 periods)	3) Confirm by observation how animals are dependent upon plants for life, such as how they grow up eating the leaves, seeds and fruit of plants. *(Evaluation: Interest 1)* 4) Carnivores which feed on other animals are also indirectly dependent on plants. Learn that in this way, animals greatly benefit from plants as food. *(Evaluation: Thinking and Representation 1, Knowledge and Skills 1)* 5) Plants produce nutrients such as starch along with oxygen through photosynthesis. This oxygen is used in respiration of animals, and the resulting carbon dioxide in turn becomes fuel for photosynthesis. Learn that with generation and consumption of oxygen and carbon dioxide, plants and animals live closely tied to each other. *(Evaluation: Thinking and Representation 1, Knowledge and Skills 1)* 6) Learn how plants and animals share deep ties in various aspects, such as how plants are used as medicines and spices, and how animal waste products are decomposed by microbes in the earth to make fertiliser for plants. *(Evaluation: Knowledge and Skills 2)*
Intermediate Review (No time allotted)	Give the **"1st and 2nd Sub-Unit Review Test."**. (Homework can be given depending on the progress of the class.)
3. The Food Chain (2 periods)	7) Learn that as there are animals that eat plants and in turn animals that eat these animals, living animals are tied together by the food chain in which they eat and are eaten. *(Evaluation: Knowledge and Skills 3)* 8) Learn that the food chain starts with photosynthetic plants, known as producers, and preserves balance in the natural world. *(Evaluation: Thinking and Representation 1, Knowledge and Skills 4)*

Intermediate Review (No time allotted)	Give the "**3rd Sub-Unit Review Test**." (Homework can be given depending on the progress of the class.)
4. Crops and Pests (2 periods)	9) Learn that some insects and birds are pests that damage field crops. *(Evaluation: Interest 2, Knowledge and Skills 5)* 10) Learn that there are pests such as rats and insects like the weevil that damage stored grains. *(Evaluation: Interest 3, Knowledge and Skills 5)*
5. The Effects of Pests on Crops (1 period)	11) Learn that field pests and storage pests bring about various kinds of damage, such as lowering yields and quality of crops as well as causing sickness in humans. *(Evaluation: Knowledge and Skills 5)*
Intermediate Review (No time allotted)	Give the "4th and 5th **Sub-Unit Review Test**." (Homework can be given depending on the progress of the class.)
6. Extermination Measures and Nature Conservation (2 periods)	12) Learn of the various methods of preventing and lessening damage from pests, such as setting traps, trimming weeds and using pesticides. *(Evaluation: Interest 3, Thinking and Representation 2, Knowledge and Skills 5)* 13) Humans also use crops and the plants and animals in nature as food and medicine. Accordingly, since things like using large quantities of pesticides, deforestation and throwing away refuse pollute our atmosphere and water, we have to work towards preserving the environment by restraining ourselves from these activities for the sake of all living animals, including humans. *(Evaluation: Interest 4, Thinking and Representation 3)*
Unit End Review (2 periods)	14) Give the **1st Final Unit Evaluation Test**. 15) Give the **2nd Final Unit Evaluation Test**.

Lesson Plan

1. Interdependence Between Plants (2 periods: 1st period – 2nd period)

Goals of this sub-unit

- Observe common plants helping each other and be able to record the results.
- From observation, be able to explain how plants cooperate by supporting each other and providing shade.

Material Preparations

- Recording worksheet

Period 1: Observation of Plants' Mutual Cooperation

	Learning flow and activity	Teaching Hints and Advice
Introduction 5 minutes	• Do plants help one another? Do things like that really exist?	• Give various points of observation to ensure pupils properly record what they investigate. → Search for plants that spread out as vines. → Find out what kind of plants grow in the shade. • Indicate what time to return to the classroom.
Questions	How do plants relate with one another? Go outside to observe plants and record the results in your worksheet.	
Observation 25 minutes	• Find examples of plants cooperating to live together in the school yard and around the school. → Search for plants growing wrapped around another plant.  MACMILLAN Primary Science 7 (p.39) → Search for plants growing in the shade of another plant. • Record results in the worksheet.	*(Refer to pg. 128 regarding worksheet)* • Give thorough safety warnings and go together with the pupils. • Check whether pupils are actively participating in the observation and properly recording things in the worksheet or not. *(Evaluation: Interest 1)* Taking an interest in what ties plants to one another, and willingly making efforts to observe and investigate them.
Summary 5 minutes	• Recheck the contents of your worksheet to be sure there are no mistakes.	• Instruct the pupils to bring the worksheets next period. • Having them turn them in is fine, as this will allow you to avoid pupils forgetting their sheets in the next period.

Period 2: Plants' Mutual Cooperation

	Learning flow and activity	Teaching Hints and Advice
Introduction 5 minutes	• Share worksheets with one another to see what you observed in the last class.	• Recheck the observation results recorded in your worksheet from the last period.
Questions	Present the results of your observations on whether you saw plants cooperating or not.	
Presentation 25 minutes	• Present the results of your observations. → There were plants supporting vine plants. → There were plants making shade to protect other plants that need to retain moisture. → There were plants that spread their roots to grow on another plant's stem, not in the ground.	• Letting pupils discuss in groups and present a summary is acceptable. • Summarize the results on the blackboard. Having pupils draw a picture on the board will make things even easier to understand. • Check how many examples pupils were able to record. *(Evaluation: Thinking and Representation 1)*Ability to discover the interdependence among plants based on observation of plants around us, summarise the process leading to this conclusion in a report, and present it.
Summary 5 minutes	• There are many plants which help out other plants by supporting vine plants, making shade to help the growth of plants that need to retain moisture, and other methods. • There are also plants with thick stems where other plants will spread their roots. • Plants grow by helping one another.	• Along with the summary of interdependence among plants, give advance notice that you will be investigating the relationship between plants and animals in the next period. → By having pupils predict what kind of connections there are, you can increase their motivation going in to the next period's observation. (*Evaluation*: Knowledge and Skills 1) Ability to investigate different types and ways to raise common plants and, based on this, explain how plants live by sharing with one another.

2. Interdependence Between Plants and Animals (4 periods: 3rd period – 6th period)

Goals of this sub-unit

- Be able to observe common plants and animals, discover their connections of interdependence and record them.

- Be able to explain from observation that some animals live off of the leaves and seeds of plants, and also that the carnivores that feed off of other animals are indirectly dependent upon plants as well.
- Be able to explain that plants and animals live closely tied to each other in terms of generation and consumption of oxygen and carbon dioxide. Oxygen made by photosynthesis in plants is used in respiration of animals, and the resulting carbon dioxide in turn is used in photosynthesis in plants.
- Be able to explain how plants are used as medicines and spices, and how animal waste products are decomposed by microbes in the earth to make fertiliser for plants.

Material Preparations

- Recording worksheet, magnifying glass or similar tools

Period 3: Observing Flowers and Insects, Livestock Food

	Learning flow and activity	Teaching Hints and Advice
Introduction 5 minutes	• We observed plants helping out one another, but do animals and plants also help each other? • What kind of things should we observe?	• Have pupils think back to the first period and get them to think of as many observation points themselves as they can. • Indicate what time to return to the classroom.
Questions	How do plants and animals relate with each other? Go outside to observe plants and record the results in your worksheet.	
Observation 25 minutes	• Find examples of plants and animals cooperating to live together in the school yard and around the school, such as flowers and insects, and cows and goats grazing. → Observe how insects approach flowers.  MACMILLAN Primary Science 7 (p.45) → Find out what cows, goats and chickens eat. • Record results in the worksheet.	*(Refer to pg. 129 regarding worksheet)* • Inform pupils of all observation points and give all necessary safety warnings. • Go around together with pupils and point out observation points. *(Evaluation: Interest 1)* Taking an interest in what ties plants and animals together and willingly making efforts to observe and investigate them.
Summary 5 minutes	• Recheck the contents of your worksheet to be sure there are no mistakes.	• Instruct the pupils to bring the worksheets next period. • Having them turn them in is fine, as this will allow you to avoid pupils forgetting their sheets in the next period.

Period 4: Ties Between Plants and Animals

	Learning flow and activity	Teaching Hints and Advice
Introduction 5 minutes	• Share worksheets with one another to see what you observed in the last class.	• Recheck the observation results recorded in your worksheet from the last period.
Questions	Present the results of your observations on how plants and animals relate with each other.	
Presentation 25 minutes	• Present the results of your observations. → Flowers and insects live cooperatively, with flowers giving insects nectar in exchange for help with pollination. → Cows and goats were grazing on plants. → We humans also eat fruits and grains made by plants, as well as cows and goats which are raised eating plants. Plants really are a blessing!	• Letting pupils discuss in groups and present a summary is acceptable. • Summarize the results on the blackboard. Having pupils draw a picture on the board will make things even easier to understand. • Check how many examples pupils were able to record. *(Evaluation: Thinking and Representation 1)*Ability to discover how animals are dependent upon plants based on observation of plants and animals around us, summarise the process leading to this conclusion in a report, and present it.
Summary 5 minutes	• Animals and plants are dependent upon each other, like the relationship between flowers and insects in pollination, and how cows and goats graze on plants. • Understand that the animals eaten by other animals are raised eating plants, so carnivores are also indirectly dependent on plants. • The benefits we as humans get from plants are not only as food, but also include various things such as medicines like quinine and antibiotics as well as spices.	• Have pupils realise that the food of animals, including humans, all starts with plants, helping them develop a sense of appreciation for plants. • Also have them realise that humans benefit from plants as medicine as well. • Also explain that antibiotics such as penicillin are made using microbes. (*Evaluation*: Knowledge and Skills 1) Ability to investigate different types and ways to raise common animals and plants and, based on this, explain how animals are dependent on plants to live.

Period 5: Photosynthesis in Plants and Animal Respiration

	Learning flow and activity	Teaching Hints and Advice
Introduction 5 minutes	• Plants make starch through photosynthesis, but is that all that is produced in this process?	• There is a gas produced along with starch. • Remind pupils of their studies of respiration.

	→ Is there a gas that we give off as well?	
Questions	What is the relationship between photosynthesis in plants and respiration in animals?	
Presentation 25 minutes	• What kinds of gases enter and leave the bodies of animals, including humans, during respiration? → What kinds of gases entered and left plants in photosynthesis? • Think about the relationship between plant photosynthesis and animal respiration in terms of oxygen and carbon dioxide. → Oxygen made in photosynthesis is for animal respiration, and carbon dioxide made in animal respiration is for plant photosynthesis.	• Urge pupils to speak up as much as possible, and start your teaching with the topics they mention. *(Evaluation: Thinking and Representation 1)* Ability to summarise the relationship between plant photosynthesis and animal respiration in a report and present it.
Summary 5 minutes	• Through photosynthesis and respiration, plants and animals live by giving each other oxygen and carbon dioxide.	• Make pupils sufficiently aware that oxygen and carbon dioxide circulate in the natural world through plant photosynthesis and animal respiration. (*Evaluation*: Knowledge and Skills 1) Ability to explain through plant photosynthesis and animal respiration how plants and animals live by sharing with one another.

Period 6: Plants as Medicine and Spices, and Material Circulation

	Learning flow and activity	**Teaching Hints and Advice**
Introduction 5 minutes	• Give some examples of things which make food taste better and things used when we get sick. • Withered plants and animal carcasses go away with time, but how?	• What do we put in food when cooking? • Are there any medicines that your family has always used when someone gets sick?
Questions	Plants and animals are of use to each other even outside of being food. What are some examples?	
Presentation 20 minutes	• Summarise what your classmates are saying. → Plants used as medicine → Plants used as spices → What happens to withered plants and dead animals	• Have pupils put things in order and write notes on the blackboard. → Medicines − calisaya, etc. →Spices − pepper, etc.
Summary 10 minutes	• The benefits of plants → Plants greatly benefit humans not only as a food supply, but also used as medicine and spices. • The function of microbes and material circulation → Withered plants, animal carcasses and waste products	• This aims to change the image of animal waste and

	are decomposed by microbes in the earth and absorbed again by plants as fertiliser. • Material circulation → There is a circulation of oxygen and carbon dioxide in nature associated with respiration and photosynthesis. → Another kind of circulation is how animal waste and carcasses are decomposed by microbes in the earth to become fertiliser for plants.	carcasses as dirty to that of something important to nature. • Make pupils reconfirm that we live thanks to the many benefits received from the plants and animals of nature. *(Evaluation: Knowledge and Skills 2)* Ability to give examples and explain how humans use plants as food and medicines.

3. The Food Chain (2 periods: 7th period – 8th period)

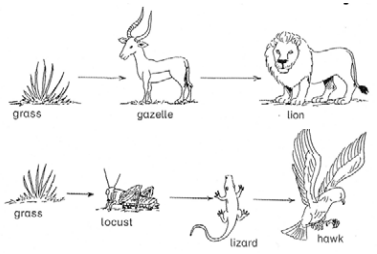
Goals of this sub-unit

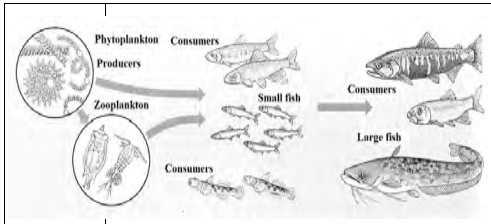
- Be able to give examples and explain how plants and animals in nature are connected by the food chain, in which they eat and are in turn eaten.
- Be able to explain that the food chain starts with photosynthetic plants, and that the food chain is useful in preserving the balance in the natural world.

Material Preparations

- Figures of the food chain, showing meadows, forests, rivers and seas

Period 7: The Food Chain

	Learning flow and activity	**Teaching Hints and Advice**
Introduction 5 minutes	• There are plenty of zebras, antelope and lions in the meadows and plains. Which animal is the strongest? → What about common locusts and small birds, or hawks?	• Let pupils discover the relationships of eating and being eaten by giving examples of common plants and animals.
Questions	Find out which plants and animals in the natural world eat and which are eaten.	
Presentation 25 minutes	• Nature's food chain → In nature, plants and animals eat and are eaten. This relationship is called the *food chain*. → Look at figures in your textbook and think about what order plants and animals are eaten in. → Make a simple food chain.	

	 Keirinkan Middle School Science, vol. 2 (1998)(p.84) • Record results in the worksheet.	MACMILLAN Primary Science 7 (p.47) • Put the pupil's answers in order and summarize them on the blackboard. → Make pupils think about the food chain in rivers and oceans as well. *(Evaluation: Knowledge and Skills 3)* Ability to give examples and explain the food chain.
Summary 5 minutes	• The food chain starts with plants. • It ends with meat-eating carnivores.	

Period 8: The Food Chain and Nature's Balance

	Learning flow and activity	Teaching Hints and Advice
Introduction 5 minutes	• Recall the sequence of the food chain. → It starts with plants. → It ends with the strong carnivorous animals.	• Show pupils a simple food chain figure while helping them remember.
Questions	What kind of rules are there in the food chain?	
Observation 25 minutes	• Photosynthetic plants are called the *producers*, and the herbivores that eat them are known as *primary consumers*. • Next, the carnivores which eat herbivores are called *secondary consumers*. • How the food chain works Producer→Primary Consumer→Secondary Consumer ↓ ↓ ↓ Plants Herbivores Carnivores	• Make pupils think what would happen if all the grass in the savannah was cut down and a large number of trees in the forests were felled. *(Evaluation: Thinking and Representation 1)* Ability to investigate the food chain, summarise the process used to reach a conclusion in a report and present it. *(Evaluation: Knowledge and Skills 4)* Ability to explain that interdependence of plants and animals along with the food chain preserve nature's balance.
Summary 5 minutes	• The food chain is what preserves the balance of nature.	

(PLANTS／7th grade)

[Worksheet]---------- *To be used in 1st – 2nd Periods

Searching for Cooperation Among the Plants Around Us

Date: **Class:** **Name:**

1. Observe vine plants.
   - Write the names of the plants observed.
   ( )
   ( )
   - Sketch the appearance of the vine's growth in the box on the right.
   - What would happen to plants with vines if the other plants supporting them were not there?
   ( )

2. What plants were growing in the shadows? Write their names.
   ( )( )
   ( )( )
   - What would happen to these plants if they tried to grow under direct sunlight?
   ( )

3. Search for plants growing with their roots spread on another plant's stem.
   - Write the names of the plants observed.
   ( )
   ( )
   - Sketch the appearance of the vine's growth in the box on the right.

** Keep this worksheet for the next class.*

[Worksheet]---------- *To be used in 3rd – 4th Periods

Investigating Insects and Flowers and What Livestock Eat

Date: **Class:** **Name:**

1. Observe insects swarming around flowers.
   - Write the names of the plants observed.
   (　　)
   (　　)
   - Consider the following things while observing:
   → Why do insects swarm around flowers?
   → What purpose do the insects serve from the flower's perspective?

2. Observe what cows, goats and chickens are eating. Draw a picture of what they were eating in the boxes on the right.
   - What cows and goats were eating
   (　　)
   - What chickens were eating
   (　　)
   - Consider the following things while observing:
   → Where did the grains that the chickens are eating come from?

Cows and Goats

Chickens

** Keep this worksheet for the next class.*

1st and 2nd Sub-Unit Review Test

* given after the end of 6th period

Class: Name:

1. Different plants grow by helping each other in a number of ways. Write appropriate words in the blanks of **i. – iii.** below to complete the sentences.

   i. Plants support other plants by letting them wrap (**vines**) around them to grow.

   ii. Plants can be the living habitat of other plants that grow by spreading (**roots**) on the surface of the host's stem.

   iii. Plants can make (**shade**) from strong sunshine to help low light plants grow.

2. Many different insects swarm around flowers. What benefit do the insects serve to flowers? And what benefit do the insects receive? Write your answer in the blanks.
   How can you describe this kind of cooperation? Write your answer in the blanks.

   i. Benefit to flowers (**Insects help pollen reach the pistil**)

   ii. Benefit to insects (**They feed on the nectar and pollen produced by flowers**)

   iii. Term meaning *to help one another* (**Interdependence**)

3. Keeping in mind that plants photosynthesize, answer the following questions about the connection between photosynthesis and animals.

   i. Write down the two things produced through the function of photosynthesis.
   Products: A (**starch**)
   B (**oxygen**)

   ii. And how are these products used by humans and other animals?
   Product A: (**becomes food (nutrients)**)
   Product B: (**taken in through the lungs and used in respiration**)

3rd Sub-Unit Review Test

* given after the end of 8th period

Class: Name:

1. There is a relationship in nature between different plants and animals in which they eat and are eaten.

   i. What is this relationship called? (**The food chain**)

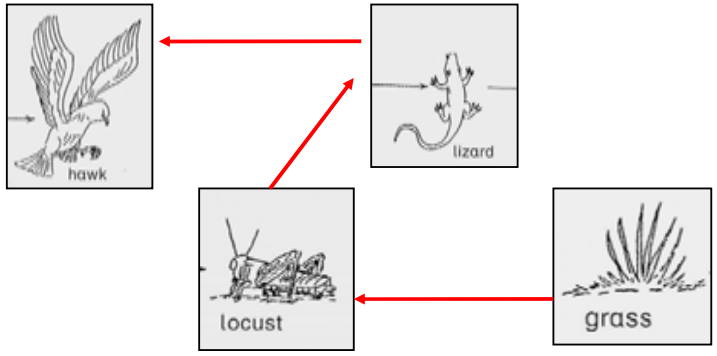
   ii. Put the plants and animals given in **A – D below** in order according to the relationship in **i. above.**
   The arrows point from the organism being eaten to that doing the eating.

   A. chicken **B.** hawk **C.** weeds **D.** locust

   (**C**) → (**D**) → (**A**) → (**B**)

2. The following animals either eat or are eaten by one another.

MACMILLAN Primary Science 7 (p.47)



   i. Draw arrows showing the order in which things are eaten.

   ii. Which one exists in the greatest number or quantity? (**grass**)

   iii. And what is the answer in **i. above** known as in the natural world? (**producer**)

   iv. What are the other animals called in the natural world? (**consumers**)

4th and 5th Sub-Unit Review Test

* given after the end of 11th period

Class: Name:

1. Answer the following questions about various pests that damage field crops.

   i. Which of the following shows a grouping of only field crop pests?

   (**B.**)

   A. weevils, termites, cut worms
   B. cut worms, aphids, weaverbirds
   C. termites, aphids, weaverbirds
   D. stalk borers, mites, weevils

   ii. Pests damage crops in many different ways. Give 4 examples of possible damage below.

   (**lowering harvest yields**) (**worsen quality of the harvest**)
   (**spread sickness to other crops**) (**cause sickness in humans that eat it**)

2. Answer the following questions about various pests that damage stored grains.

   1. Which of the following is a list grouping only pests that damage stored grains?

   (**D.**)

   A. mice, aphids, termites
   B. stalk borers, mites, termites
   C. stalk borers, mice, aphids
   D. termites, mice, weevils

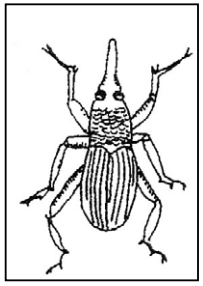
KENYA LITERATURE BUREAU
Primary Science 7 (p.57)

   2. The insect on the right is a pest. Name the pest.

   (**weevil**)

   3. What kind of damage does this pest cause?

   (**makes holes in grains, eats out the insides**)



1st Final Unit Evaluation Test

*Done at Unit End

Class: Name:

1. The following sentence talks about respiration in animals and photosynthesis in plants. Write suitable words in the blanks below to complete the sentences.

   - When plants make (**starch**) through the process of photosynthesis, oxygen is also produced. This oxygen is taken in by animal's bodies and used in (**respiration**). The (**carbon dioxide**) produced by this process once again becomes material for photosynthesis.

   - In this fashion, (**oxygen**) and carbon dioxide (**circulate**) in nature through the bodies of plants and animals.

2. Answer the following questions about the food chain.

   i. Give an example to explain the term *food chain*.

   (**A relationship between plants and animals based on what they eat and who eats them, like how a locust eats grass and then is eaten by a chicken.**)

   ii. What living organism always comes first in the food chain? And what is this living organism known as in the natural world?

   (**(photosynthetic) plants**)(**producers**)

3. The following problem points out harmful insects and the damage they do to crops. Choose the 2 options below which are correctly paired.

   (**B, C**)

   A. Aphids → eat leaves of rice plants and beans and leave holes in them
   B. Stalk borer → leave holes in maize stalks and sugar cane, weakening crops
   C. Cut worms → cut the stems of beans and tomato plants, killing them
   D. Termites → suck the juice out of maize and oranges, weakening them

(PLANTS／7th grade)

4. The following are pests that damage field crops and stored grains. What kind of damage do these pests cause? And how can this damage be avoided? Write the answers below.

	Damage	Prevention Method
• Weaverbirds	(**Eat grains**)	(**Scare them off**)
• Cut worms	(**Kill crops by cutting their roots**)	(**Dig in the ground to find and kill them**)
• Aphids	(**Weaken crops by sucking juice from them**)	(**Pluck infested leaves**)
• Weevils	(**Eat grains, leaving holes**)	(**Pluck them by hand**)

5. Dead plants and animals, as well as animal waste products, will in time gradually disappear. Answer the questions below about this phenomenon.

   i. What living animals in the ground are working to make this happen?

   (**bacteria, fungi and other microbes**)

   ii. What results from the efforts of these living animals? Give two results.

   (A. **carbon dioxide**)
   (B. **humus**)

   iii. How are the products given in the answer for **ii. above** used?

   (A. **becomes fuel for photosynthesis**)
   (B. **becomes crop fertiliser (nutrients)**)

2nd Final Unit Evaluation Test

*Done at Unit End

Class: Name:

1. The following pests damage field crops.

   i. What are the pests given in **A – D below** called? Write their names below.

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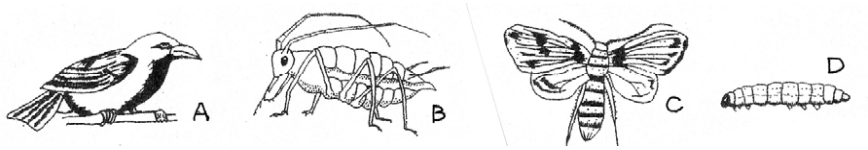
Primary Science 7 (p.56)



A. (**Weaverbird**) B. (**Aphid**) C. (**Stalk borer**)
D. (**Cut worm**)

   ii. Write below how the pests in **i. above** damage various crops.

A. (**They eat unripe grains and diminish the harvest.**)
B. (**They drink the sap from leaves and stems, weakening crops.**)
C. (**Leave holes in stems, making the stems fall over.**)
D. (**They bite through roots and stems, killing crops.**)

2. The many plants and animals in nature can be related to each other by what they eat and who eats them.

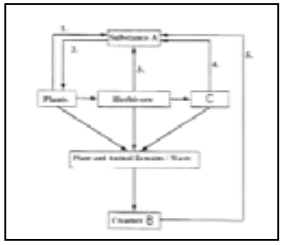
   i. What is this relationship called by which plants and animals eat and are eaten?

(**The food chain**)

   ii. The following shows an example of the relationship in **i. above**. Write the names of appropriate living animals in spaces **A – E below**.

(grass) → (A. **locust**) → (frog) → (B. **hawk**)
(C. **producer**) → (primary consumer) → (D. **secondary consumer**) → (tertiary consumer)
(green plant) → (herbivore) → (E. **carnivore**)

3. The figure on the right shows substances which circulate through the natural world, and their ties to plants and animals.



   i. Write in the appropriate answers for **substance A** and **creatures B and C**.

Substance A (**carbon dioxide**)
Creature B (**bacteria and fungi (microbes)**)
Creature C (**carnivores**)

   ii. And where does the energy come from that forms the basis for this circulation?

(**The sun**)

Student Questionnaires

1. What kinds of studying have you done in the past for the above test problems?

0.	None at all	This was done 10% of the time for all problems.
1.	No	This was done 30% of the time for all problems.
2.	Average	This was done 50% of the time for all problems.
3.	Yes	This was done 70% of the time for all problems.
4.	Absolutely yes	This was done over 90% of the time for all problems.

Answering Questions using Pictures and Diagrams in the Textbook or Illustrations Drawn on the Blackboard

1. The Students answered the questions by walking up to the board and drawing diagrams or writing words.

0. 1. 2. 3. 4.

2. The teacher asked and answered the questions by drawing diagrams or writing words on the board.

0. 1. 2. 3. 4.

3. Questions were answered using pictures and diagrams in the textbook.

0. 1. 2. 3. 4.

Experiments

1. Did the students conduct any experiments or observations?

0. 1. 2. 3. 4.

2. The teacher conducted the experiments.

0. 1. 2. 3. 4.

3. The students conducted the experiments by following the teacher's instructions.

0. 1. 2. 3. 4.

Discussion and Thinking

4. We talked with friends in the class and thought about the problems.

0. 1. 2. 3. 4.

5. We thought about the problems carefully with friends and stated our ideas logically.

0. 1. 2. 3. 4.

6. We thought about the problems carefully when coming up with a hypothesis and after the experiment.

0. 1. 2. 3. 4.

Understanding Ideas

7. I was able to understand new ideas.

0. 1. 2. 3. 4.

8. I was able to see new viewpoint of looking at and thinking about science.

0. 1. 2. 3. 4.

9. I was able to grasp the principles hidden beneath the facts.

0. 1. 2. 3. 4.

Application of Knowledge

10. I was able to apply the new knowledge that I learned in school in my daily life.

0. 1. 2. 3. 4.

11. The teacher has explained that the new knowledge things the students are learning in school are connected with actual life.

0. 1. 2. 3. 4.

12. I was able to learn that the new principles and viewpoints toward science can be applied to a variety of different phenomena.

0. 1. 2. 3. 4.

Pursuing Knowledge through Problem Solving

13. We were first given a problem and then were to solve that problem.

0. 1. 2. 3. 4.

14. We made predictions, put then to the test, formulate scientific explanations, and put them to practical use.

0. 1. 2. 3. 4.

15. The students were asked to verify through the experiment that they had created a hypothesis as well as a plan for the observation.

0. 1. 2. 3. 4.

2. When you learned each unit for the above test problems, did you become interested in the material?

0.	None at all	This was true 10% of the time for all problems.
1.	No	This was true 30% of the time for all problems.
2.	Average	This was true 50% of the time for all problems.
3.	Yes	This was true 70% of the time for all problems.
4.	Absolutely yes	This was true over 90% of the time for all problems.

Interest and Motivation

1. I was very interested in science lessons.
0. 1. 2. 3. 4.
2. I became more motivated to learn.
0. 1. 2. 3. 4.
3. I was interested in what we were learning from start to finish.
0. 1. 2. 3. 4.

Concentration and Involvement

4. I was actively engaged in learning the topic.
0. 1. 2. 3. 4.
5. I enjoyed learning the topic so much I lost track of time.
0. 1. 2. 3. 4.
6. I was very focused on learning topic material but at the same time, I was also very excited and enjoyed myself.
0. 1. 2. 3. 4.

Cooperation and Collaboration

7. I enjoyed the learning process while collaborating with friends.
0. 1. 2. 3. 4.
8. I was able to learn through cooperation and mutual support with my friends.
0. 1. 2. 3. 4.
9. I shared my experiments and ideas with my friends and we all had a fun time learning together.
0. 1. 2. 3. 4.

（PLANTS／7th grade）

Level of Earnestness and Enjoyment during Experiments

10. The experiments were very enjoyable.
0. 1. 2. 3. 4.
11. Since experiments need five senses, I carefully moved my hands and eyes when collecting the data.
0. 1. 2. 3. 4.
12. During the experiments, I recorded my observations accurately and carefully.
0. 1. 2. 3. 4.

Spirit of Inquiry

13. I began to have more an inquiring mind toward new discoveries.
0. 1. 2. 3. 4.
14. I became very excited and curious about challenging the unknown.
0. 1. 2. 3. 4.
15. I made a strong effort to learn what is known by trying to find examples, drawing illustrations, and through discussions and experiments.
0. 1. 2. 3. 4.

Logic and Objectivity

16. I attempted to find plenty of evidence and facts to check whether my hypothesis held true.
0. 1. 2. 3. 4.
17. I was able to confirm that the principles and concepts were true by applying them to actual life.
0. 1. 2. 3. 4.
18. The explanations were very convincing and easy to understand for the entire class. I was very satisfied with the interpretations which were logical and accorded with the truth.
0. 1. 2. 3. 4.

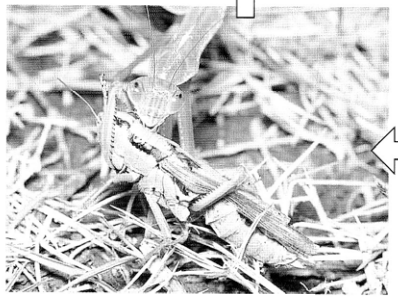
Appendix

Food Chain on Land

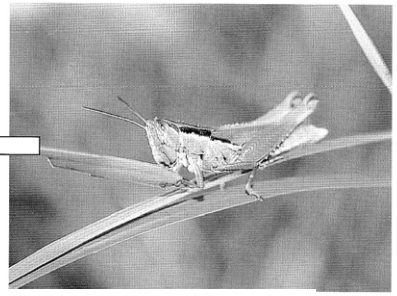
Grey-faced buzzard eats tiger keelback

Toad eats praying mantis

Tiger keelback eats toad



Praying mantis eats grasshopper



Grasshopper eats rice plant

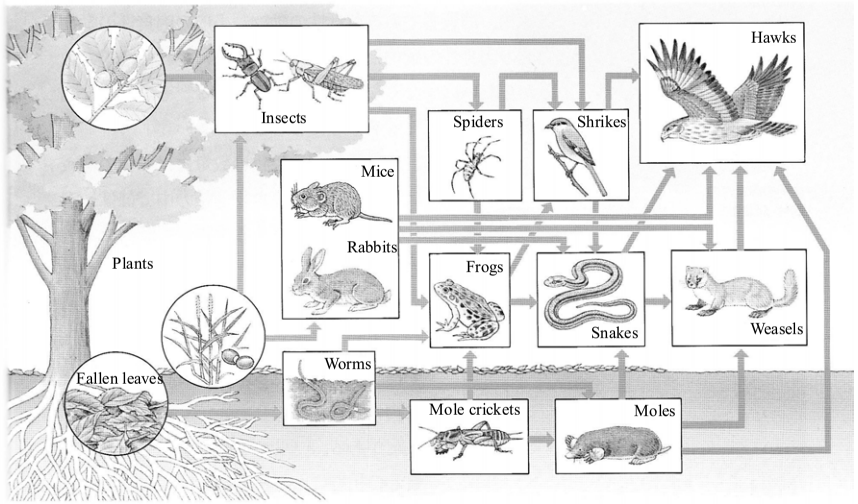
Photosynthetic plants (Producer) → Herbivore (Primary Consumer) →
Carnivore (Secondary Consumer) →Carnivore (Tertiary Consumer)

（PLANTS／7th grade）

Appendix

Complex Food Chain

This food chain is a complex network.



Underground food chain

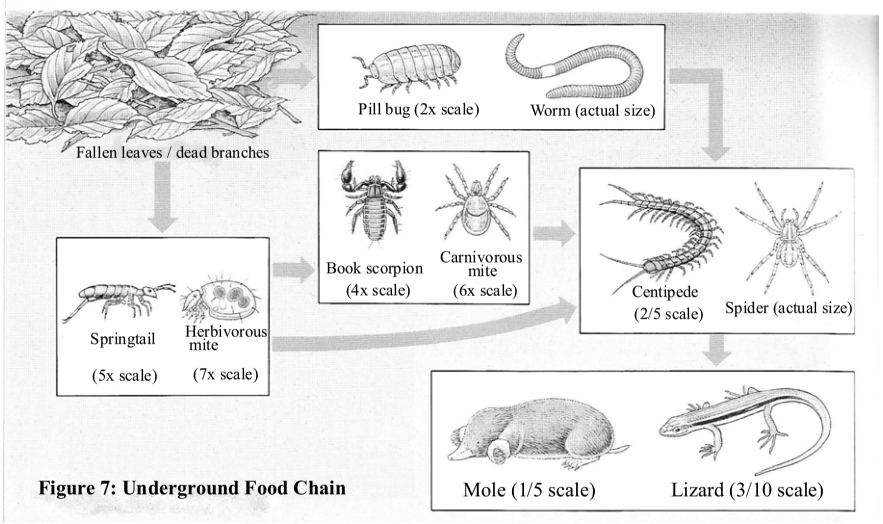


Figure 7: Underground Food Chain

Appendix

What happens to fallen leaves

▪ **Animals that feed on fallen leaves and animal remains**

If you leave a pile of fallen leaves alone, you will begin to notice a multitude of smaller animals on the leaves and earth beneath (refer to **Figure 7**). Pill bugs and earthworms live off of fallen leaves. There are also insects such as the carrion beetle, which lives off of eating animal remains, and the dung beetle, which lives off of animal waste.

Once eaten, the leaves and remains pass through these animals' systems and are decomposed into smaller elements, then excreted as waste.

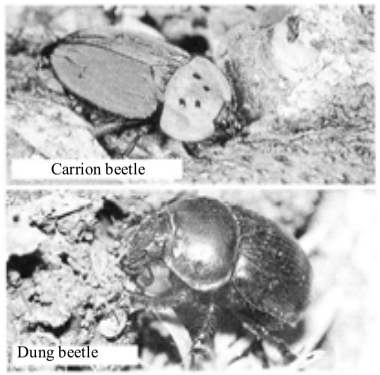
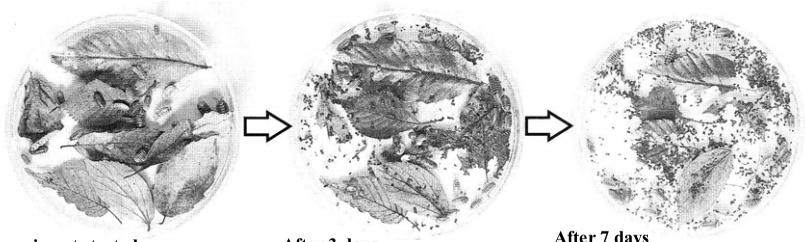


Figure 8: Carcass / waste-eating insects



Experiment started **After 3 days** **After 7 days**

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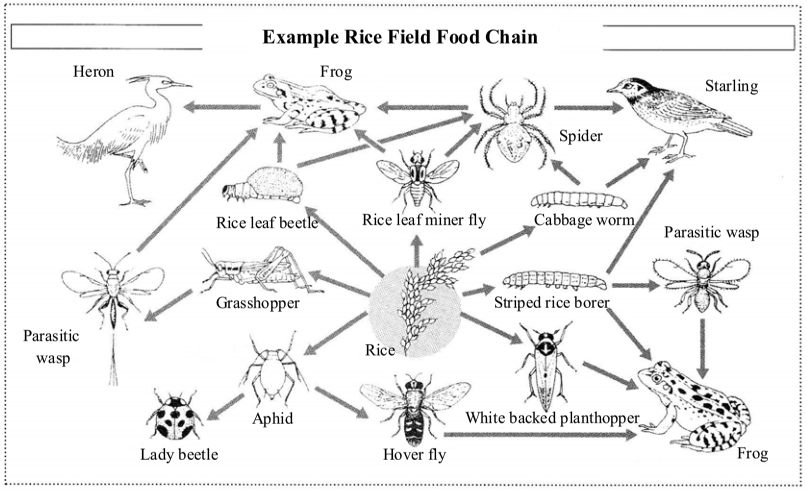
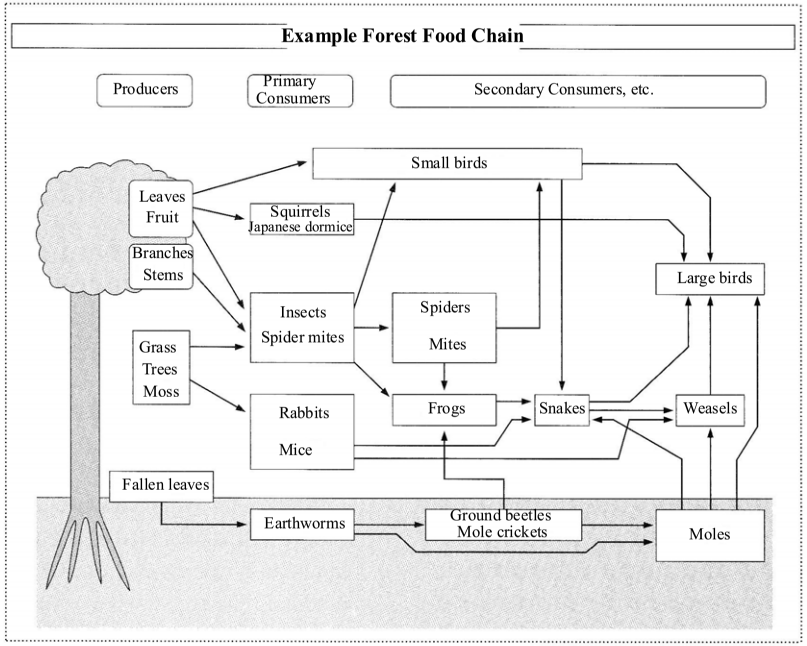
Appendix

Paddy field and forest food chains

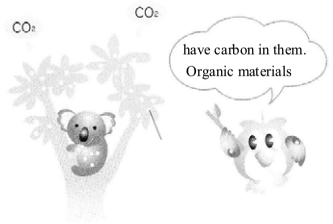




Appendix

The Food Chain and Quantities

*1 Plants and animals use organic materials like starch, carbohydrates and fat as material to make new cells and grow. By breathing, they also produce the energy they use to live with organic materials.



Quantities of Plants and Animals

The food chain begins with photosynthetic plants. Plants produce organic substances from inorganic ones (water and carbon dioxide) through photosynthesis, and are thus called **producers**.

In contrast, animals which eat plants and other animals to get their nutrients are called **consumers**.

If one were to investigate the quantitative relationship among the plants and animals of a certain region, one would find that normally the higher up the food chain you go, through producing plants, to the consuming herbivores, small carnivores and large carnivores, the fewer in number specimen become. Putting this quantitative relationship in figures is often shown as a pyramid (**figure 2**).

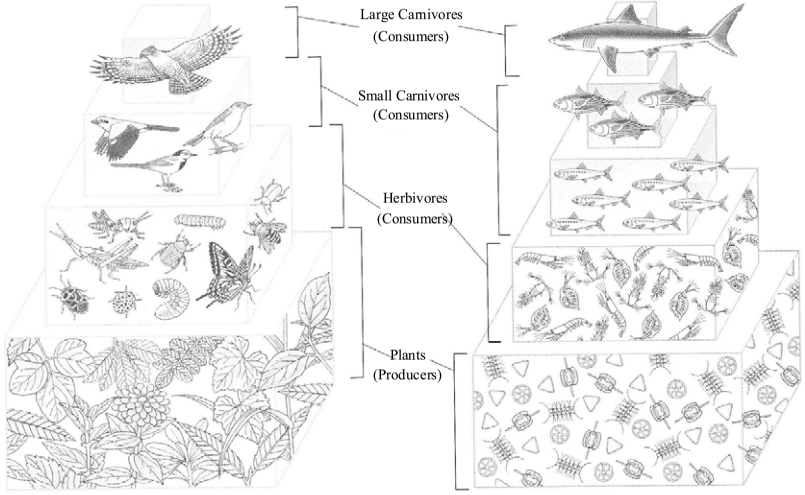


Fig. 2:Quantitative Relationships in a Pyramid Food Chain

(PLANTS／7th grade)

Appendix

Food Chain Fluctuation

Animal Population Fluctuation

The graph to the right was made based on fur summary reports from Hudson's Bay Company, the period's lone handler for all furs in Canada. As seen in the graph, the numbers of both snowshoe hares and Canadian lynxes captured rose and fell on approximately a 10-year cycle. In addition, fluctuation of the lynx came 1-2 years after that of the snowshoe hare.

From this we can surmise that population of prey (snowshoe hare) is highly influential upon population of carnivorous animals (lynx). Also, a decrease in carnivorous animal population when prey becomes scarce is the living world's way of finding balance.

It is not clear why the snowshoe hare population fluctuates on a 10-year cycle.

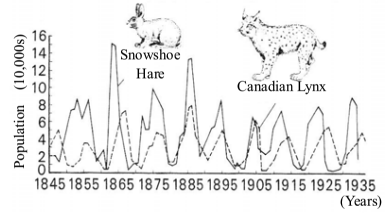
- **Example of Nature's Balance Being Broken**

There were about 4,000 deer living on the Kaibab Plateau of Arizona in the United States along with the pumas, coyotes and wolves that fed upon them. In order to protect the deer, a large number of carnivorous animals were killed starting in 1907, and the deer population skyrocketed. Along with this, however, the deer ravaged the plateau's plant life. Over the 2-year period immediately following the deer population reaching 100,000, 60% of that number died from starvation. The population continued to dwindle after that, falling to 10,000 in 1940.

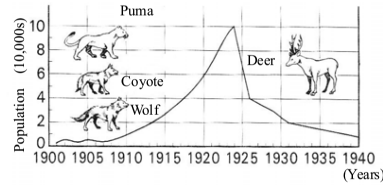
- **Spreading pesticides**

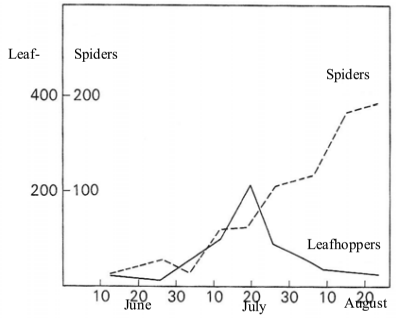
The leafhopper is a pest affecting rice plants that normally start to rise in number in the end of June, peak in mid-July and abruptly fall off in early August. In this rice field, pesticide was spread in late June when the leafhoppers start to multiply. The leafhoppers died off in July, but there was a huge outbreak in early August. The graph on the right shows the fluctuation in the number of leafhoppers and spiders in the field. It is thought that the outbreak of leafhoppers after spreading pesticides was due to the carnivorous animal spiders dying off due to lack

Animal population fluctuation: This graph shows the populations of the snowshoe hare of Canada and their carnivorous animal, Canadian lynx, estimated from numbers.

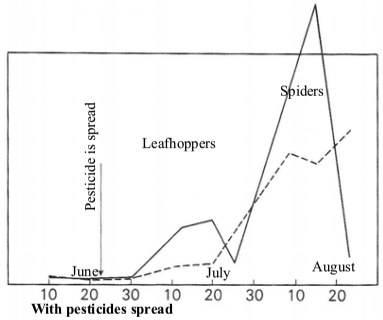


Deer Population of Kaibab Plateau





Leafhopper/spider population per 1m²



With pesticides spread