

SOIL STRUCTURE-ORGANIC MATTER-SOIL MICRO ORGANISMS

Background

The texture and structure of the soil influence the dimensions of the open spaces in the soil. The texture refers to the proportions of sand, silt and clay particles. Structure refers to the extent to which the soil particles are bound together.

Soil organic matter is actually comprised of two parts: the living and the dead. The living parts include the “microorganisms”. bacteria, viruses, fungi, plus a host of larger animals like worms, termites and beetles. For these

animals and microorganisms are responsible for the majority of the processing that takes place when a dead animal or plant enters the soil system



Many of the fungi serve to breakdown and process dead organic matter into smaller and smaller components. These organisms are called “Saprophytes”. Many of the bacteria serve useful function in transforming nutrients into forms that are then able to be absorbed by the plant roots. Still other fungi and bacteria may act as predators and parasites to help protect the plant roots from attack by diseases and pest.

Objective

We should be able to explain the relationship among soil structure, organic matter, and soil microorganisms.

Times: 120 minutes

Materials: Sand, local farm soil, compost, soil, plastic bottles (at least 1 liter), rubber bands, sharp knife, clear plastic cup, large papers, pen

Procedures

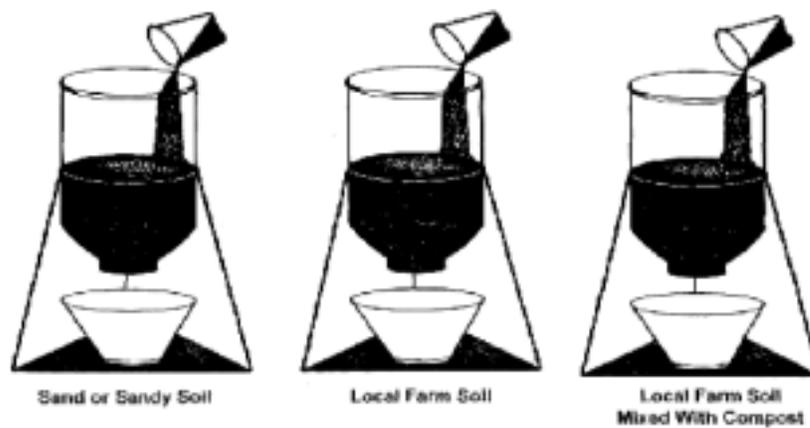
□ Preparation

Use the following question as discussion topics;

- What is the meaning of soil structure, organic matter, and soil microorganisms?
- What is the relationship among soil structure, organic matter, and soil microorganisms?
- What is the function of organic matter and soil microorganisms?

□ Action

- Take a quantity of soil and spread it out on a plastic sheet in the sun to let it air and dry for a day. Choose 3 samples (1) sand or sandy soil, (2) local farm soil, (3) local farm soil mixed with compost.
- Prepare three bottles to set up experiment (see sample below)
- Fill each inverted water bottle half full with the soil from three dried soil samples.
- Place each soil filled bottle in its own wire holder, suspended above the 3 plastic cups.
- Take the other plastic cup and fill it to the mark; then add it to the soil in first bottle. Do the same for the second and third bottles. Wait a few minutes and observe the waterfall down.

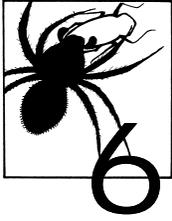


□ Discussion

- Which bottle can retain water for along time? Why?
- What do we think is the function of organic matter?
- What is the relationship of organic mater and soil microorganisms?

□ Follow up

- Choose 3 samples of field soil (from dike, rice field, and vegetable area that using organic manure) and put them in the sun to let it air dry for a day.
- Weigh the dried soil (volume of 3 samples are same) than burn the soil sample and weigh them again.
- Compare the 3 samples, whice one has lost more weight?



NUTRIENTS SOURCE AND BEHAVIOR

Background

All nutrients have a primary location where most of the nutrient is found in the plant. This is the “*primary reservoir*”. For carbon, nitrogen and oxygen, the atmosphere functions as the primary reservoir. This fact has important implication for the mobility of nutrients in the ecosystem.

In contrast, the “soil-based” nutrient elements are much less mobile. These include phosphorus, potassium, sulfur, calcium and most of the trace elements, which are taken up by plant roots, stored for a period of time in biomes and if not artificially removed by the action of human, returned to the soil within the same ecosystem. The distinctions among nutrient elements include how they are cycled, where they are stored and how they are lost from the system.



Objective

We should be able to understand the source of macro-nutrients, where they are stored and how they are lost from the system.

Times: 120 minutes

Materials: Fertilizers (N,P,K), plastic glass, rice plant, pot, large papers, pen

Procedures

□ Preparation

Start with an open discussion about ;

- The distinctions between macro-nutrient and micro-nutrient.
- The atmosphere and the soil as primary reservoir.
- Characteristics of nutrients from the atmosphere and the soil.

□ Action

- Put one small spoon of fertilizer in the plastic glass (each glass has a different kind of fertilizer)
- Add water in each glass
- Wait a view minutes and observe which fertilizer is the fastest to dissolve in the water?, Which fertilizer needs a long time?
- Discuss in the small group about the function, source, and behavior of each nutrient. To get help discussion we are following format (see example below)

NUTRIENTS SOURCE AND BEHAVIOUR

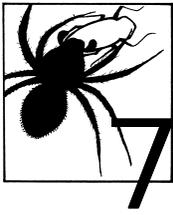
	FUNCTION	SOURCE	BEHAVIOR	Plant parts most have	Symptom Deficiency
N Nitrogen					
P Phosphorus					
K Potassium					
Ca Calcium					

□ Discussion

- Considering the photosynthesis process, what is the function of phosphorus, potassium, and calcium?
- How about the nitrogen cycle in the ecosystem?

□ Follow up

- Set up an Indoor study about the symptoms related to deficiencies of each nutrient



COLLECTING INSECTS AND SPIDERS

Background

Insects and spiders can be collected many ways. The best way is to sit in a field and watch the insects and spiders to observe their activity and behavior. Keep notes on what specimens are doing in the field. Collecting can be done by hand or with a small sweep net.

Insect collections are not for museums or art but to help us to identify and get more information about the characteristics, behavior, and activities of insects. One important aspect of insect collections is that it is an easy method to preserve insects and allow them to be carried anywhere.



Objective

We should be able to make a simple insect collection that can be brought anywhere.

Times: 120 minutes

Material: Playing cards, alcohol 70 %, transparent tape, scissors, small sweep net, plastic

Procedures

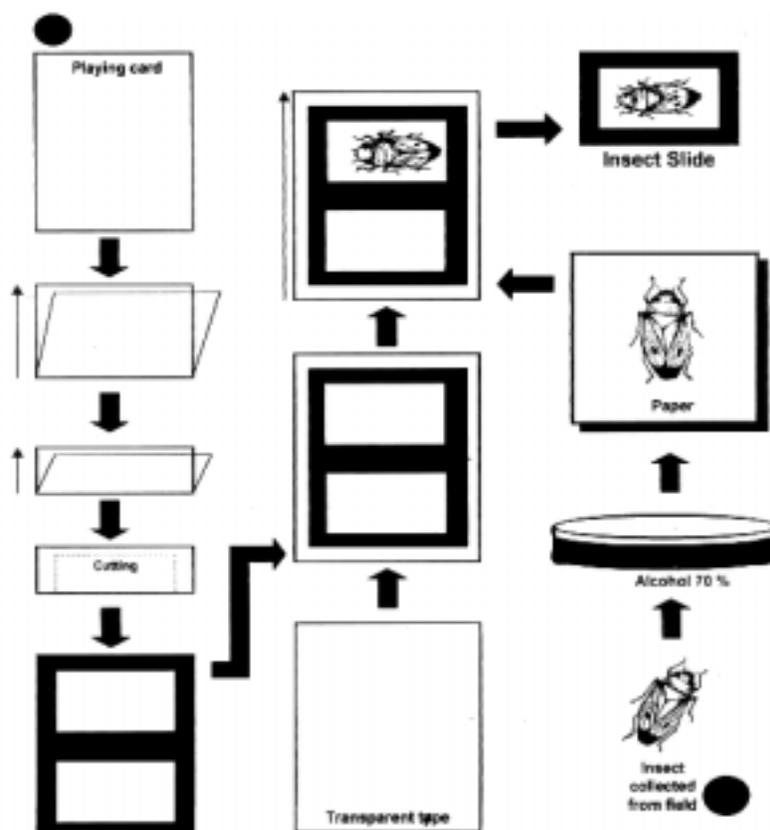
- Preparation
 - Open discussion about ;
 - The objective of collecting insect specimens
 - Several methods for collecting insects
 - The important points to consider in insect collections
 - Facilitator should give an example of how to make materials to preserve insects with playing cards and transparent tape (see example below).

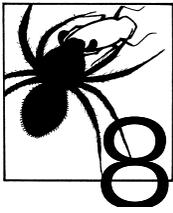
- Action
 - Go to the rice field to observe the behavior of insects or spiders, try to catch the insect with a hand or small sweep net.
 - Kill insects with alcohol (put into a glass for 15 minutes and then dry for another 15 minutes on an open place.
 - Make a slide from playing card for holding the insect.
 - Make labels that give the common name, function, habitat, and time of collection for each sample.

- Discussion
 - Do we have other methods to collect insects that are easier, cheaper and can be kept a long time?

- Follow up
 - Continue to collect and preserve insects during the season.

Diagram of how to make materials to preserve insects



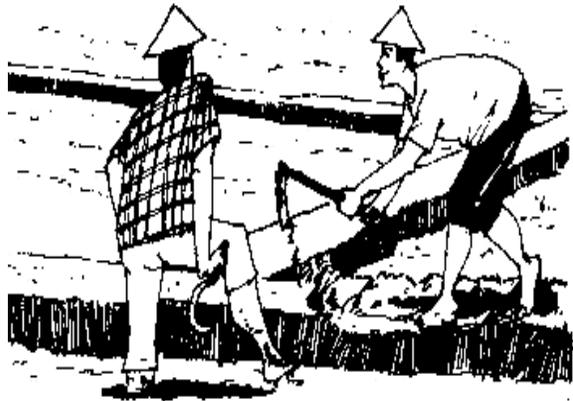


HABITAT STUDY IN FALLOW RICE FIELD

Background

We know that the development of natural enemies depends on herbivore populations which are the source of their food. So when rice plants have been harvested and the herbivore population is very low, what happens to the natural enemies?

Between two seasons there are fallow fields. This period we call the "*Transition Time*" because the time is like a bridge that connects the two seasons. Rice plants grow in the seed bed and grasses grow on the dikes, irrigation canals and surrounding rice fields. Fallow fields become important habitats for certain insects and spiders before the rice field is planted in the next season.



Objective

We should be able to understand the importance certain insect and spider of fallow fields habitat.

Times: 180 minutes

Material: Transparent plastic bag, netting, white paper, ruler, large paper, drawing pen

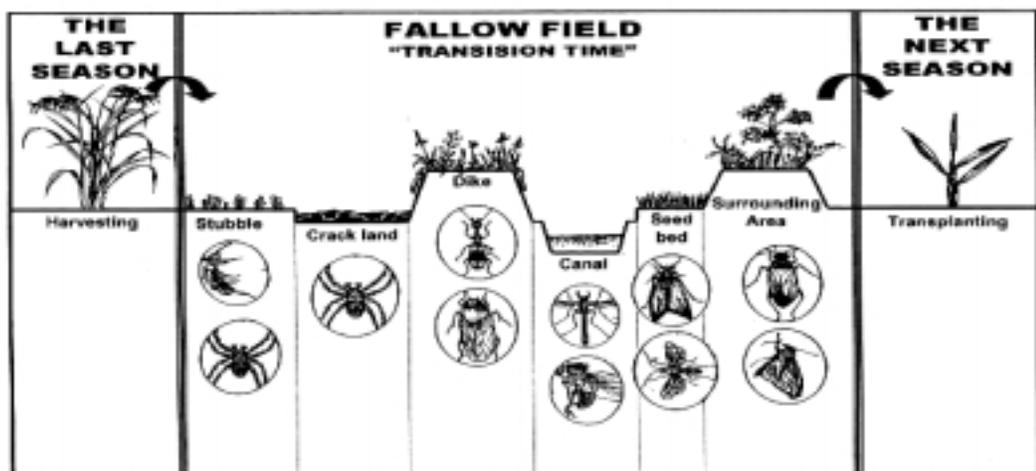
Procedures

□ Preparation

Open discussion about transition time between two seasons (last season and next season), how the habitats change, and the survival mechanisms of insects and spiders living there.

□ Action

- Go into a fallow rice field to observe stubble, cracked land, dikes, irrigation canals, and seed beds.
- Closely observe the area using different methods:
 - Collect 4 or 5 stubble from fallow field; be careful to withdraw the stubble to get some roots. Put them into the netting. Put white paper under the netting and knock the netting so some small insects and spiders fall down to the white paper. Observe what kind of insects are there.
 - On the rice dike, measure 1-meter length; carefully observe the grass (open it up slowly) or other crops that grow on the dike.
 - On the seedbed, measure 1-meter square, search for all small insects and spiders.
 - Take water from the irrigation canals. Put it into the transparent plastic bag and hold it up to the sun or a light to observe it.
 - Carefully open the cracked land and look for insects and spiders inside the cracks. Look for spider webs.
- Return to the classroom. Draw a cross section of the fallow field including stubble, cracked land, seedbed, irrigation canal, and dike. Use a cross section. Now draw insects, spiders and other animals seen on the cross section, according to where, they were observed in the field. (example see below).



□ Discussion

- Did we see small insect jumping when we knock the netting with stubble inside?
- Where were the most insects and spiders found in each area?
- Why is the habitat in fallow field important?
- What can we do to conserve habitat in the fallow field?

□ Follow up

- Make an aquarium to get more information about aquatic organisms. Set up a field study to see the impact of burning straw in the fallow field.