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NATIONAL SCIENCE EDUCATION STANDARDS

K - 4 **Life Science**
The Characteristics of organisms
Organisms and their environment

5 - 8 **Life Science**
Regulation and behavior Structure and function in living systems

CREDITS

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FARMER ANTS

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SYNOPSIS

Attas ants, commonly referred to as leafcutter ants, are the farmers of the ant kingdom. They farm their crops similarly to human farmers, and biologists marvel at the precise farming techniques, efficiency and coordination that have kept these remarkable creatures in existence.

This edition of SCIENCE SCREEN REPORT FOR KIDS looks at the behaviors of leafcutter ants and explores their agricultural ability. They have a natural instinct to farm and are able to maintain crops that are pest and disease free, something that remains a problem for human farmers. This investigation into the world of the leafcutter ant offers insights into their farming success and what scientists can learn from them to improve the crops of human farmers.

CURRICULUM UNITS	RUNNING TIME
■ BIOLOGY	12:25
■ BOTANY	
■ ENTOMOLOGY	
■ HORTICULTURE	

BACKGROUND

Nearly 9,000 species of ants exist. Each is unique and has adapted its survival instincts to its environment. One particular species, the leaf-cutter ant, survives by growing its food just as humans farm their crops. Biologists have studied the industrious techniques used by leafcutter ants to understand how such a small creature has the ability to grow and maintain a crop that is pest and disease free.

Aside from being unbelievable farmers, the leafcutter ant is also one of the most advanced of all social insects. This ant society is focused around its nest and its queen. New Attas ants are produced to build new colonies. The ants are classified into separate castes such as workers, soldiers, foragers and gardeners to perform tasks that aid in the colony's survival. When building new nests, these ants are said to excavate approximately 44 tons of loose soil, creating underground, fungus-growing chambers that can be up to 25 centimeters high and up to one meter in length. A colony can cover a region the size of a major league baseball field!

Through research and observation, biologists witnessed a flawless and precise system employed by leafcutter ants in order to successfully grow their own food. They innately know how to plant, grow, weed and irrigate their gardens.

Time-lapsed photography shows how leafcutters begin the farming process through the destruction of foliage. They diligently measure and cut leaves to haul back to the nest where they are then chewed into bits that will be used as soil for the fungus garden. The ants then cultivate the fungus into a thick, white, fuzzy substance. All of this leaf consumption makes the leaf-cutter ant one of the largest consumers of leaves and grass in the American tropics.

Aside from tending to their crops, these ants must adapt their nests to wet and dry seasons. You will see the farmer ants working feverishly on a nest which can contain close to a thousand entrances with underground chambers as deep as 6 meters. During the dry season, nest openings are enlarged to create reservoirs to capture rainwater. This collection of water is used to irrigate crops when water is scarce.

Intrigued by their ability to maintain crops that are free of pests and disease, scientists have conducted controlled experiments to find answers that could help farmers today. They observed the regimen of care given to the ants' crops. They then studied the ants' anatomy and discovered a small gland on both sides that produces a chemical hormone called heteroauxin. This hormone aids in the control of plant germination and growth. Farmers could use this hormone or a chemical substitute to control weeds in our crops. In addition, another chemical, phenylacetic acid, is produced that protects against pathogenic bacteria and fungi. Scientists work to see if and how these agents can be duplicated to help human farmers.

ADVANCED ORGANIZERS

Prior to showing the program:

1. Have students brainstorm different species of ants and their varying characteristics. Create a chart outlining this information.
2. Draw a diagram of an ant and label the anatomical features.
3. Read a book such as *The Magic School Bus Gets Ants in it's Pants* or *A Book about Ants*, by Joanna Cole.

CRITICAL THINKING EXERCISES

1. After showing the video, ask your students the following:
   a| How might human farmers benefit from studying farming techniques of the leafcutter ant?
   b| What impact could this have on future farming?
   c| Discuss environmental hazards of pest and disease control methods on human crops.
2. Write an essay explaining the leafcutter's steps in growing and maintaining a fungus garden.
3. Illustrate the leafcutter's farming steps.
4. Have students grow plants or a garden. Record daily observations of growth and weed and pest infestation. Discuss the challenges in growing a healthy garden. Relate this experience to the leafcutter ants.
5. Observe an ant farm via an ant farm educational kit. Measure and record the length and number of tunnels built over a given amount of time.
6. Identify and research another species that has the innate ability to grow and maintain its crops. Then, compare the two species' process. For example, the bee makes honey and the royal jelly is fed to the larvae who are next in line to be queen. Also, a termite, called macrotermitinae, grows fungus for food.

VOCABULARY

Agriculture	Farming: cultivating soil, producing crops, and raising livestock
Castes	Specialized levels in a colony of social insects where some members such as workers or soldiers carry out a specific function
Controlled experiment	An experiment in which one thing is tested at a time under controlled conditions
Cultivate	To improve and prepare for growing
Fungus	Plants that have no chlorophyll and must get nourishment by living on other plants
Irrigate	To supply water by means of ditches, pipes, streams or canals
Herbivore	Feeding mainly on plants
Mandible	Either of a pair of mouth organs in insects used for biting or seizing food
Morph	Size, shape, and form of a species
Pathogen	An agent that causes disease such as a bacterium or some fungi
Petri dish	In scientific studies, a shallow circular dish used to culture bacteria or other microorganisms
Reservoirs	A natural or artificial body of water used to store and regulate water
Social insects	Insects that cooperatively work together for the survival of the colony

CAREER POSSIBILITIES

- BIOLOGIST
- BOTANIST
- ENTOMOLOGIST
- ENVIRONMENTALIST
- HORTICULTURALIST