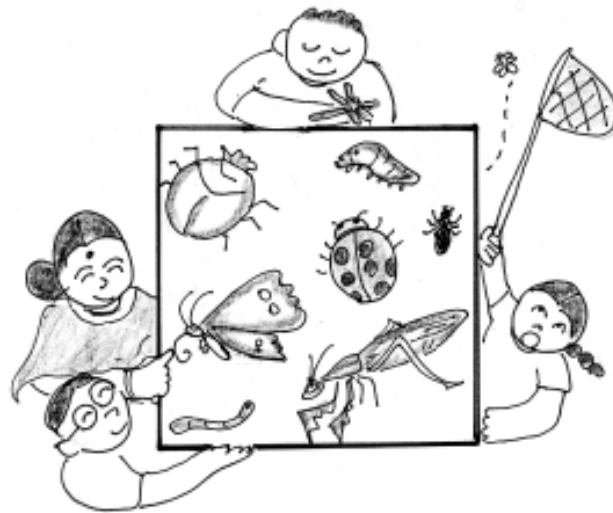


Creative Lesson Plan on

# Insects & Worms



for teachers, educators and community workers

By ENRE (Ecology and Natural Resource Education) project  
DRCSC (Development Research Communication & Services Centre)  
58A, Dharmatola Road, Bosepukur, Kasba, Kolkata 700 042

**'Creative lesson plan on INSECTS & WORMS'  
(Selections from 'Basbhumi' : booklet - 2)**

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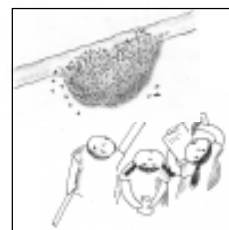
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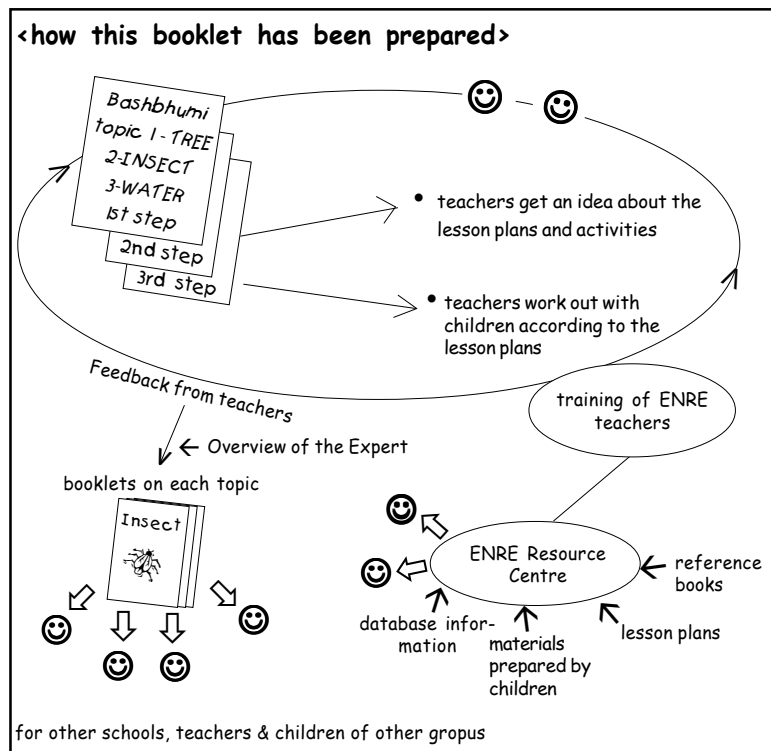
## About this booklet—

All lesson plans included in this booklet were developed by ENRE team and tried out (and sometime modified ) by teachers and children’s groups in ENRE network. Originally these lesson plans were provided to a network of teachers as model lesson plans targeted for class 4-9 children in shape of bi-monthly ENRE newsletter ‘Basbhumii ( Living Places)’. Along with ENRE teachers’ training which guides teachers about concepts and skills of ‘active learning methods’, they have tried out each activity with their students in their class or as extra curricular activity for last 2-3 years. Their feedback makes this booklet more unique and life related.

12 topics related to Natural resources and their utilization / management etc. were discussed in various issues of ‘Basbhumii’ (in Bengali). ‘Insects’ is the second topic centred booklet in English & Bengali.

We hope this booklet is useful for other teachers and educators as well as community workers and even for those parents who are actively involved in environmental education or environmental activity in own local community.

And we shall be delighted if this booklet can help in nurturing the mind & spirit of young generation who can take key role for caring about own environment and community life.



(Please see page 94 for forthcoming issues)

## How to use this booklet—

The lesson plans in this booklet are designed step wise (see page 8 & 9). We suggest that you try out these activities step by step, but you can also adapt each core idea according to your local context.

### ***Regarding teaching & learning process :***

- You can get some ideas here on how to prepare your own lesson plan promoting action learning.
- You can try out several participatory learning & sharing tools (eg, brainstorming, making charts & graphs, mapping, ranking, timeline, data collection, interview, presentation etc. ) for your class.
- You can get ideas on how to connect your class room to your community.
- You can use these lesson plans both for school curriculum and extra curriculum work and obviously you can generate children's interest & enthusiasm on Environmental issues and activities.

### ***For community aspects :***

- You can help children to collect local data on natural resources in community and to know more about their surroundings.
- You can organize children's group to improve community environment through collective action.
- You can grow community members 'awareness on environment through children's' activity.

### ***For home :***

- You can try out some of these activities with children in your home during their school holidays. We are sure you can design your own home –based activity for a greener world, because we have already got good feedback about this from various people.

In 'reference' section we included **expert's view point on the topic** and introduced some useful documents. You can get some ideas how your community based activity can be related and contribute to global environmental issues etc. and hopefully you can utilize these resources & information to strengthen your capacity of facilitating activities.

## About lesson plan —

Through activity of ENRE project we have realized that creating & developing own lesson plan is extremely difficult for most of the teachers participating in the network. Primarily because they don't have the habit and experience to do so. The situation must be more or less same for other teachers in our country. Though Environmental Education as a subject has been brought into the school curriculum, the teaching method is text book centered, memorizing & repetition based and examination oriented just like the other subjects. But can children develop their interest about any issue by memorizing names of trees, birds, and animals etc. or just by copying the text book's drawing of seed germination or insects' metamorphosis etc. ? Unfortunately for children ( fortunately for teachers?) all answers are already given and always appear on the text books. We wish the learning process could be more exciting and open ended process rather than 'being hammered by more and more information'.

### What is 'creative lesson plan' ?

We think that good lesson plans provide children with the opportunity of discovering and searching out the fact by themselves. Children can chose their favorite learning process and context and the teachers only need to facilitate it, rather than impose uniform style & pace.

Creative lesson plans have the following aspects.

- Starting from what children already know and what children have experienced / felt;  
This helps to enhance children's interest about the topic.
- Having the overall goal for both 'Social / Environmental' and 'Scientific'.  
For example on the topic Insect, social / environmental goal can be <identifying harmful & beneficial insects in agricultural field> <learn about how pesticides affect our environment>, and scientific goal can be <learn about life cycle of insects by own observation> <understand how insects are involved in pollination> etc. Setting up goals help the children to be aware that they can do something to improve their environment and solve some of the problems.
- Including group activity as well as individual activity. Through group discussion, planning, and activity children can find out better ideas and solution and also can

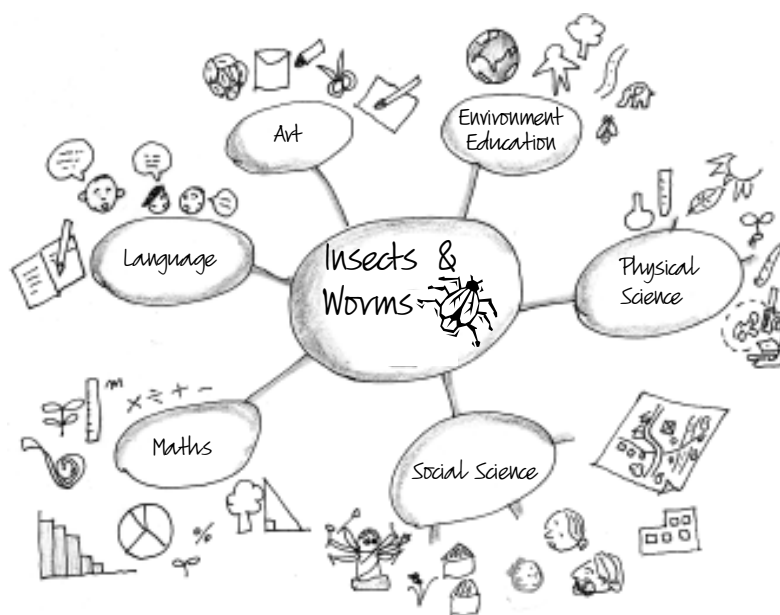


grow their cooperative attitude and collaborative skills. They can learn to respect other's opinion, too.

- Children can have fun and relish the moments of discovery in their learning process.
- Children's learning activity links their class room and community. This is essential for Environmental Education as we need more initiatives for a better environment.
- Using active & group based learning methods with children ( eg, brainstorming, making charts & graphs, mapping, ranking, timeline, data collection, interview, presentation & sharing skill etc.)
- Using local materials and examples for activities. You can make the activity more low – cost and eco-friendly by using waste material.

### Curriculum connection

Creative lesson plan has also integrated curriculum approach. This helps you to weave what you are doing in science or EVS (environmental studies) with math, language, social studies, geography and art etc. We illustrate below how each activity in this booklet can be connected to school curriculum.



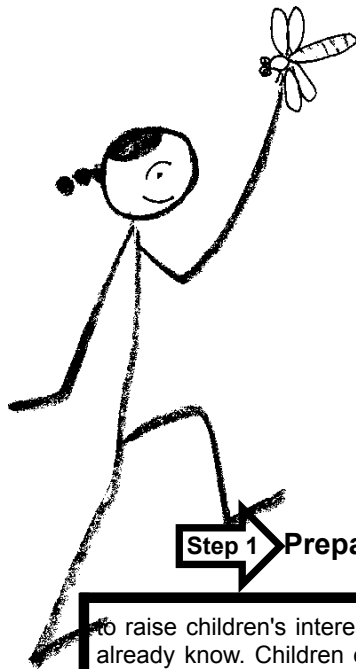


# Insects & Worms

## Overall goal

Insects are everywhere in our life. Often we ignore them either because they are too small or too common. Through this series of activities we focus on children's observation skill and guide them to find out common insect's role & function in our surroundings.

Children can understand all insects are neither harmful nor do they disturb us and many insects are helpful for us especially in organic farming / gardening.



### Step 1 Preparatory work



to raise children's interest and to know what children already know. Children observe common insects in the surroundings & keep their record more scientifically.



#### Activity (A)

'Keeping an insect diary'



observation, keeping record, sketching



Common Insect, Insect definition, Insect body structure (EVS), Art, Language



#### Activity (B)

'Insects & other living things in the soil'



observation, sketching, graph



Insect & their habit, Insect & soil fertility (EVS), Art, Bar graph (Maths)

### Step 2

### Further enquiry

to collect more information/data. Children observe the habitat and life cycle of



#### Activity (A)

'Let's breed mosquitoes'



observation, keeping record, sketching



Metamorphosis (EVS), Language, Art



### ■ Changes Expected

- More school/home gardens through an organic approach which attracts more pollinators like bees & butterflies
- Careful attitude toward pesticide use in Agricultural products for both producing level & consuming level.
- Growing interests towards Organic Farming in community.



### Step 3 Investigation/Project Work

to create child-oriented activity. Children can apply their collected information into designing studies meaningful for community.



**Activity (A)**  
'Honey, the gift of insects'



interview, sketching, data analysis



Social insects, beneficial insects, insects life cycle, pollinating insects (EVS)



**Activity (B)**  
'Do, we really need pesticides'



group work, keeping record, school gardening, site mapping



Pest & pesticide (EVS), Agricultural products (social study), Health, Art



conduct some experiments to insects.



**Activity (B)**  
'Inviting ants'



observation, creative thinking, hypothetical thinking, keeping record



food habit of insects, body parts of insects (EVS), Language

### Concepts and techniques which you can develop in activities

Keywords	Step 1		Step 2		Step 3	
	(A)	(B)	(A)	(B)	(A)	(B)
The parts of insects	✓	✓		✓		
Habitat of insects	✓	✓	✓	✓	✓	✓
Metamorphosis (life cycle of insects)			✓			✓
Food chain & natural enemy				✓	✓	✓
Helpful & Harmful insects			✓		✓	✓
Pollinating Insects					✓	✓
Pesticide & Environment					✓	✓

## We got a feedback from different Organisations —

Even if we all do the same activity, our results could be different, depending on where one lives or the children's abilities. It's quite natural for this to happen. The results that you obtained and data collected which is specific to your locality will become a valuable case study. In this booklet, we will share with you the feedback we got from different ENRE network groups. You can compare your results with theirs.

We would like to learn more about the urban school situation & about hill areas from the other groups, since we do not work in these areas yet. So, it would be nice if you would share your experiences.

### Gandhi Vichar Parishad group

Bankura district

4 teachers were involved in conducting various activities. This district is located in a dry-land area. The Vegetation & soil there is rather different from that of other groups. Fortunately, a beautiful river runs through their villages and provides an important water source including for drinking water.

### Kajla group

Midnapore district

5 teachers & their students conducted the activities within their E.E. school curriculum in 6 villages. About half the children belong to Hindu families and

the rest are Muslim.

The area is located in the coastal area and regularly hit by cyclones. As a result it does not have irrigation facilities.

Agriculture, Small scale industries (handicraft) and fisheries are the main sources of livelihood in this area.



### Chandannagore group

Hooghly district

One of the staff from ENRE team tried out these activities with her children as home-based activity. Children study in English medium schools unlike the other children in network. Chandannagore is a small town and located on the bank of Ganga river. Many trees and ponds are observable like in other towns in this district. Many commuters go to Calcutta everyday by train from here.



West Bengal



### Swanirvar group

North 24 Pargana district

4 network teachers in association with 13 other teachers conducted activities with children in 8 villages.

All the children study in government schools & are aged between 10 & 16 years.

Intensive agriculture is the main occupation of this area and the farmers used to apply large amounts of chemical

fertiliser & pesticide.

Arsenic in the ground water is one of the major environmental problem in this district.



### Ashurali group

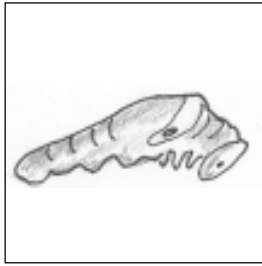
South 24 Pargana district

2 teachers conducted activity with 15 children in two villages, Sudarika, Karaghata. Children study in NGO-run primary schools.

Their area is mainly agricultural land but industrial estate is also located nearby. Villagers earn their livelihood from agriculture and working in factory.



Step - 1



for growing childrens' interest



**Lesson Plans**






**Feedbacks**



## INSECTS & WORMS — Step 1 — Activity (A)

### “Keeping an Insect Diary”

For this week you will be an “Insect Watcher”. Let’s keep watching and record our observations. This way, we can find out what kinds of insects there are in our surroundings.

[  both for urban and rural schools  class 4 to 6  observation, keeping records, sketching common insects, insects' definition, insect body structure (EVS), Art, Language]



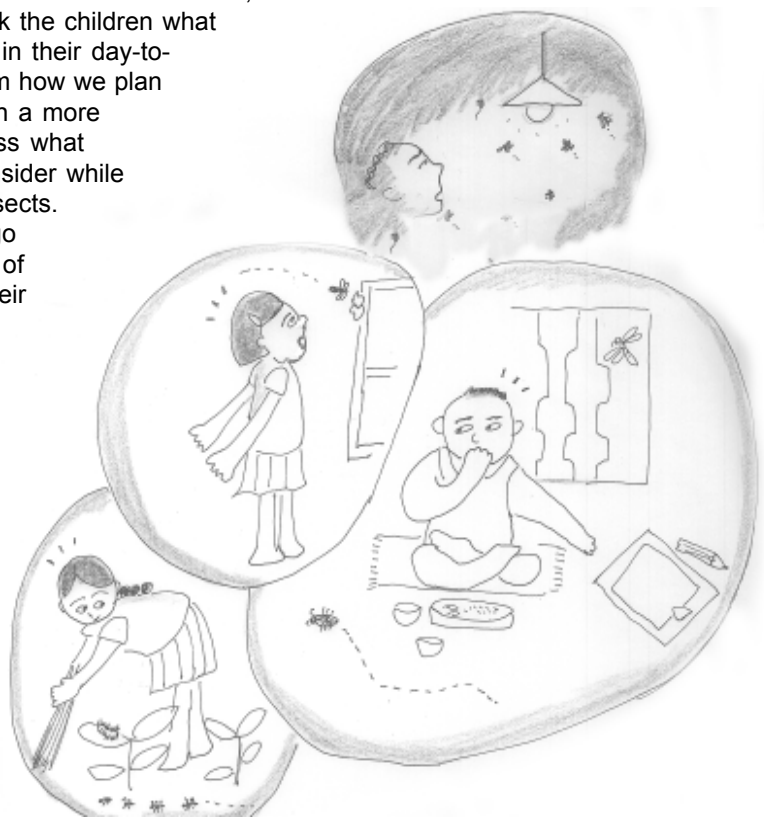
### Objectives

- To observe common insects in our surrounding.
- To identify insects' character and its definition.



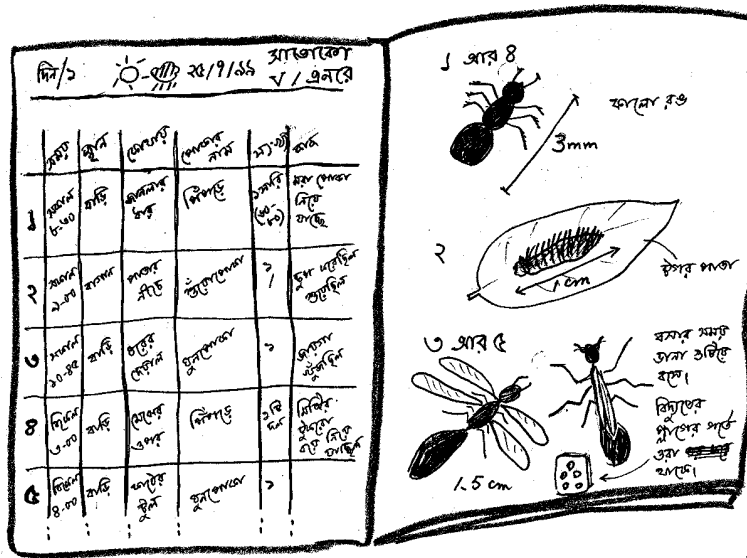
### Collecting Data — “Insect Diary”

There are so many kinds of insects in our surroundings. Many are hidden from our view, while some are not. Ask the children what insects they encounter in their day-to-day lives. Then tell them how we plan to study these insects in a more scientific manner. Discuss what factors they should consider while recording details on insects. Then the children can go about keeping a record of whatever they see in their daily lives pertaining to insects for one week.



■ **Points to be included in record:**

- Name of child recording, Class, School, Teacher's name
- Date, time, weather, place, and exact location.
- Description of insect (name, shape, size, colour)
- Number of insects seen (in a group or individual?)
- Insect's activity (what was the insect doing?)



**Collating and Analysing information gathered: “Insect Chart”**

After one week, gather all the records made by the children and summarise it with them in the classroom. First have them analyse the records in groups of 5-6 children and then go on to make a class summary.

Each group will make a presentation of their findings to share them with rest of the class.

■ **Points to be included in each presentation:**

- How many different kinds of insects in records & how many do they know by names ?
- Were there any insects unknown to them?
- Which were the insects that were seen by most ? (Top 3)
- Was there any relationship between certain insects and the time, place or type of weather they were seen in?
- Special characteristics of any particular insect behaviour (eg. “According to our records the ant mostly....”)

Later, the information obtained from each group can be summarised in the form of a chart by the entire class. Explain to the children how the more “sample numbers” we have, the more reliable our facts will be and we can thus come to a clearer conclusion or frame “hypothesis” – and test the hypothesis.

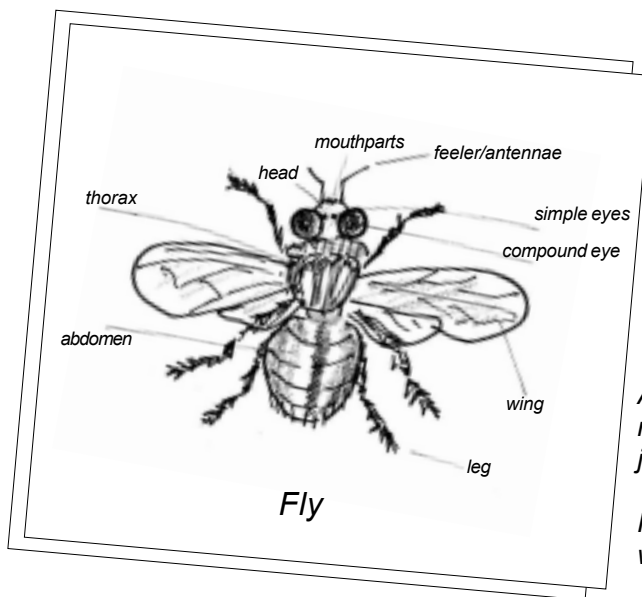
- In the chart representing the data of the class, you can make columns to arrange the information with the following heads:
  - Name of insect (with a drawing if possible)
  - Location where it was seen
  - How common it is (number of times seen)
  - Behavior
  - Active time (morning/mid-day/ evening/night/ always)

Apart from these, they can also add “Food Habits – cause and effect” type columns for further study (in steps 2 and 3).



### [A variation on this idea]

- Instead of a chart, “insect cards” can also be made. On one side of the card there can be a drawing of the insect and on the other, some related information. These cards can also be used in games or as reference material for another class. When the children are drawing the insects, make sure they show the basic structure of the insect as shown in the example drawing below.



### Body structure of an insect

*Insects have no bones. What every insect does have however, is a hard outer covering known as the exo skeleton*

*An insect's body is divided into 3 parts : head, thorax and abdomen*

*An insect has 6 legs - the segments are connected together by joints.*

*Most insects has two pairs of wings.*

- Teachers can also use Worksheets & Data cards on insects produced by ENRE (see p.95)



**Building interest, raising further questions:**

Have a discussion on what else the children know about insects. Make a list of these points or the questions that come up. Do not be in a hurry to answer questions the children asks. Let them think about it and in future activities we can then try to find answers to these questions together with the children. What you can do is make a “solving action plan” for each point of inquiry. For example, “ did we cover all the different places where insects live?”. Let’s do another activity based on this and see what we can find by looking at soil (step 1 activity B).

Also teacher can make sure with children about the character & definition of insects **based on children's observation & experience.**

Example:

- usually insects are 'small'.
- insect don't have bone but its body is covered with hard skin.
- insect has 6 legs
- most of insect changes its shape in different growing stage (metamorphosis)
- insects are cold-blooded creature

We are not insect, because we don't have 6 legs & 3 main body parts. But we are not snake. Because we don't have a back-bone.

earthworm

We are not insect, too. Because we have 8 legs & 2 body parts.

spider

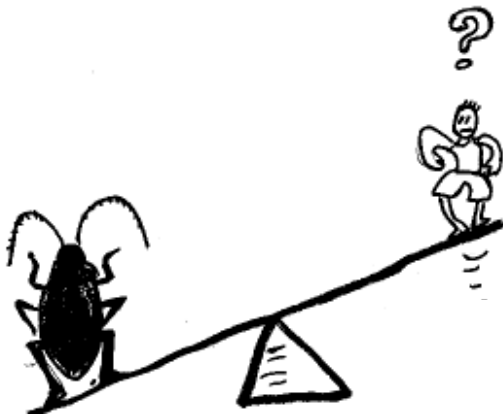
[see p.50 & Expert's note p.85 for more detail]



## Some interesting information for the children:

You can provide some interesting information or tell a story related to the topic. The information can be the newspapers, magazines, books, TV programmes or someone you know. These bits of information will increase the children's interest and help to grow children's 'appetite' to know more.

- *It is said that the total weight of all the insects in the world is 15 times heavier than the total weight of all humans put together!! For each person (taking the average weight to be 50 kgs) there are 750 kgs of insects.  
If there are 8,000 honeybees in a Kg, how many honeybees will be there in 750 kgs? You see now that there are several million insect per person on this earth.*



- *There are 18,00,000 species of insects known to us. It is said that there are 25,00,000 species of animals on earth. Insects make up 70% of the insect&animal composition of the earth.*

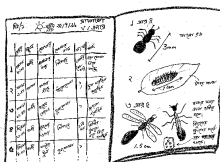
- *There are almost as many insects still not described. It is said that if all the insects species are described then the total estimate of species on earth would go up by atleast three fold.*

[Source : "Takusan no Fushigi - Mushi no Ikikata Guide"  
Tamami Sawaguchi, 1997, Japan]



## Feedback

### Step 1 — Activity (A)



In this activity children are requested to write down for one week about whatever insect they observed.

Children should observe carefully and be patient.

May teacher who conducted this activity reported that children enjoyed a lot and in the process they discovered many things which usually they didn't give attention before.



### Feedback Summary

	Ashurali	Swanirbhar	Swanirbhar	Kajla	Gandhi Vichar
1)Village	Not Mentioned	Gokulpur	Bajitpur	Hinchi	Not mentioned
2)Children's Class / Number	class II to IV 15 students	class V to X 19 students	Class V to X 19 students	--- 20 students	class V to IX ---
3)Class / period spent	3 periods	4 periods 1 period=2 hrs	4 periods	4 periods	Not mentioned
4)Products/Result	Not mentioned	Children made 'Insect Diary'	Children made 'Insect Diary'	Children made 'Insect Diary'	Children made 'Insect Diary'
5) Children's Interest	The children enjoyed in doing the work. Many questions came to their mind, while working with insects.	children showed ample amount of interest. Carried their notebook almost every where even to play	All children are not equally interested to do the activity.	Children are enthusiastic to do the activity. But they do not know the names although they can indentify the insects.	Not mentioned
6) Teacher's opinion / difficulties	The teachers had problems identifying some of the insects, so could not help the students properly	The teachers did not have any problem to do their work	The activity demands more time	Children & the teacher himself came to know many new information on insects	Not mentioned



## Collected Data

20 students of 2 groups of Swanirbhar (class V to class VIII) have sent their summary chart on insects based on their observation. The chart is typed for your easy understanding. They included some other animals beside insects in their chart like toads, snake, snail, lizard, spider, centipede. However we omitted rat, cat & fish from their chart.

<b>Chart on Insects</b>			
<b>Name of the insects/other animals</b>	<b>When can be seen</b>	<b>Where can be seen</b>	<b>Characteristics/other observed features</b>
(Toads)	Morning & afternoon and night	Bank of the pond, water of the pond	a) 5 inches in length, walks on four feet, pale yellow and ash coloured, solitary, moves by leaping, eaten by 'Beji'.
Ant	Throughout the day	Window sill, courtyard balcony, openspace	Carry sweetmeats in a line, red in colour, 1/2 inch or less in length, walks fast six feet, in large numbers. Moves about the kerosine lamps at night in search of dead insects. Carry dead ants in groups, smaller in size, almost 100 ants carry puffed rice from the kitchen. 12 ants were moving towards a source of food. An ant, black in colour, was moving in 6 legs.
(Snake)	Throughout the day	Pond-bank, courtyard, backyard	Mostly seen in the afternoon, in the pond bank, courtyard, rooftop, move in search of food. Those seen on pond bank are approximately 4 1/2' in length, walks on their chest, so they are known as reptiles, they are deaf. The snake is 4 1/2' in length, pale yellow in colour, moves in the courtyard, catches toad for food. Snake bites are poisonous, sometimes people die for that.
Grasshopper	In the evening and night	Fly over the lamps, in the room, on the walls	Green in colour, moves by jumping, six legged. Fly at night also, 3 inches in length. Seen sitting on the walls, mostly seen in the evening.
Cockroach	Afternoon & night	Around the covered food in the kitchen	Moves around the covered food in the kitchen. They spread infections in food, can also be seen in cowshed. Dig holes on the walls and nests there in search of food. Catches insect at night. Some reside in boxes and cuts paper. They are oily in appearance seen in walls of the rooms. A cockroach and glass insect was fighting, the glass insect stinged the cockroach towards its nest. Pale in colour, six legged. two tentacles.

(Snail)	Morning & afternoon	In the walls of the room	They have tentacles, recoil their soft body within shell when hurt, moving up the tree in groups, sometimes seen in the top of papaya tree. Moves on the leaves of the papaya tree. Pale ash coloured, around 3 inches in length.
'Jenjhi'	Afternoon	On the scaffolding, front the house, roadside places	Solitary or moves in groups, benefits us by consuming mosquitoes, catches insects, moves in flocks, a pair of wings and six legs, mostly seen in flocks
(Lizard)	Evening, morning, & afternoon	Walls of the rooms, on the mango trees	Move in pair or alone, approximately 3 inches in length, soft tail, pale in colour, walks on their chest, so reptiles makes ticking sound. A lizard was watching an insect for a long time, and lashing its tail, suddenly it caught the insect and gulped it, this means that small insects are tasty food of lizards. They are 4 legged, they also move on the roof top.
Butterfly	In the noon & afternoon	In the garden	3-4 together can be seen, differently coloured, they help in pollination, sit silently on the leaf surface. They collect honey from flowers, since they help in pollination, seeds & fruits are formed. They collect honey from different flowers. The colour of their body is white, black or any other. They have a pair of tentacles & wings.
Caterpillar	Evening & night	On the drumstick plant	They live in drumstick tree and eat leaves. They have spines on their body. They gradually metamorphose to butterfly. Sometimes seen resting on leaves, in the afternoon. Some times hide within the clothes.
Bee	Morning & afternoon	In the bee-hive, & garden	They live in bee-hives in flocks. They collect honey from different sources & store it in the hive. We drink that honey. They are yellow and black in colour. They cause pollination, while collecting honey from flower, thus fruits are formed from flower. Around 500 bees are present in the flock. They form hive. There are many cells in the hive.
(Spider)	Morning, 8am, 6am, 9am & in the afternoon	On the walls, houses, rooftops, crevices on the doors and windows, garden	They are seen singly in the walls of the houses. The net they weave from secretaion look beautiful. They have 8 paired and jointed append ages. Seen at 8 am sitting on rooftop, two in number. They weave

			<i>net to catch their prey, in the garden and corners of rooms. They have paired tentacles. Body pale coloured.</i>
<i>(Centipede)</i>	<i>6 pm in the evening, afternoon</i>	<i>In the kitchen, inside the soil</i>	<i>Roam in the kitchen in the evening, bite is poisonous, bite creates a burning sensation. Yellow coloured body. Remain underground in the afternoon, seen when soil is dug.</i>
<i>Termite</i>	<i>10am, morning 2pm afternoon 6pm evening</i>	<i>In the field, balcony of the house</i>	<i>They chew wood, live in groups. Roam in a group of 6-7, live underground, clay coloured. Move in rows in the clay walls of the kitchen. Seen in the wood stack, kept for long.</i>

### ⇒ How Teachers can help

- Encourage children to put simple drawing on each listed creature on the chart. Then ask children to categorize listed living creature to identify the **true 'Insect'**. Later the chart can be revised more focussed on insect & worms.
- After children's initial observation work, teacher can introduce 'Data Cards & worksheets on insects' prepared by ENRE as supportive materials. By filling up these data cards, the observation skills of children can be improved. (to obtain the materials see p.95 – From ENRE)





## Children's work

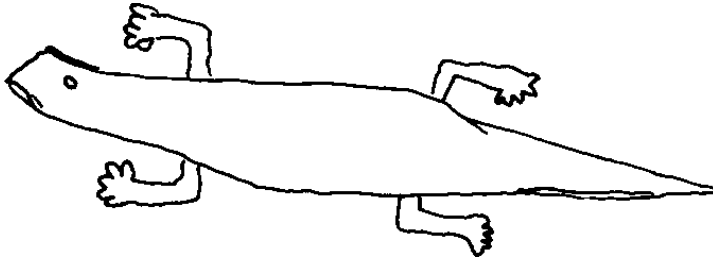
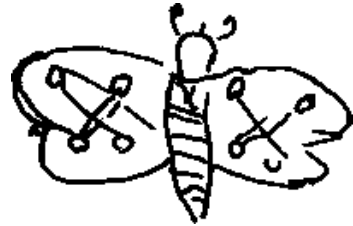
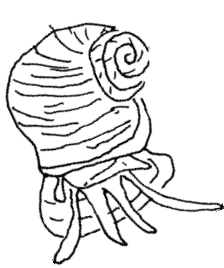
Children's note books are valuable record. Out of many note books we selected three examples here.

- a few pages from a notebook of **Bappa Sardar (boy, class V, teacher - Sourendra Nath, Swarnirvar)** \* we put ( ) for which is not insect.

Name of the insect	Activity	When	Number	Day	Where	Comments
(Toad)	Catching insects	Morning	1	Tuesday	Roadside	5 inches in length, yellow in colour, walk on four feet.
(Snake)	Roaming around the pond	Afternoon	1	Tuesday	Pond bank	3 to 4.5 ft. in length walk on their chest, reptile, cannot hear
Ant	Taking a piece of sweetmeat	Afternoon	A group	Tuesday	Window sill	Redish in colour, walk fast
Dragonfly	Hovering around the lamp	Evening	1	Tuesday	On the floor	Looks like mosquito, walk on four feet
Cockroach	Hovering over the food	Afternoon	5	Tuesday	In the kitchen, over the food plate	A little more than 2 inches in length, they contaminate food.
(Snail)	leaf	On the Arum	Morning	1	Friday hedge of arums	In the They have auditory devices, recoil within their hard shell when touched
'Jejhi'	Flying	Evening	1	Saturday	Over the scaffold	Two inches in length, benefit us by eating mosquitoes
(Lizard)	On the wall	Afternoon	1	Saturday	In the room	3 to 4 inches in length, soft bodied, pale brown in colour
Butterfly	Sucking honey	Afternoon	3	Sunday	On the top of the roof	Variously coloured, help pollinating the gourd flowers
Caterpillar	Lying on a branch	Afternoon	1	Sunday	On the 'Shayani' tree	They have pricks on their body, metamorphose to butterfly
Honey-bee	Sucking honey	Afternoon	A swarm	Sunday	In and around the	They store honey in their hive, we collect &



					bee-hive	drink this honey, black & yellow in colour
(Spider)	Moving on the cobweb	Morning	1	Monday	On the walls	The secretion of their mouth is used to build the cobweb, it looks beautiful
(Mouse)	Entering its hole at the corner of the room	Morning	1	Monday	Corner of the room	6 inches in length, pale grey in colour, they cause damage by chewing up paper, cloth etc.



- Typed from Notebook of **Mita Goldar (student, class VI, Teacher - Sudip Kumar Mondol, Swanirvar)** she completed her 7 days observation

**Day 1 Date : 21-11-1999**

Sl. No.	Time	Place	Spot	Insect name	Number	Activity
1	9.15	Home	Floor	Ant	90-100	Carrying grains
2	1.10	"	"	Fly	8-10	Eating rice
3	6-7	Dark place	Cowshed	Mosquito	50-60	Suck blood of human

- 1) Ant - Swarm towards food, and they carry the food in groups. Red, black or any other coloured. It's hard to save a tree when ants attack it. To find ways to kill the ants.
- 2) Fly - Flies are very annoying, since they sit on the food, inspite of our efforts to show them away. Flies also sit on dead and decaying matter etc.
- 3) Mosquito - They live in dark places. They cause harm to human, cause malaria when they suck blood. They also suck blood of dogs, goats etc. They can be slapped to death when they sit on the body. Mostly they are seen at night.

**Day-2 Date : 22-11-99**

Sl. No.	Time	Place	Spot	Insect name	Number	Activity
1	8-9	Home	Floor	Cockroach	8-10	Taking puffed rice
2	4-7	Tree	Leaf	'Chuch poka'	90-100	Eat the leaf
3	4-15	Tree	Branches	'Benu poka'	5-6	Stay on the leaf

- 1) Cockroach - Brown in colour, 3 pairs of jointed legs. They are omnivorous, puffed rice, biscuits, bread etc. 1 pair of eyes, mostly seen at night. Cause a prickling sensation when they come in contact of the body. They have cutaneous. Extensions on their legs.
- 2) 'Chunch' - Mostly seen at night. They are found on Egg-plant, white in colour, found in homes also, small in size.
- 3) 'Benu poka' - Round and small, found on the leaves. 3 pairs of jointed legs. Green coloured body, mostly seen in the afternoon.

**Day - 3 Date : 23.11.1999**

Sl. No.	Time	Place	Spot	Insect name	Number	Activity
1	7-8	Tree	leaf	Snail	4-5	Cause damage to plants
2	10-11	Jute Plant	Branches	Caterpillar	10-12	Cause irritation when they come in contact with the body

- 1) (Snail) - Cause damage to plants. It's hard to save the plant when they are, by the snails. Recoil within shell when touched. Eat the leaves of plant. Drink the exudate of papaya tree. Mostly the large snails live in papaya tree.
- 2) Caterpillar - They are seen on the jute plants. Green in colour. Cause irritation and itching when the pricks of caterpillar come in contact with body. They move by crawling. Mostly seen in jute and drumstick plant.

**Day - 4 Date : 24.11.1999**

Sl. No.	Time	Place	Spot	Insect name	Number	Activity
1	3-20	Home	Floor	'Pedo poka'	3-4	Fly hither & thither
2	Morning 4-15	Tree	Leaf	Ant	80-90	Eat up trees
3	2-10	Home	Floor	Fly	5-6	Sitting on a plate of rice

- 1) Pedo poka - They liberate obnoxious odour, food becomes smelly when they sit on them. They are black in colour, fly around.
- 2) Ant - They live in dwellings. Sit on food materials. Omnivorous in food habit. cause itching when they bite. 3 pairs of jointed legs, black/red in colour. They also bite cows and dogs.
- 3) Fly - Flies sit on open food, sit on dead animals and then sit on our food and therefore contaminate rice on which flies sit should not be consumed, black in colour.

**Day - 5 Date : 25.11.1999**

Sl. No.	Time	Place	Spot	Insect name	Number	Activity
1	4-5	Field	Grasstip	'Jejhi'	3-4	
2	8	Field	Grasstip	Grasshopper	1-2	Eat insects
3	7	Home	Bed	Bed-bug	10-20	Suck blood

- 1) 'Jejhi' - Seen in field and garden. 3 pairs of jointed legs. They have wings. Blue, red or yellow in colour.
- 2) Grasshopper- They can be seen on roadside hedges, gardens and fields. Green in colour, and 3 pairs of jointed legs. They have a pair of wings, and they fly by this. They eat insects. They can mostly be seen at night.
- 3) Bed-bug - They can mostly be seen at night. Their bite cause burning sensation and they suck blood. Now bedbugs have become rare. They suck blood of human, cows, dogs, goats etc.

**Day - 6**

Sl. No.	Time	Place	Spot	Insect name	Number	Activity
1	9-10 am	Home	In the cowdung	Dung beetle	1	Eat dung
2	5 am	Home	On the floor	Termite	10-20	Consume clay
3	10 am	Home	Roof	Kath poka	50-60	Consume rice grains

- 1) Dung beetle- Their presence can be felt by the sound they produce. Black, spherical with a hard cover over the body. They eat dung and live in it.
- 2) Termite - They live in soil and white in colour. They are very minute. They are seen in jute field. They eat soil and their bite cause a burning sensation. They destroy wooden doors and windows.
- 3) Kath Poka- They consume rice grains and are ash coloured. They look like lice and minute. They have a hard shell. They break down the grains into small pieces. They are killed by insecticides.



## Day - 7

Sl. No.	Time	Place	Spot	Insect name	Number	Activity
1	9.15 am	Tree	Leaf	Silk Caterpillar	8	They weave silken cocoons
2	10 am	Tree	Branch	Bee	90-100	Produce wax, collect honey, sting
3	11 am	Tree	Branch	Wasp	15	Bite

1) Caterpillar- They weave cotton. They live in trees.

2) Bee- They gather honey from flowers and make their nest on the branches of trees. They also make wax. They are yellow in colour and have sting. Their stinging causes burning sensation. Queen bee and Drones sting the animals.

3) Bhimrul- Yellow coloured, their bite is poisonous, they also have sting and they bite and sting when disturbed. They cause us harm.

Caterpillar- They are black and yellow coloured. They have poisonous spines. Their contact with the skin causes itching. They live in Jute and hemp plants. They feed on their leaves. I saw the caterpillar at 3-20 in the afternoon. Their head is black, the back is also black, mostly seen in monsoon time, almost 2 inches in length.

Bee - They are black and yellow striped. They have three pairs of jointed legs. They sting and it causes a burning sensation. They visit various flowers and gather honey. They are 1 cm. in length. They are seen in the morning. They make their hive in mango, jackfruit and banyan trees.

Cockroach - They are brown coloured, three pairs of jointed legs. They catch other insects. They have spines on their legs. Two cm. in length. Live in the corner of the rooms and eat bread crumbs and insects.

Grasshopper - The body of the grasshopper is green and its mouthparts are red. It has three pairs of jointed legs. 2 cm. in length with rough texture, and they can be seen in the fields and gardens. They are sighted in the afternoon.

Red Ant - They live in buildings. They eat bread, sugar etc. I saw ants in the room. 1/2-1 cm. in length. It has 6 jointed legs. They bite us and sometimes comes harm.



□ Manosi Chatterjee (age 9, Chandannagore) wrote her experience with ant in an article for her handmade "Childrens' magazine".

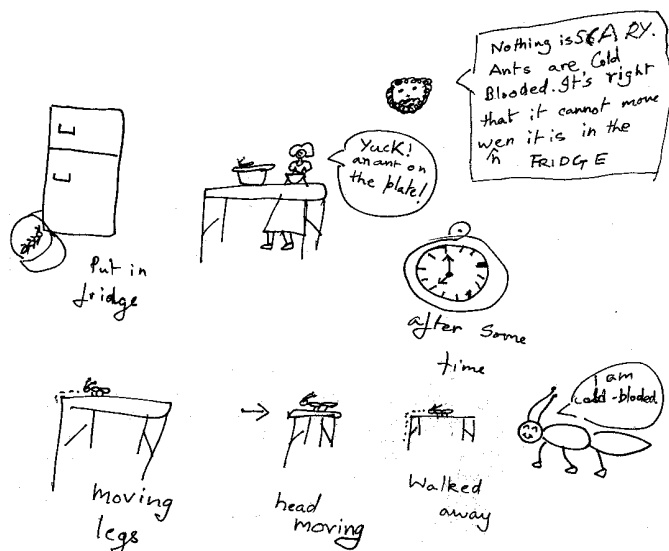
This is one good exercise to develop children's writing ability and also through her experience she really learnt about the meaning of the word 'cold-blooded'.

### ★ The Amazing Ant (TAA)

One morning my mother took out a bottle of milk. There was a "dead" black ant on the cover. My mother told us that the ant might have got in when she had put the milk in the fridge. I took it off the cover and kept it on the table. I started eating my breakfast. Suddenly TAA came alive!! He started by moving his legs feebly..... his head started moving..... his antennae started wiggling. Finally TAA went away as if nothing had HAPPENED!! SCARY AND AMAZING!

By - Manosi Chatterjee

(Ant looks like 'dead' in refrigerator because of cool temperature. But in room temperature, ant starts move again.)





## Sharing Ideas

It was surprising to see the names like 'tiktiki', frog, rat; even cat & dog are listed by children. This is not only in one child's record but most of the data presented by different children's groups too.

When teacher find out unexpected names are appearing in children's initial record, don't make children fool, this is good learning opportunity for both teachers & children.

First teacher needs to think about whether his/her that own explanation to children was not clear? Also sometimes 'poka' in Bengali may include frog, tiktiki, spiders & earthworms.

Secondly teachers need to make sure whether children properly understood what is called as 'insect' scientifically. If not, discuss more with children about the body structure of insect.

Thirdly both teachers & children need to agree on what other living things (like tiktiki, frog, spider, earthworm) can be included for 'insect diary' though they are not really insect. But, the reason should be clear.







*Which one is true insect?  
(from student's notebook)*



## INSECTS & WORMS — Step 1 — Activity (B)

### “Insects & Other Living Things in the Soil”

Turn over some fallen leaves or look under a big stone....what do you see?  
There are so many different places where one can find insects. Let's investigate and find out what they are up to!

[  both for urban and rural schools  class 5 to 8  observation, keeping records, sketching  
 Insect & their habit, Insect & soil fertility (EVS), Art, Bar graph (Maths)]



### Objectives

- To learn about insects and other living things in the soil.
- To find out whether there is any relationship between the variety of insects and soil moisture/fertility.
- To grow children's interest knowing that insects live in various places as their habitat.



### Questions to investigate

- What kinds of insects/living things can be seen in the soil?
- Can they all be classified as “insects” or not?
- According to the location, in which type of soil were there the most variety and number of insects seen?



### Conducting activity (outdoors)

**Setting up:** Divide the children into groups (4-6 children per group). Each group can decide on one spot to discover, like the base of a big tree, a playground, a vegetable garden, a rice field, the road-side, under bricks/stones etc. It would be good if 2 -3 groups chose the same type of location to investigate, that way you can get the variation of results for the same type of place.

Be careful ! There might be snake, scorpion etc. under the stone.

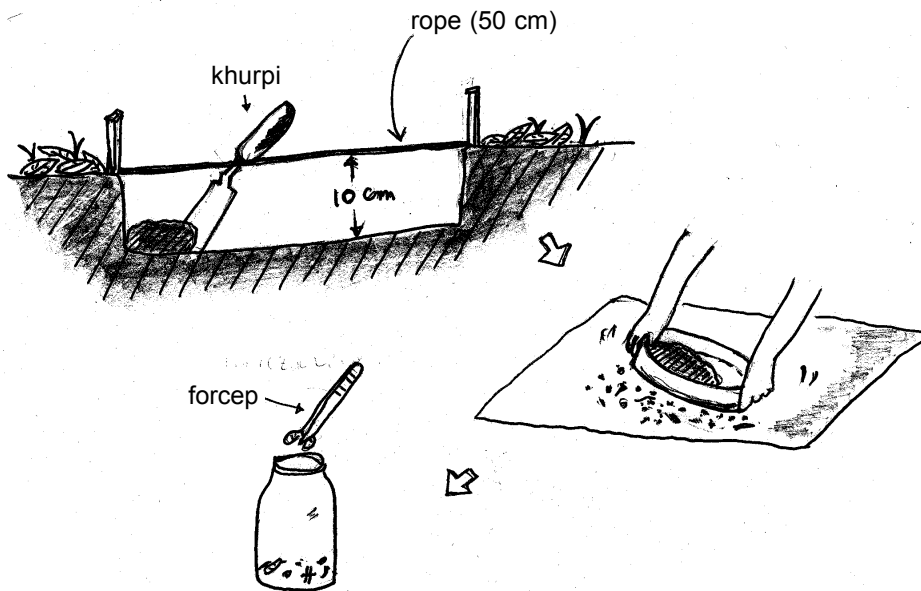


**What you need:**

- (70-90%) Alcohol, if available or formaldehyde
- stick and rope (2.5 m long)
- glass bottles (3)
- spade or hoe for digging up soil
- old newspaper sheets
- magnifying glass
- measuring tape
- a riddle

**What you do:**

1. Mark out an area of 50cms square in your chosen spot.
2. Remove the top layer (fallen leaves, stones etc) and place it on a newspaper sheet. Write out a description of the things you found in the top layer. Collect the insects you see and put them in a glass bottle.
3. Dig the soil to a depth of 10cms. Gently move the soil and pick out the insects and other living things. Put them into another glass bottle. Be sure not to mix up this lot of insect with those in the first bottle.
4. In the last bottle, put in a sample of the soil in that area.



**Writing out a record (after returning to classroom)**

Have the children

- Count the total number of living things/insects found in both top layer and underneath/ in the soil
- Count the numbers of each variety
- Put this information into the chart
- Make a sketch of each of the living things and measure their size
- Check to see whether they have named them correctly
- Write out a description of the soil texture and character
- Write about/describe the top layer and what they saw in it

Don't forget to put the date, time, type of weather, name of children in group, school, class and teacher's name!

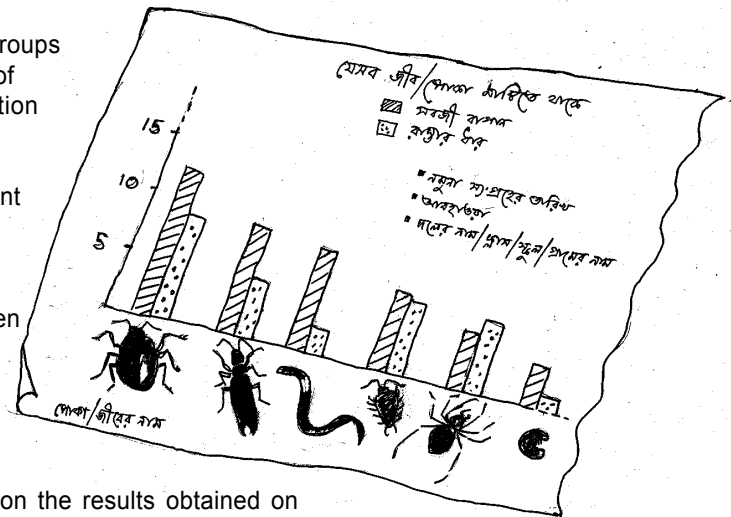
## Analysing / Collating Data:

The children can then categorise the living things collected using scientific classification as well as “daily life classification”

Compare the results of different groups who have studied the same type of location. Put together this information into the form of a chart/graph.

Compare the data from the different locations and put them into chart form.

Have a discussion on what children understood from their results, especially whether there is any relationship between insects in the soil and soil fertility.

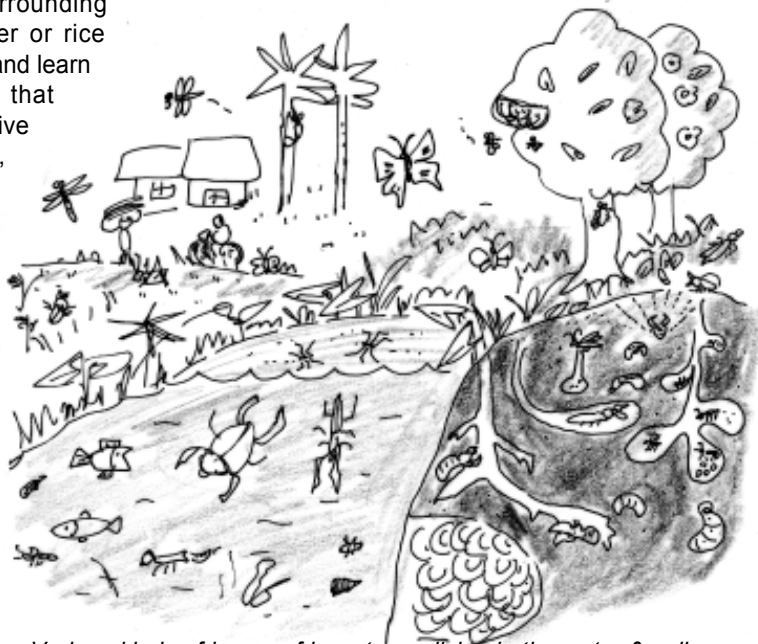


Ask the children to write a report on the results obtained on each of the points of investigation.

## Raising further interest & question

Discuss with the children what do these observed insects / creatures eat in soil and their other functions too. Children must realise these insects help & work for creating rich soil which provides base for our life. Alternatively way children can observe & survey on insects / creatures surrounding water body like pond, river or rice field etc. If children realise and learn through their observation that different types of insects live in different types of habitat, your activity becomes successful. Also you can give some suggestion that insects are good indicators of water pollution. (see expert's note, too)

For upper class children you can introduce microscope to observe more smaller creatures like micro organism in soil / water in relevant to syllabus of school text-book.



Various kinds of larvae of insects are living in the water & soil.

**Teacher's Note****Concept of Living Soil**

Observing insects & living things in soil is good start for children to realize that 'soil is full of life'.

Fertile soil is like a laboratory factory, where many living organisms are working constantly to manufacture plant food through complex living process.

Various micro organisms (thousands of them can easily fit in the space of 1 mm. and we need a microscope to see them) together with some larger soil organisms like ants, termites, earthworms, centipedes, snails etc. break down both organic (dead plant and animal material) and inorganic (sand, clay etc) matter to make plant food that is easily observed by plants' roots.

Thanks to these soil organisms, soil become fertile and nutrient flows continuously from soil to plants; from the plants to insects, birds, animals and humans; and from the plants and animals back to the soil; making life possible on the earth. When we see agriculture aspect, soil is the basis of food and maintaining abundant life in the soil is the basis of productive and sustainable agriculture. Understanding this concept is very valuable for children especially those who will be involved in agricultural work in their future. Surely they will be concerned about more ecological way in their work.

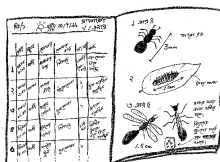


[Source : "Living Soil – Home Garden Series no. 5" / Jeremy Ironside & Ardhendu S. Chatterjee / TRC - 2000]

(see also page 36)

## Feedback

### Step 1 — Activity (B)



This is to find out there are many kind of insects and living things even under the soil.

Children can find out also the relation between insects variety & soil texture and its moisture. This will help to learn about insect/ living things role in soil and how they help to create good soil for plant and crops.



### Feedback Summary

	Swanirvar	Swanirvar	Ashurali
1)Village	Gokulpur	Bajitpur	Karhaghata
2)Children's class / number	class V to X 20 students	class V to X 19 students	class V to X 15 students
3)Class / period	5 periods 1 period = 1 hr. 30 min	2 periods 1 period = 1 hr.	We did not receive any written report.
4)Products/Result	Worked with investigative questions : 1) List of subterranean insects 2) List of insects above the soil	Worked with investigative questions : 1) List of subsoil insects 2) List of insects above the soil	Received a chart of subterranean organisms and insects.
5) Children's interest	The students enjoyed the work	The students enjoyed the work	
6) Teacher's opinion / difficulties	A little more time required to do the work. So the children lacked interest towards the completion of the activity.	The students did the work smoothly	



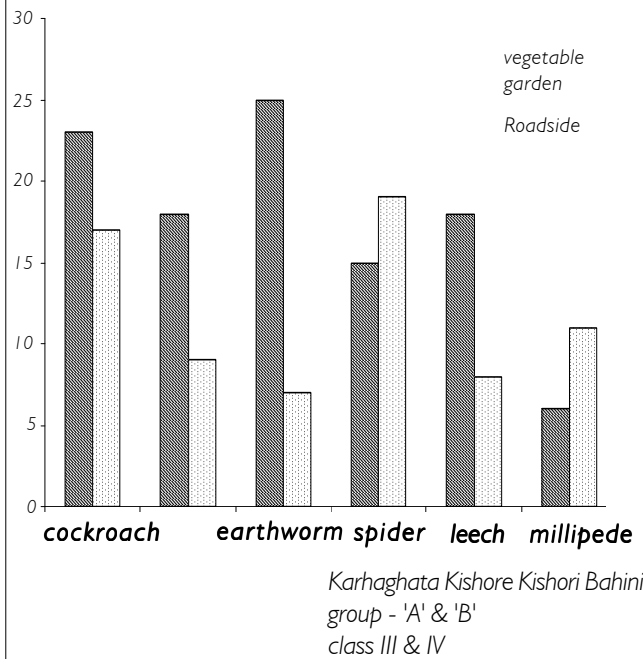


### Summary Chart

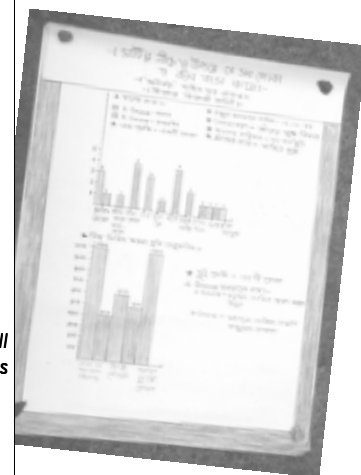
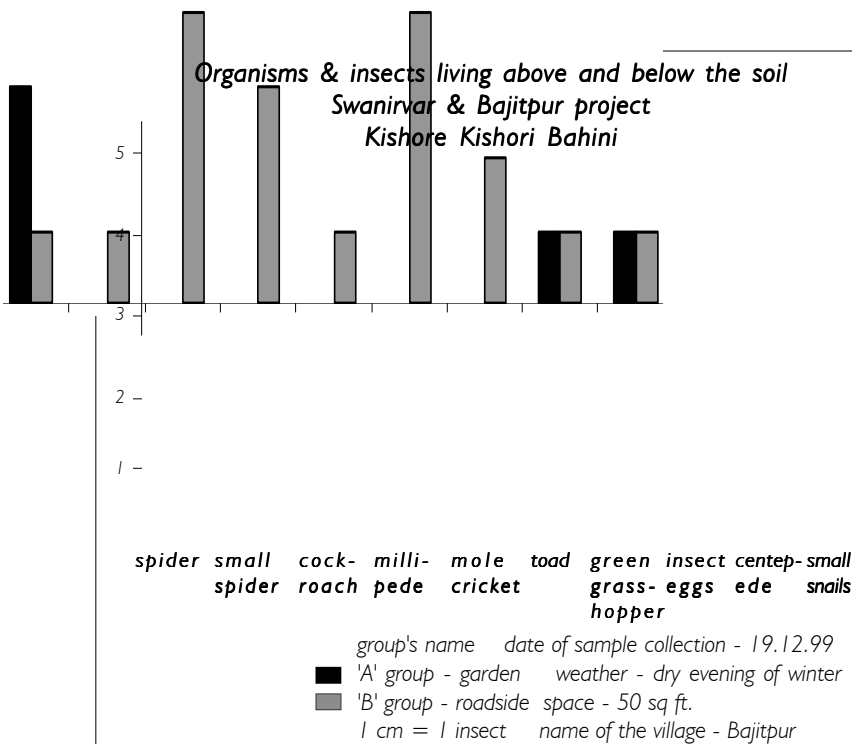
Children in AGP compared the insects which can be seen under vegetable gardens and roadside soil.

It shows us number of earthworms is very high in vegetable garden.

Chart on organisms and insects live in the soil



This bar graph shows the number of insects in garden soil (black column) and in roadside (grey column).





## Children's Work

We show a few children's record.

- Sanjay Pramanik (student, class VIII, teacher - Sudip Kumar Mondol, Swanirvar)**

### Experiments on Insect

Time - 3pm to 4.20pm

Place - We selected a place where trashes are disposed beside the house of Mita. On one side there was a jackfruit tree & on the other side a row of beetle-nut trees were present. There was also a "Bhatui" tree on one side. A stack of hay was piled on one side. Some 18 feet away there lay a pond.

#### Insects above the soil

We saw a cockroach-like insect with black spots and a pair of tentacles when we were clearing the garden. We saw a black and a red insect which stays in "Gerambul" tree. A small grey coloured insect, resembling house-fly, was also seen. We came accross a toad, about 9 inches long but we could not catch it.

Another insect like termite was seen. It had a striped appearance and can be seen in monsoon. A black coloured insect like fly, with six legs was also seen. We came accross a multicoloured spider like organism. We saw a red insect which looked like the 'Chamta' insect. Small, ant like insects, were seen, which were black in colour. A beautiful insect, with stripes and various designs was also seen. It had two tentacles and 2 cm in length. A lice-like, small, black coloured insect was seen. We also saw a 2 cm long grey coloured insect with several ridges on its back. After that we came accross a small green coloured spider.



#### Insects below the soil

A centepede was seen, when we dug the soil. A earthworm could be seen in small hole. Another black, 3 cm long insect was seen. A few yellow coloured centepede was seen approximated at a particular place. A black coloured, 1 cm long insect with a hard shell was seen. We observed small, flat, hard shelled insects were seen which are hard to see through the naked eye. A few black insects were observed. A baby earthworm was also seen at the end.

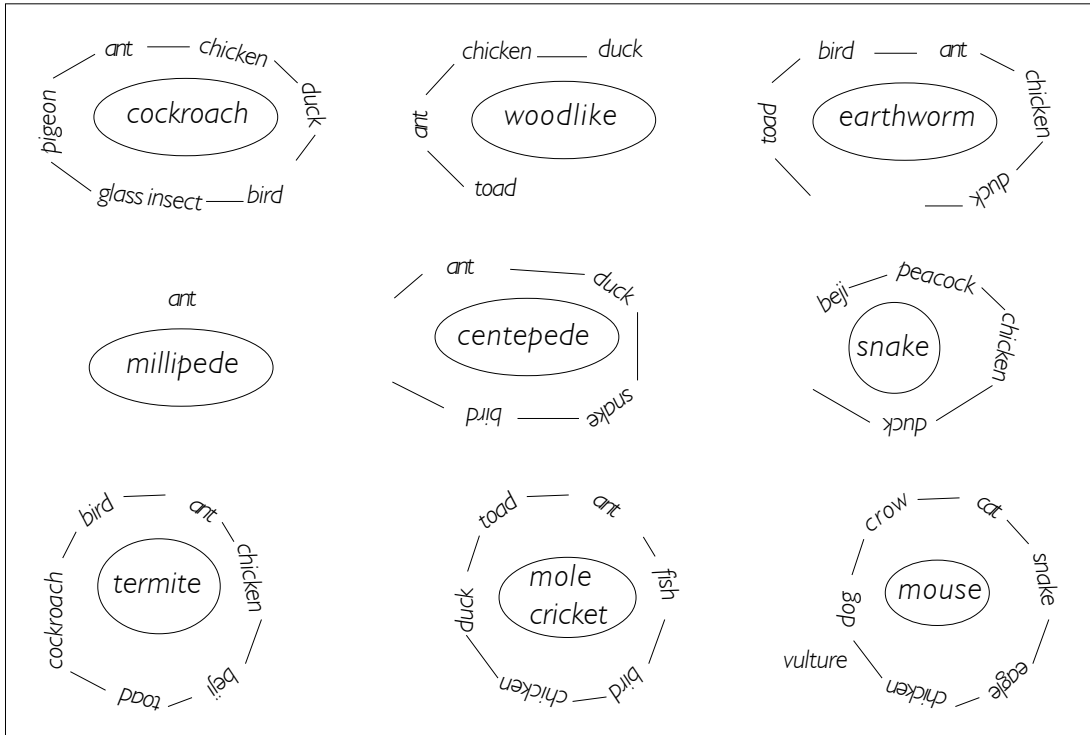


#### Nature of the soil

The soil was reddish and hard with few pieces of brick. The nature of the soil was sandy-loam and roots of many trees were found beneath the soil.

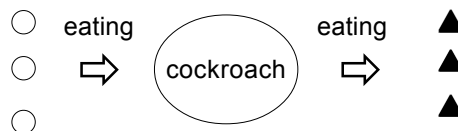
□ **Jaya Sarkar (student, class VIII, teacher - Sourendranath Sen, Swanirbhar)**

- A) The insects which reside below the soil.  
 Termites, ants mainly red ants, black ants, army ants, dung beetle, centepede, millipede, earth worm, scorpion, mole cricket, grasshopper etc below the soil.
- B) Write down the food habits of the insects found below the soil.

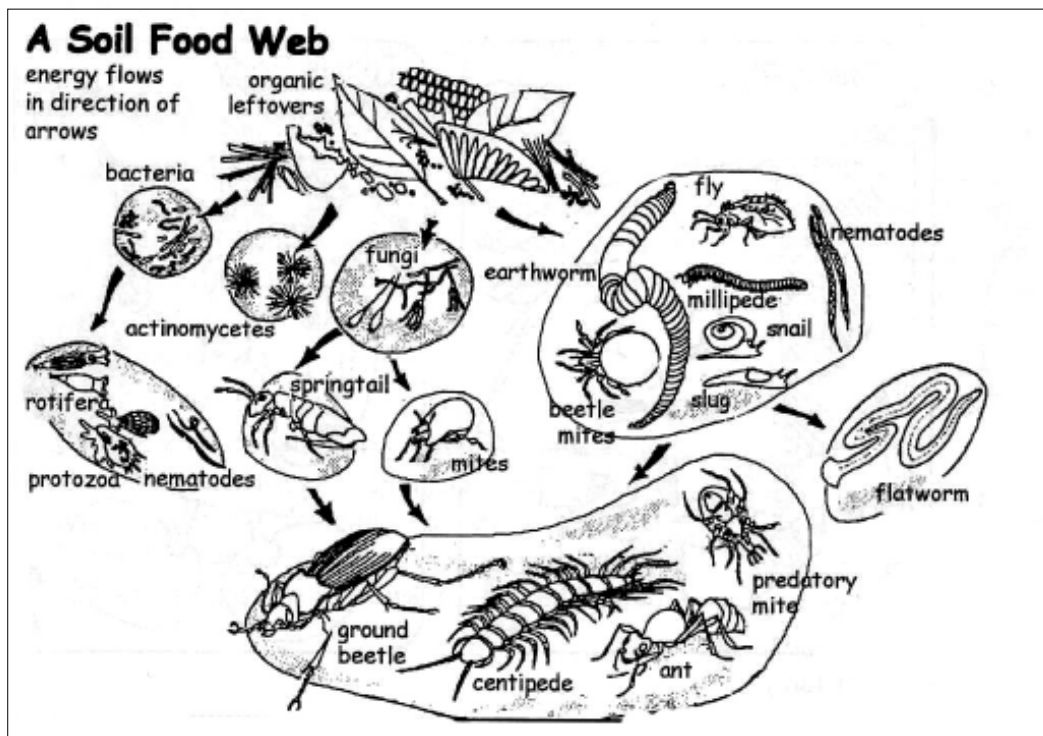


⇒ **How teachers can help**

- Finding out 'food habits' of insects/other living things under the soil is interesting work. If children aware of only 'one side' of food habits like Jaya Sarkar, teacher needs to explain the other side of food habits, like 'what does cockroach eat ?' & 'what eats cockroach?' The drawing will be



- Through this activity teachers can tell children about 'food chain / web' and encourage children to draw the 'food chain/web' of under soil creatures. However this work is not so easy neither is it suitable for small children. We give some example of 'food web in the soil' below.

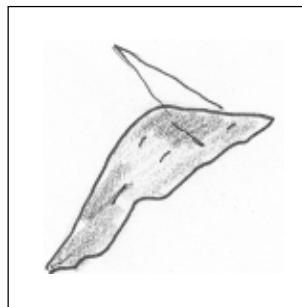


[Source : "Outreach - Soil Series: Understanding Soils" by Outreach / TVE, 2002 pg. 18]

## Sharing Ideas

In this activity, knowing each insect's name is not so important. Important thing is children can realise that many kinds of insects & living things are under the soil. But if you want to check the name, ask children to make simple sketch (drawing) of each insect. Don't forget to ask children to measure the size of the insect also. Later, you can search their names from books or from somebody. Just like unknown names of trees, you need the minimum description of them.

Step - 2



for collecting more information



**Lesson Plans**



**Feedbacks**



## INSECTS — Step 2 — Activity (A)

### "Let's breed mosquitoes"

We would like to know about the life cycle of our common insects. The best way to do this is to keep some and observe them. If we know how they function, it becomes much easier to deal with them, especially the ones that are pests, like mosquitoes!

[ 🏠 both for urban and rural schools 😊 class 4 to 6 ✎ observation, keeping records, sketching metamorphosis (EVS), Language, Art]



### Objectives

- Learn about insects' metamorphosis by observation.



### Building interest, raising questions

Look at the results obtained in the activity on keeping an "insect diary" (in 2-1-A) once again and discuss the most common insects in our surroundings. Ask the children whether they have ever seen the insect's eggs and if so, where, etc. Find out if they



know how many days it takes for a mosquito to go from the egg stage to becoming a mosquito. We all know of the process of "metamorphosis" from textbooks; tell the children that we will now try to observe how it actually happens by observing this with our own eyes.



## Preparation

Divide the children into groups so that each group can deal with a different insect : Mosquito, Butterfly, Cockroach and House-fly.

Have a discussion with each group separately on how they can set up a breeding situation and what the necessary conditions are for this purpose.

Make the children collect necessary information from other sources as well. For example they can try to find out what the insect in question likes to eat etc.

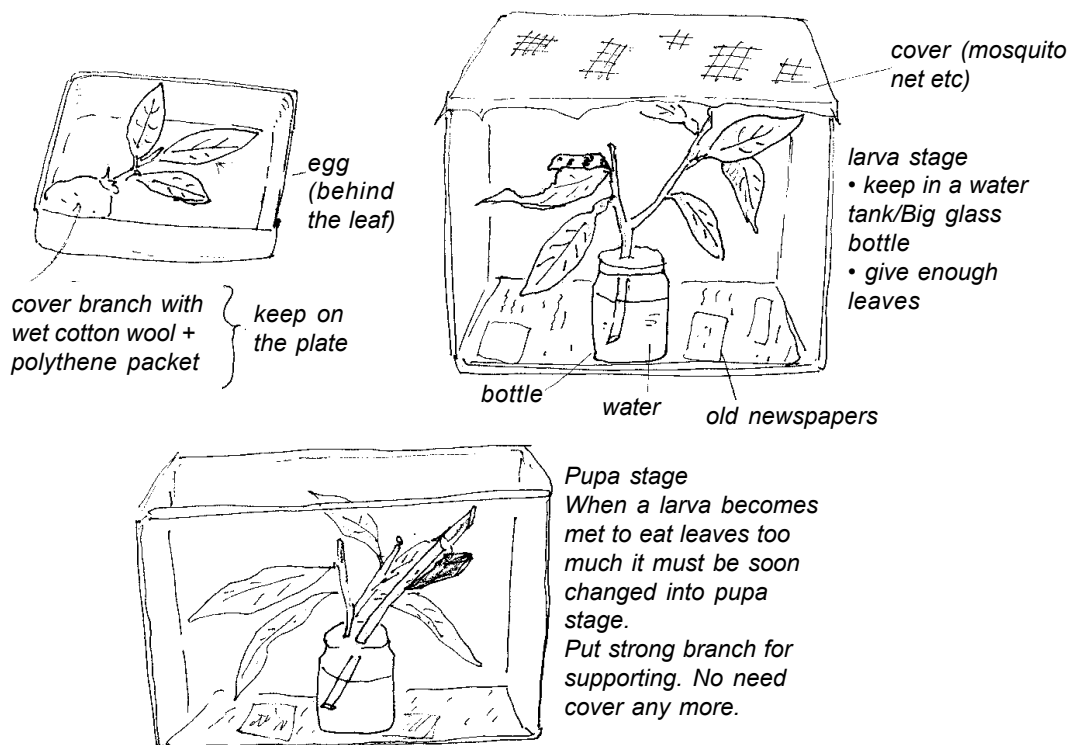


## Observation

Each group first has to set up a “breeding station”. They will then go about keeping a record of the process the insect goes through in the “growing stage” : Egg --> larva --> pupa --> adult

The days required for each insect is (approximately):

Mosquito	: 4 - 7 days
Butterfly	: 1.5 - 2 months
Cockroach	: 15 - 90 days (depending on the temperature and humidity)
Housefly	: 7 - 10 days



[butterfly observation]



## Information Collection

During the observation period, the children can collect other information regarding the insect that their group is working on from books, magazines, newspapers, friends, elders etc.

Some possible research topics:

- the life cycle of the insect
- how many species are there of that particular insect in India and in whole world
- how many eggs they lay
- their life span
- their favorite food
- history of the insect
- what their effect on our lives is (more detail in next step)
- who is their enemy etc.

The children can and most probably will, come up with more ideas on what they would like to learn more about.

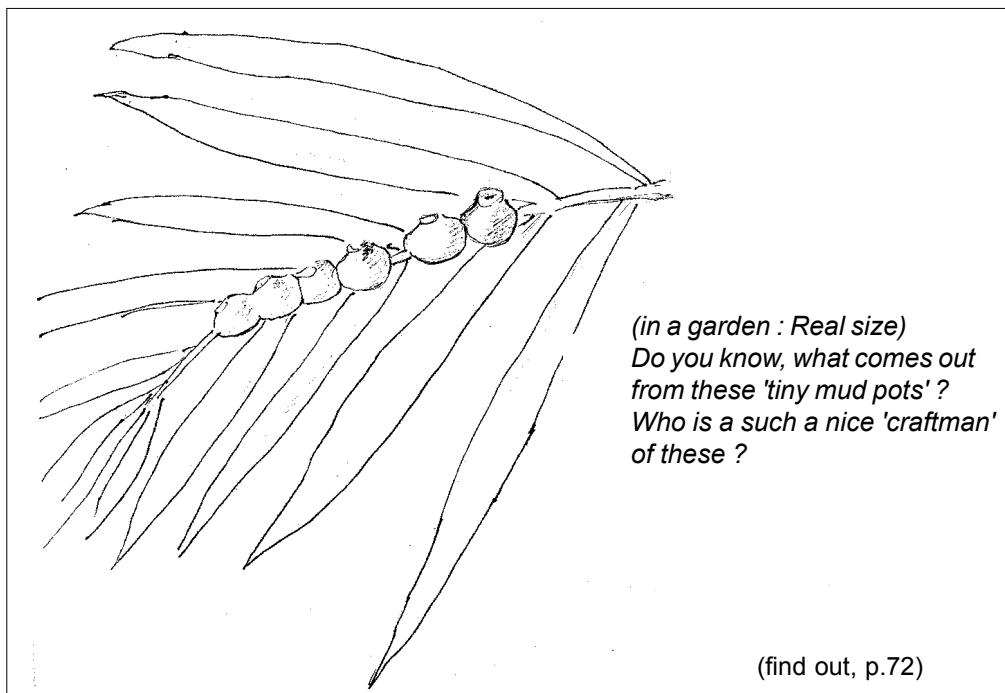
When they have researched these, have the children put the information into chart form.

Unanswered questions can also be included for future study.



## Presentation of results of observation:

Each group can make a presentation on how to set up a “breeding station” or “observation station” and the results of their work. Use of drawing and graphs for this purpose should be encouraged.





## Feedback

### Step 2 — Activity (A)



This activity needs also observation & keeping record but more over children can discover by themselves the real shape changing of insect.

It's exciting to find out the insect life cycle through our own observation rather than from just seeing illustration on the text book.

This will help children to understand how we can control disease inviting insects for human beings or how we can help to increase beneficial insects linking towards next step activities.

According to teachers' report it seems it was difficult to observe complete life cycle (metamorphosis) of insects. We have got two reports from teachers of Swanirvar.



## Feedback Summary

	Swanirvar	Swanirvar
1)Village	Gokulpur	Bajitpur
2)Children's class / number	class V to X 20 students	class V to X 19 students
3)Class / period	6 periods	4 periods
4)Products/Result	Compiled information on chart has been sent	Compilation of information on 6 insects have been sent
5) Children's interest	The students enjoyed doing the work	All the students were not interested to do the activity
6) Teacher's opinion / difficulties	The teacher gained some experiences through teaching the children	Students of the higher age group is ideal to do this activity



## Children's Work

### □ Experiments with Cockroach

#### ☺ Sanjay Pramanik (student, class VIII, teacher - Sudip Kumar Mondol, Swanirvar)

He reared a cockroach for 3 weeks. The information kept by Sanjay is typed in the following lines.

5 cockroaches were kept in a glass jar and a net was fixed in its neck on 29.01.2000. Kul and puffed rice was given to them as food. It was seen on 30.01.2000 that the cockroaches got weak.. It was thought that this may be due to scarcity of food. Some more food in the form of sweet potato and sweet bread was given to them. Two more cockroaches were put into the jar on 30.01.2000.

30.01.2000	No change was observed
01.02.2000	" " " "
02.02.2000	" " " "
03.02.2000	Two legs were missing in one cockroach
08.02.2000	5 legs were missing in the same cockroach
05.02.2000	No change was observed
06.02.2000	" " " "
07.02.2000	The same cockroach died
08.02.2000	Half of the body of the dead cockroach was eaten up.
10.02.2000	The cockroaches did not lay any eggs, so they were released keeping two big ones. The jar wa cleaned and 'shankalu' was given as food.
13.02.2000	No change was observed
15.02.2000	" " " "
19.02.2000	Some white coloured krimi-like organisms were seen in 'shankalu'. These were taken out and the jar was cleaned. Then the cockroaches were cleaned and fed to the chicken.



### ⇒ How the teachers can help the children

- ask children to mention clearly about place & size and what kind of food did he give.
- Encourage children to think & write what conclusion / summary can be drawn.
- Try to put drawing too.

## Some Useful Information

from website : [yucky.kids.discovery.com](http://yucky.kids.discovery.com)

### Amazing Roach Facts

- There are 5000 species of cockroach world wide.
- Roaches can live without food for a month, but will only survive a week without water.
- Cockroach can hold their breath for 40 minutes.
- A cockroach can live a week without its head. The reason is without a mouth, it can't drink water and dies of thirst. For cockroach water is more important than food.

### Experiment on insects and lizard

#### ☺ Swanirvar group

*To check what insects do house lizards eat, one of them was kept in a bottle and various insects were put into the bottle. The responsibility to look after the whole set-up was given to a student named Jaya Sardar.*

### Caterpillar Keeping – 1

#### ☺ One of children from Swanirvar group

*- On 17/12/99 I was riding my cycle along the road. Suddenly an old lady asked me to stop. She handed me a branch of Indian Jujube with a large green caterpillar-like organism hanging on it, and told me, "I heard that you are doing a study on insects, so take this!" I brought it home and put in a plastic jar with some more jujube branches and leaves. Within one week, the insect devoured all the leaves and formed a cocoon. Till now (2/2/2000) nothing has come out of it and it can be felt that something is moving inside.*

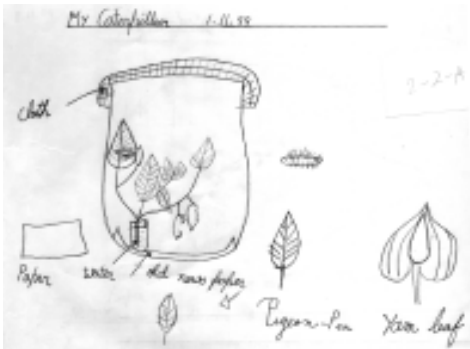
*- A caterpillar on a Jamun branch, with leaves, was brought from neighbouring lady. Later it was kept in a jar along with some branches of Jamun. It formed a cocoon within one week. After another 4-5 days it metamorphosed into a complete butterfly and hovered inside the jar. Thereafter branches with full bloomed flowers was inserted into the jar. The butterfly was seen to occasionally sitting on the flowers.*

□ **Caterpillar Keeping – 2**

☺ **Manosi Chatterjee (girl-student, class I, with help from her mother, Chandannagore)**

She kept 2 kinds of caterpillar which were found in her garden. She kept record from 1st November'2000 for one month. She found out one of the caterpillars became moth not a butterfly. Her writing is typed as original for your convenience. \* we put underline for language correction.

1.11.99



I found it on the roof yesterday. My mother made a home for my caterpillar. She eats the yam leaf faster. Her name is Yammy.

8.11.99



Now 'Yammy' has become big and fat. Yammy has finished eating the yam leaf, that's why my mother put new yam leaf. Now it has big lines on it. Now it is eating very fast. It has eaten some them. It has done many poty. The poty is like birds' poty. The shapr is round. It is in black colour. Some leaves are dry. It is brown in colour. But yammy didn't eat it. Thats why my mother took pigeon pea out.

9.11.99



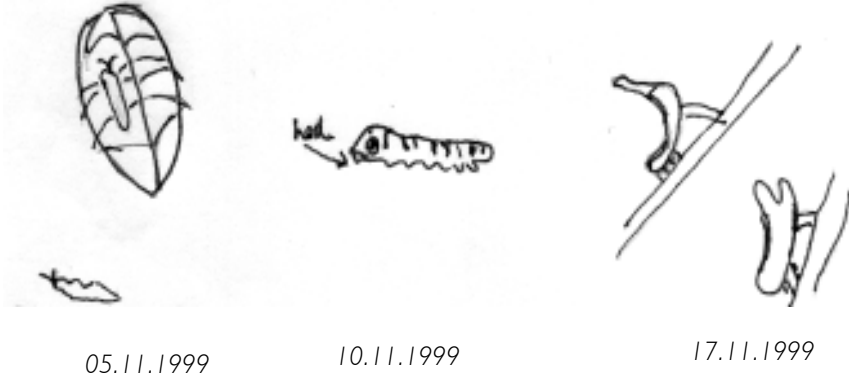
Now it has become more biger and fater. There is new papers in the bottle. Yammy is eating very fast. That day it was small, now it has become bigger and bigger. Yammy has eaten half of the yam leaf. My mother has given some leaves. If it finishes, my mother will give more. Many dry leaves has fall down, the stick is also brown. The clothes colour is brown and white.

5.12.99



Yammy is a moth not a butterfly. Yammy has come out from the cocoon. The smell is very bad because of Yammy's droppys.

- ☺ Another caterpillar became a butterfly, one moth later emerged the moth. Here is a part of record from Shantonu (class III), Manosi's brother.



### ⇒ How the teachers can help the children

- Teacher can teach some important related words in the language class (singular & plural like 'leaf' and 'leaves', comparison of adjectives like 'big, bigger, biggest')
- If the students are above class III standard, they can take measurements of the various stages of the life cycle of insects.
- Some students are not interested in keeping records. They have interest in observing the insects but not keeping their records. Do encourage the children to keep some minimum records. For example, like Shantonu, they can draw and note the date only when the insect changes its shape.



## Sharing Ideas

- Observation & keeping record is not only work for children. Teacher can also make own record book like children.

It is interesting and sometimes you can also discover real background of the fact which you usually teach children from the text book.

I myself found out through observation & keeping record what is the difference of meta morphosis between butterfly and moth.

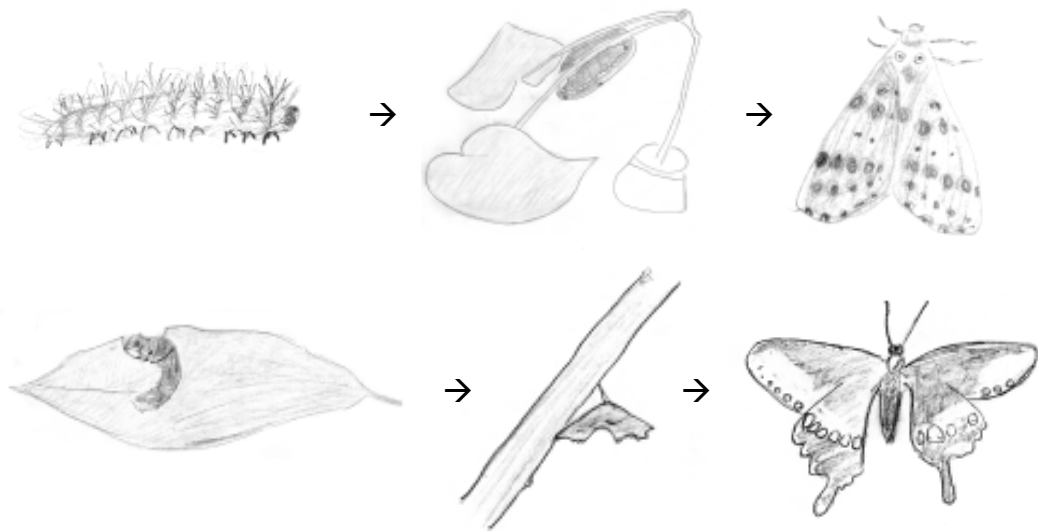
And doing work with children itself brings interesting realization & discovery too. My children gave special name to each caterpillar like Droppy & Yammy. Later whenever they see same butterfly they identify "oh ! that is Droppy butterfly".

When they say "Droppy Butterfly", this is not a kind of knowledge from book. This is a knowledge & identification from their own experience. They can also now identify which caterpillar become a butterfly and which caterpillar becomes a moth.

After droppy became a beautiful black butterfly, children tried to find out the name from general books. I did not tell them to do but they started searching by themselves.

We set free both Yammy moth and Droppy butterfly into the sky. Soon after they hatched from cocoon.

Thanks Yammy & Droppy. They taught us a lot. (Satoko Chatterjee)



*[what a magic !]*

- Children must raise a lot of questions after their observation on insect closely. Beside from books & encyclopedias, you can find out interesting & useful information / facts on insects from website, too.

### Useful Information

**from Website — "Children's Butterfly Site" - [www.mesc.usgs.gov](http://www.mesc.usgs.gov)**

Q: What is the difference between butterflies and moths ?

A: Butterflies are mostly brightly coloured day-flying insects with long clubbed antennae and most moths fly at night and lack clubs at the end of their antennae. A group of tropical 'moths' has been found that are closely related to butterflies but they lack clubs on their antennae; they are now considered to be butterflies & perhaps the best answer that matches our current knowledge is just to say that butterflies are 'fancy moths'.

Q: How long do butterflies live ?

A: Adult butterflies live about a week or two on average. Because of the chance that birds or other animals could eat them or an accident on emerging from their Chrysalis. Some butterflies could live only a day or less after they emerge.

Q: Where do butterflies go when it rains ?

A: Butterflies hide when it rains. They usually go to the same place do for the night. Some butterflies hide under large leaves, ome crawl down into dense leaves or under rocks, and some first sit head down on grass. Stems or brushes with wings held tightly. It the rains are exceptionally hard or of long duration many of the butterflies become tattered or die.



## INSECTS & WORMS — Step 2 — Activity (B)

### "Inviting ants"

One way to learn more about insect behaviour is to observe the most common colony insect, the ant. What can we learn from them ?

[ 🏠 both for urban and rural schools 😊 class 5 to 8 ✨ observation, creative thinking, hypothetical thinking, keeping records 📖 food habits of insects, body parts of insects (EVS), language]



### Objectives

- Setting up own experiment for observing insects behaviour.
- Close observation on insects' body structure and its function.



### Building interest, raising questions

Based on the children's experiences and observations while writing an insect diary (step 1-A), hold a discussion on ants and what they eat, how they carry their food etc. Let them know that we now plan to examine the behaviour of ants.



### The First Step: formulating a hypothesis

Divide the children into groups. Make a list with them of what the different things they want to know about or examine more closely are. Prepare the sheet like this:

General observation (what I saw)	Study question	Hypothesis	Examination - collecting data	Conclusion
ants usually picks up sweet things, but they also carry dead insects	do ants really like sweet things ?	They like sweets but also eat other things favourite food differs from species to species	keep out different kinds of food and observe how many ants come and time they take to take it away.	

Discuss with the children how they can set up an experiment to examine the behaviour to check their hypothesis.





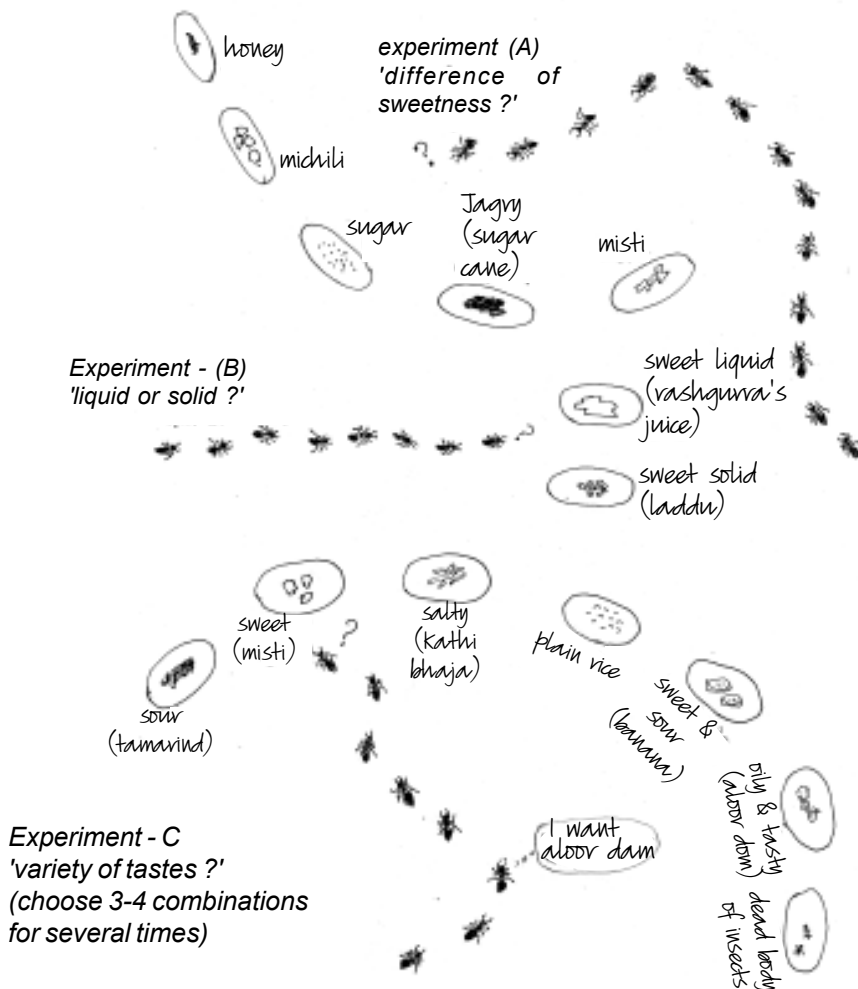
## The Second Step: Experiment and Observation

Each group is to conduct their own experiment to observe the way ants behave. They should all keep a record of these observations.

example:

- They can try with a variety of foods to see which attracts the ants
- See what the difference is in the number of ants that come for each samples. How long do they take to pick up all the food ?
- Observe how ants carry a large-sized piece of food
- What happens if the line of ants is disturbed
- Where the ants come from and where they go with the food

Examples of 'Invitation' for Ants





## Summary of information

Each group try to find out their own conclusions then share with another groups in class.

Next a chart on the “Behavior of Ants” can be made summarising the information of all the groups based on the results of their observations.

### Some useful information

- Ants are social insects. They live together in colonies.
- Ants are amazingly strong for their size - they can carry food upto 2 or 3 times their own weight.
- There are more than 10,000 species of ants in the world.
- The ants that carry the food are all female ones.
- Ants mark the ground with a certain odour to let their friends know the way to the food source. In this way, they can make “lines” for carrying food. The effect of this scent lasts for about 1 minute.



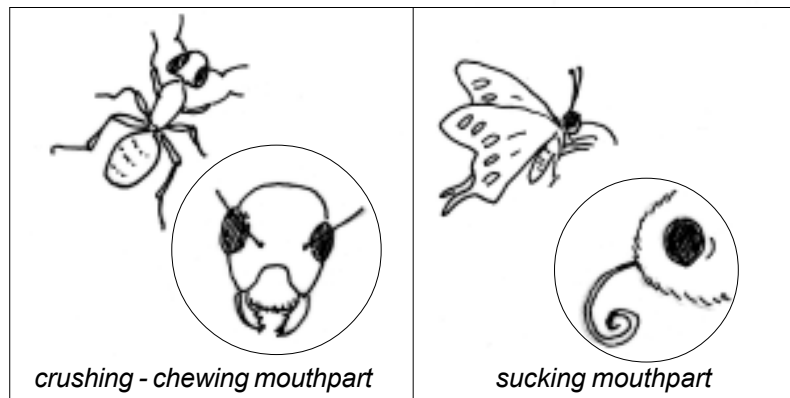
## Further Questions

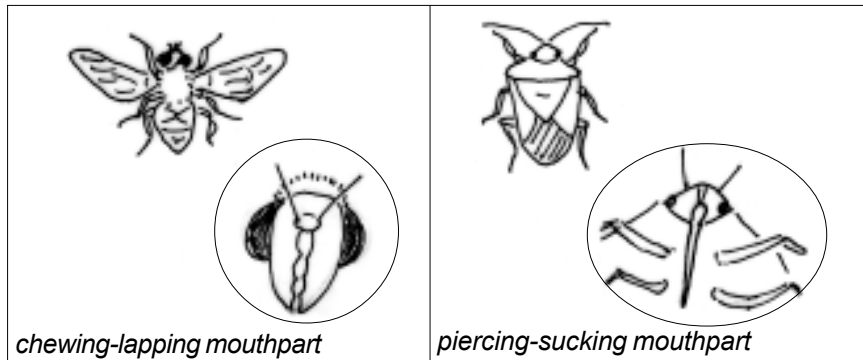
Following a discussion, make a list of any further questions the children might have.

Teacher can also draw children's attention to observe carefully the structure of ant's body parts. Through observation, for example, children might realise insects have different types of their food habit.

This is a good opportunity for the children to learn about insects 'anatomy' in relation with their 'behaviour'. Same like mouthparts, children can compare different types of legs, wings, antennae / feelers, eyes and tails of insects.

Different insects have developed specialized kinds of mouthparts suiting various food types.





**Teacher's Note**

**“Doing Science”**

What do you think is the difference between a science class and “doing” science? This is an important point to consider.

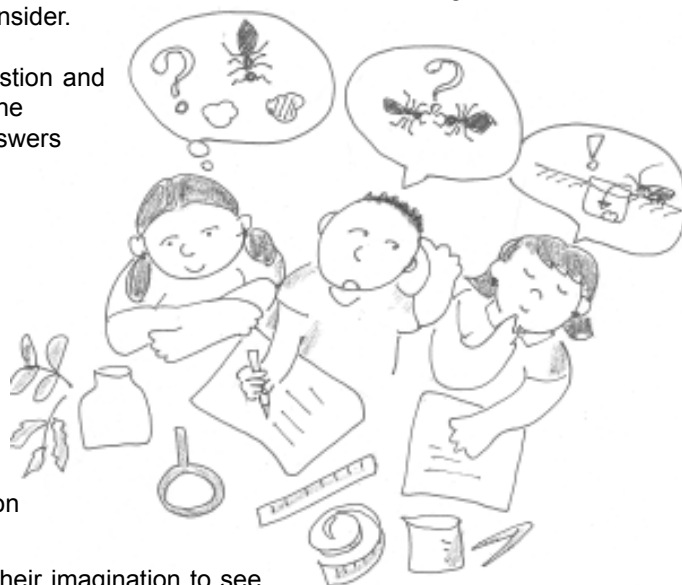
Science is all about asking question and then going about trying to find the answers. And usually these answers lead to more questions.

To really “do science” the children must be engaged in the process of inquiry. They must pose the questions and actively participate in the pursuit of answers. Students must be given the opportunity to investigate and experiment on their own terms so as to be able to internalise the information presented in class.

Encourage the children to use their imagination to see how they can examine the matter using materials which can be recovered from their surroundings, local materials and even recycled or waste materials.

To promote the attitude of “doing science” among children is one of the biggest. Most interesting and most challenging tasks a teacher has.

[extract from internet: Doing Science (The Wild Ones) 1997]



## Feedback

### Step 2 — Activity (B)



This is interesting experiment to know about ant's behaviour & favourites.

To make children think about home to set up experiment is teacher's important role here.

Help children to summarize what conclusion can be taken from the experiment too.



### Feedback Summary

	Swanirvar	Swanirvar
1) <b>Village</b>	Gokulpur	Bajitpur
2) <b>Children's class / number</b>	class V to X 20 students	class V to X 19 students
3) <b>Class / period</b>	8 periods	3 periods
4) <b>Products/Result</b>	Compiled information on chart is there. They have done the experiment on what ants eat	Compiled information on chart is there. They have observed through experiment what food do ants like most
5) <b>Children's interest</b>	The students enjoyed doing the work	The students enjoyed in doing the the experiments
6) <b>Teacher's opinion / difficulties</b>	Not mentioned	No problems was faced



## Feedback from Teachers

### □ Sudip Kumar Mondol (Swanirvar)

(A) Date - 9/3/2000

Place - Courtyard of house

Time - 12 pm in the afternoon

Names of food - 1) Molasses from date palm, 2) Dead earthworms, 3) Fresh coconut, 4) rice, 5) oiled paper, 6) Scales of fish

Observation - 8 ants came to the coconut after 6 mins. Subsequently the coconut fruit turned red due to the aggregation of the ants. Two minutes after this, big black ants were seen carrying the scales of fish. Two minutes after this, 8/10 big black ants and red ants gathered at dead earthworms, and tried to carry it away. After ants from coconut came in a file to date-palm molasses and oiled paper. The distance between each food item was 3 to 3½ feet.

(B) Date - 20/2/2000

Place - Courtyard at the back of kitchen

Time - 9 am

Names of food - Sugar, rice, bread pieces, gram, groundnut, unhusked rice.

Observation - Five minutes after the food is served, an ant went for the sugar. It is black on both sides and red in the middle. After 10 minutes 6 red ants and one black ant were seen at the bread piece. Five mins. after that 12/14 black ants gathered at the unhusked rice. The distance between each food item was 12 cm.

### □ Sourendra Nath Sen (Swanirvar)

After the tale about the ant and sweet meat was narrated, Jayanta Sarkar, a student went inside his room. At that instant, he summoned me inside, "Uncle will you please come in?" I went inside and saw pieces of molasses, sweet meat were arranged. After some time, some 40 large black ants, were seen roaming. The first ant dipped its mouth on the sweet juice and the rest selected the food according to their choice. 20 ants were on the sweet juice, 12 on 'lancha' (one kind of sweet) and 8 ants on molasses.

(1) It was questioned in the beginning that in which food the ant will go for at first?

The child said that the ant will go for the sweet juice of Rosogolla. It turned out to be true and the child, happily explained to his mother, "Mother you know; Uncle lost and I won the challenge!"

(2) Another question, in what maximum ants will gather, was asked at the beginning.

The child answered that in the juice of rosogolla, maximum ants will gather. It came true. As the ants came one by one at the juice, the child shouted at his mother, "Mom here comes another!" and so on.

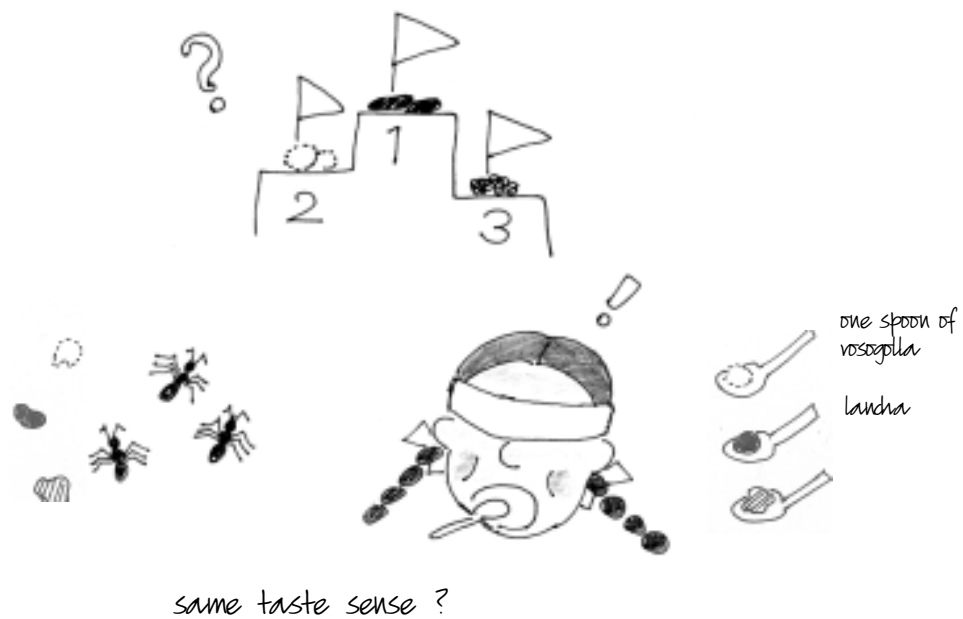


## Sharing Ideas

According to Sourendranath's report we can see how children got excited to make experiment on ant.

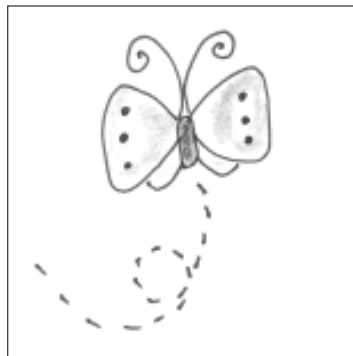
If there was more mention in his report how children analysed their result & what conclusion children reached, it would be more interesting.

If necessary teacher can give idea of comparing test sense of ant & children to check whether ant favourite is according of strongness of sweetness.



*Try to give order according sweets taste.  
Let's create learning way for children through using  
own experience.*

Step - 3



for creating child oriented activity



**Lesson Plans**



**Feedbacks**



## INSECTS & WORMS — Step 3 — Activity (A)

### "Honey, the gift of Insects"

Did you ever think that we stand to benefit from the activities of insects ?!  
Let's investigate how the little bee affects our lives, and that of plants and the environment.

[ 🏠 mainly for rural schools 😊 class 6 to 8 🗨️ interview, sketching, data analysis 📖 social insects, beneficial insects, insects' life cycle, pollinating insects (EVS)]



#### Objectives

- to investigate various beneficiary role of insects
- to aware about ecological balance through insects' role in apiculture/agriculture



#### Building interest, raising questions

Along with the children collect some poems, songs and stories related to bees.

Ask the children whether they have ever eaten honey directly from a bee hive. How was the honey collected? You could then tell them to make a sketch describing the scene with the beehive.

*A typical wild beehive (where bees live) in the village.*



#### Data Collection

Interview some bee-keepers in your village or even some people who have wild beehives in their garden.

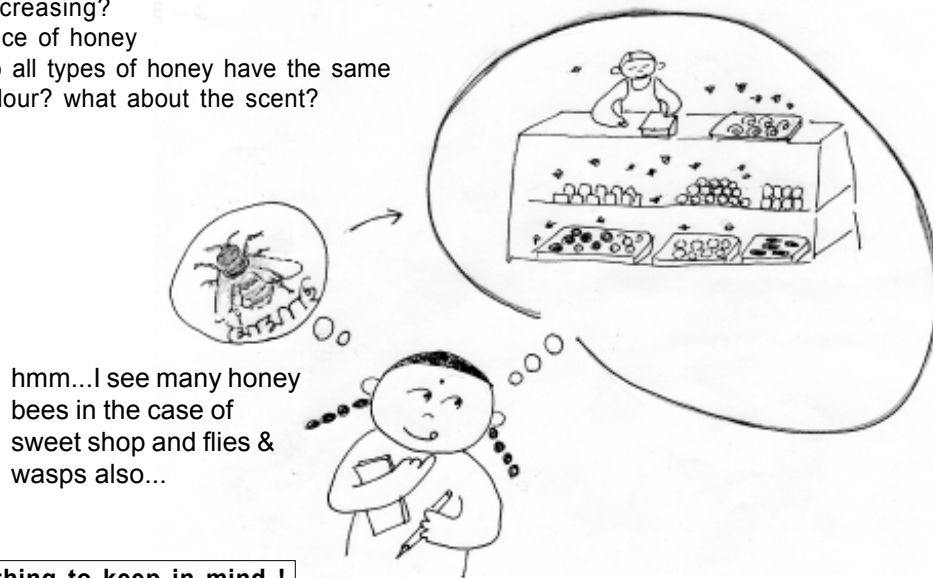
OR

Collect information from books / people who know about bee-keeping / or through your own observation (you could even talk to sweet-shop owners).



Key Questions:

- 1) What kind and how many honeybees are there? Where do they live? In which season and on which trees and plants do we see bees most?
- 2) Compared to earlier days, do you think that the number of bees is decreasing?
- 3) Price of honey
- 4) Do all types of honey have the same colour? what about the scent?



**Something to keep in mind !**

The children should prepare a “questionnaire” before going to interview people to avoid missing asking important questions or repeating themselves. Having a list of questions in hand will also be useful for later, when we analyse the information collected.

Making a sketch or a drawing of the place visited is also an important task and might provide information.



**Summary and analysis of data**

- Make a seasonal diagram of beekeeping work through the year along with the flowering season of plants and the life cycle of bees.

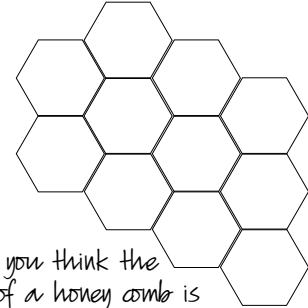
Beekeeping Calendar in our village

Season	Basanta		Grishma			Barsa		Sarat	Hemanta		Seet		
	spring		Summer			Monsoon			Autumn		Winter		
month	2	3	4	5	6	7	8	9	10	11	12	1	2
species		←	A		→	B			←	B	C	→	D
Bees activity lifecycle		—	—	—	—	→			←	—	—	—	—
Production of honey		←	→		←	→			←	→		←	→

- Then you can go on to make a summary chart of all the information collected regarding the characteristics of a honey-bee and its function.

Eg:

- they live together in colonies (social insect)
- a bee has a long “tongue” called a “proboscis” for sucking up nectar.
- they are important for the process of pollination, taking pollen from flower to flower.
- bees like to wake up when sun is shining and it is warm
- they don't like rainy and cloudy days
- only the female bees sting
- unless they are disturbed, bees generally do not sting.



Why do you think the shape of a honey comb is hexagonal?

If you want, you can make a chart by dividing the sheet up into hexagons and write one point inside each hexagon. You can use different colours depending on whether you are talking about a bee's characteristics or its functions.

□ **Points to analyse / discuss**

- The relationship between honey bee activity time/level and the flowering or fruit-bearing season of plants.
- If there were no bees, for which crops would this present a difficulty? Besides the bee, which other insects are important in the process of pollination? (see Teacher's Notes 4)
- What are the reasons for declining bee populations? What can we do about this?
- What are the difficulties encountered in bee-keeping? What are the benefits? Why don't more people keep bees?
- What else can we get from a beehive other than honey? what is it's use?
- In case one is stung by a bee, what must we do?  
It is said that putting a slice of raw onion on the area, or baking powder, etc is helpful in case of a bee sting

**Teacher's Note****Insects & Pollination**

The fruits which develop from well pollinated flowers are well structured and tasty. Others which do not develop from pollinated flowers mainly Phuti, Watermelon, cucumber, Kumro gets detached from the stalk. Fruits which are not well pollinated, or partly pollinated become rugged (Jackfruit) and less tasty or sweet. Well pollinated fruits have good structure and are heavy.

The number of bees are diminishing world wide. One of the reasons behind this is the use of pesticides in agriculture. The primary reasons for decreasing number of bees are cutting down of forests abolishing of local fruits and other varieties of trees. It is important for the bees to collect honey and pollen throughout the year. One of the main factors is that there is not enough tall trees for the bees to make hives.

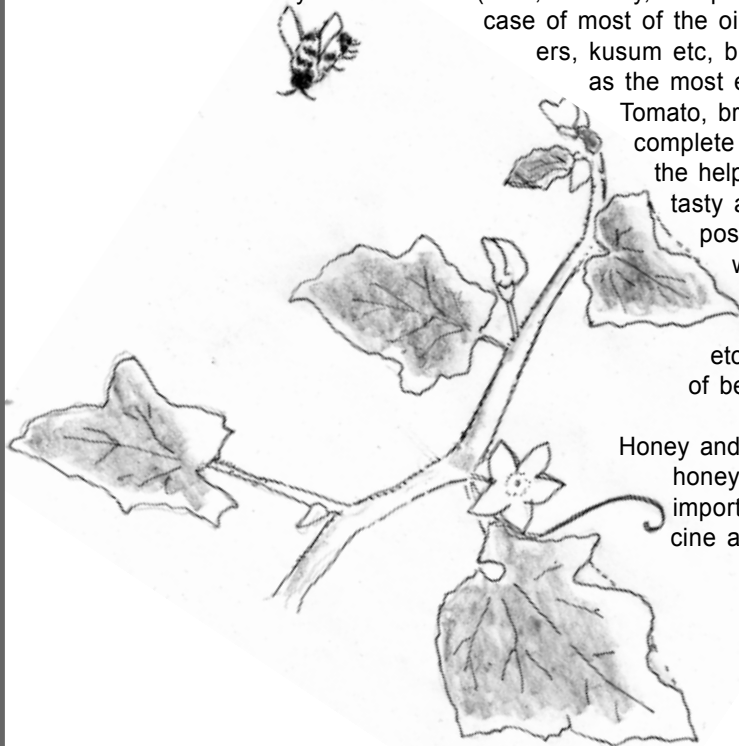
Most of the plants of cucurbitaceae family (Bottle gourd, Chalkumro, Cucumber, Water melon, Khero, Kumro, Ridged Gourd, Bitter Gourd etc) do not have complete flowers. Therefore for pollination is very important for them. Pollination by bees or any other insects (Ants, Butterfly, Wasps etc) is very important in the

case of most of the oil seedslike mustard, sunflowers, kusum etc, but among them bees stand out as the most effective and helpful pollinators.

Tomato, brinjal, lady's finger have complete flowers and they fruit without the help of bees, but formation of tasty and well structured fruit is only possible through pollination. The wind does the pollination for the crops of the gramineae family (rice, wheat, meals etc). They do not need the help of bees or any other insect.

Honey and wax are produced from the honey combs, which are very important. they are used as medicine and many other purposes.

[text by Ardhendu S. Chatterjee]





### Variations on this activity

- ➔ For example, if your area is famous for silk production, you can encourage children to investigate the silkworm. Find out with children how silk yarn is produced from silk worms.



- ➔ As an extension work from Step 1 - Activity B 'Insects and other living things in the soil' and Step 2 - Activity A 'Let's breed mosquitoes', children can breed earthworms and make good compost, too.

The earthworm is another creature that is very beneficial to us as it improves our soils. There is a method for making good compost with the help of earthworms, known as “vermiculture”. The product is called “vermicompost”.

The earthworm can transform our smelly kitchen waste into valuable compost which is very useful for growing vegetables and tree-seedlings as well. Children can collect information about the process of vermicomposting and do this themselves. **(See teachers note on vermi compost)**. This activity is suitable for both urban & rural school's children.



earthworm

**Teachers Note**

## Vermicompost

### Small Scale Household based Production

(guide for children & instructors / parents)

by Ardhendu S. Chatterjee

#### About earthworms

Earthworms like to live in moist, cool, dark places. There are many types of earthworm but not all of them can be raised in an enclosed space. Two species of earthworms are easy to raise in containers/boxes; these are called red worms (*Lumbricus rubellus*) & red wigglers (*Eisenia foetida*).

Earthworms have no ear or eyes, but they sense vibrations & light and dislike both. They can tolerate wide range of temperature but are most active when the temperature is between 15-25°C. They need high moisture (about 65-70%) together with oxygen, and they need plenty of food. They usually eat about half their body weight in 24 hours. They prefer neutral to slightly acidic soil the most, but can survive in strongly acid or alkaline soils.

Earthworms like vegetarian food, but don't mind if you add some eggshells (which should be crushed to small pieces). They like vegetable peels, tree leaves, tea leaves, fruit pulp, torn paper, & cardboard etc. They dislike meat, fish, milk products as well as oils & fats etc. They also strongly dislike any soaps, paint, insecticide in their food.

#### Why should we raise ?

Earthworms turn decomposing organic matters into nutrient rich plant foods, a type of fertiliser called vermicompost. Vermicompost is complete food for plants and not only fertilises them but makes the plants stronger against pests & disease.

Earthworms can be sold as fish food, chicken food, vermicompost starter etc and can be used at home garden or farm to feed fish, chicken, duck etc.

Earthworms multiply rapidly, create no noise or odor, and survive with minimal care if their living place is designed carefully.

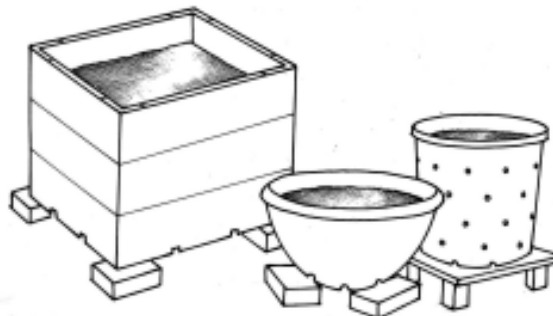
#### How to raise ?

Earthworms can be easily raised in a dark corner of the home, garage, cowshed or garden in a wooden packing box, an earthen pot or a plastic bucket, but wooden boxes are more suitable & easy to handle.

Boxes should be 50 to 60 centimetres deep, the width should be about 70-75 cms so that oxygen can reach the centre, the length can be as much as needed. For a small family of 3-4 persons which produces only 500-600 gms of non greasy food wastes everyday, the box needs to be 95-100 cm long (overall dimension 24" x 30" x 39") and the weight of earthworms added should be about 500 gms (1800-2000 mature worms).

Worm bin can be easily constructed in 6 steps.

**Step 1** : take a old packing box, drill 12-15 drainage holes of 6 to 8 mm diameter at the



bottom at about 15 cm interval. If it is a plastic container, holes will have to be made on sides also for aeration.

**Step 2 :** lay 4-5 sheets of newspaper over the holes & fill with small pebbles upto 3 finger depth (5-6 cm), wash the pebbles well before putting them in the box.

**Step 3 :** cover the pebble bed with a thin layer of silt or soil, 3-5 cm depth is sufficient. Some old compost can also be added to the soil layer after sieving.

**Step 4 :** build up a 15-20 cm deep layer of crumbled paper, coir or torn up cardboard / corrugated paper. These materials should be soaked for 2-3 hours or longer in water & squeezed well before being put in the box .. add the earthworms inbetween the wet layers.

**Step 5 :** add a 30-35 cm deep layer of straw and dry leaf which has been cut into small pieces. Food scraps will be buried 5-6 cm deep into this layer everyday.

**Step 6 :** cover up the top with a double layer of wet jute / cloth or gunny bag. The box is now ready. Keep it in a dark, cool, quiet corner. If possible use a wiremesh as lid to prevent rats, cats, birds etc. from entering the box especially if the box is kept outdoors.

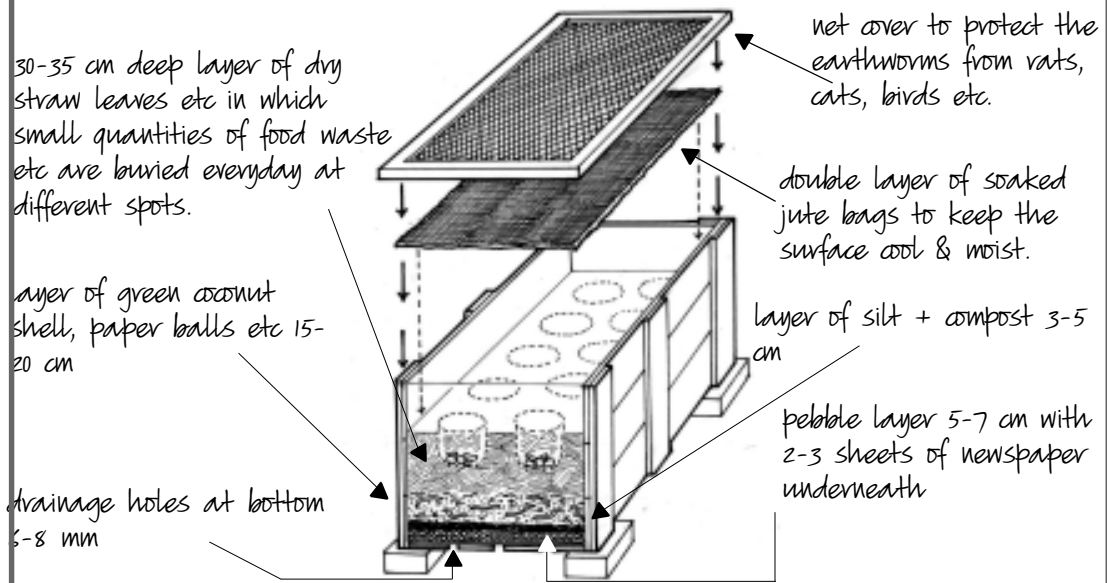
**Maintenance :** Sprinkle some water to keep the jute bag wet & bury the kitchen waste in the straw layer use a different spot everyday, this takes only 5-10 minutes per box.

#### Harvesting the Compost

After six to eight weeks the top layer would be decomposed and will look like brown teadust. When this happens, stop watering for 2-3 days & don't add any new waste. Remove the top layer upto a depth of 12-15 cms, and replace it with fresh layer of straw. Go back to the old routine of adding food & keeping the jute bags wet. After 3-4 cycles the entire straw bedding as well as the paper or cardboard layer has to be replaced and excess earthworms will have to be removed to use as fish or chicken food or to start a new box at your or your neighbour's home.

The harvested vermicompost is excellent plant food, just add a 3-5 cm deep layer on top of your flower pot or vegetable bed & mix it gently into topsoil; if you are transplanting seedlings, add a handful in every hole before planting them.

Happy gardening and cleaner / healthier environment, thanks to the silent workers, Earthworms.



## Feedback

### Step 3 — Activity (A)



This is one kind of activity to study about people's relation with insect.

Focusing on bee, children can learn & survey many aspects related on it.

This lesson plan provides teachers how to guide children for making bee keeping calendar in own area & for learn bees' role in agriculture.



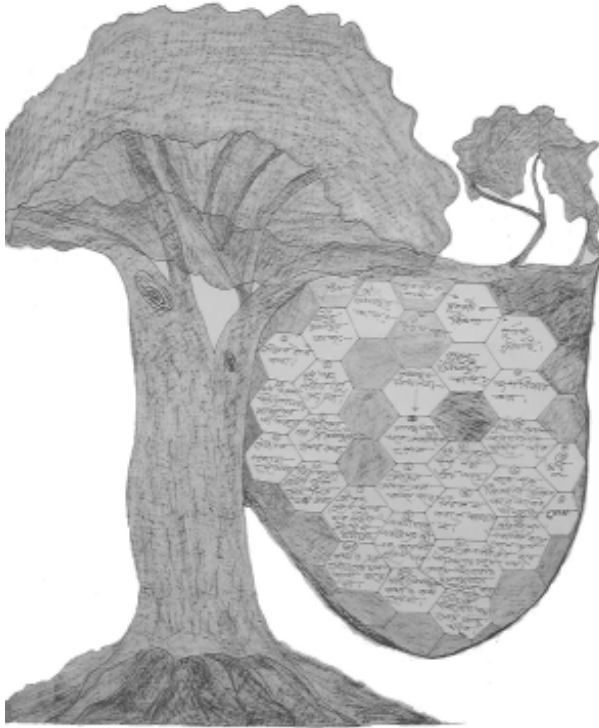
### Feedback Summary

	Swanirvar	Swanirvar
1)Village	Gokulpur	Bajitpur
2)Children's class / number	class V to X 20 students	class V to X 19 students
3)Class / period	8 hours	3 hours
4)Products/Result	The list of question is in page	The list of questions is in page
5) Children's interest	They enjoyed doing the work. Since the subject has a similarity with the text book, the students were excited to do the activity.	The students enjoyed in doing the the work.
6) Teacher's opinion / difficulties	There was no problem in doing the work. The hands on activities were of interest to the children and they had a good understanding of the work.	There was no problem in doing the work.



## Summary Chart

- The chart has been prepared by class V - VIII children (20 children, 2 groups), though information source of this chart is not clear, but the design is attractive.



*Children wrote information in each beehive cells, like bees' life cycle, their behaviour, the different work of female and male bees etc.*



## Feedback from Teachers

- **Questionnaire for Bee Keepers — A questionnaire has been prepared by Sourendranath and his students to collect information from the local bee keepers**

- How many types of bees are there and what are they ?
- What are the activities of the various types of bees ?
- Where do they stay ?
- At what time of the year and in which trees maximum bees are seen ?
- Is the number of bees going up or down ? Why ?
- What is the cost of 1 kg of honey ?
- Is the colour and smell of all types of honey same?
- How many male and female bees are there in a hive ?
- How can female bee be identified ?
- What benefits do we get from bees ?
- Why have you engaged yourself in agriculture ?

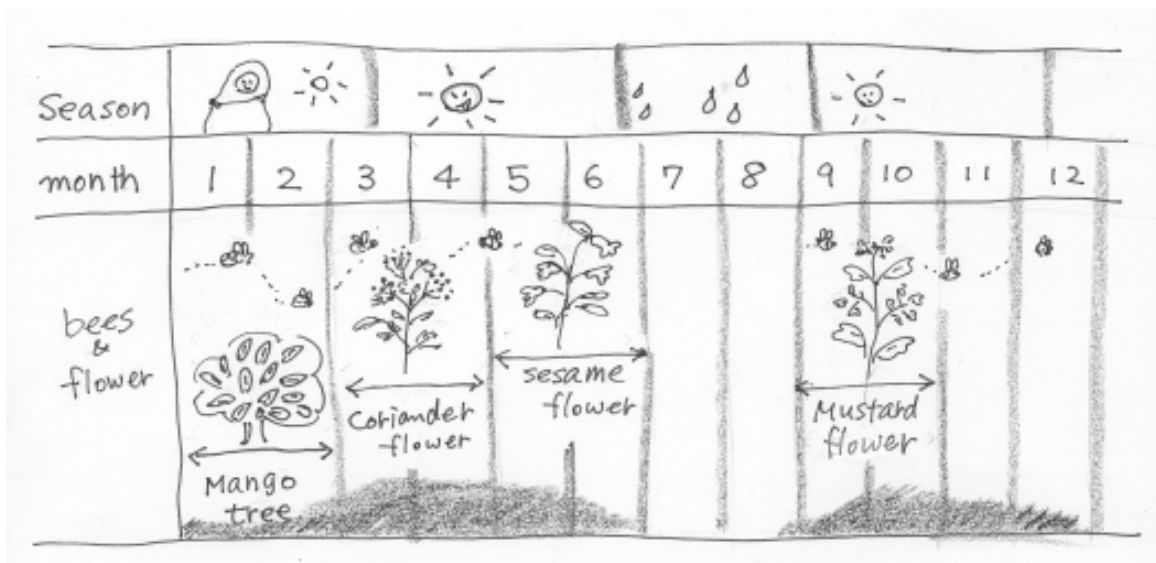


□ **Sourendranath has also explained the results came from children's survey**

- *What is the relationship between bees and flowering / fruiting season ?*  
 1) *The bees make their hive near the blossomed flowers and remain busy to collect honey.*  
 2) *In dioceous flowers bees help in pollination. eg. papaya, bottle gourd etc.*
- *What crops are affected by the no. of bees going down ?*  
*Potato, Sesame, Gourd, pumpkin, papaya etc.*
- *Does any other insects beside bees help in pollination ? What are they ?*  
*Yes. Butterfly, wasp, bhimrul etc.*
- *What role can we play to stop the number of bees going down ?*  
 1) *We have to stop burning the bees alive.* 2) *The sweet food are to be kept covered.*  
 3) *Find alternative to chemical pesticides used in agriculture.* 4) *Increase the practice of rearing bees.*
- *What are the benefits of bee keeping ?*  
 1) *We get honey, wax, larva, pollen grains as the end product of bee keeping.* 2) *Keeping the bee box beside cultivable crops facilitate pollination by bees.*
- *What are the problems of bee keeping ?*  
*Bees can sting which is very painful.*
- *Why most people do not rear bees ?*  
 1) *Stinging by bees,* 2) *No prior experience of bee keeping,* 3) *No prior knowledge of the usefulness of products obtained from bee and bee hive,* 4) *Bee keeping requires lot of attention,* 5) *Information on the time of blooming of flowers has to be kept and the bee box has to be moved accordingly,* 6) *Bee keeping is risk prone due to the large scale of use of insecticides in various plants.*
- *What else beside honey do we get from bee hive ? How do they come to our use ?*  
*Wax, larva, pollengrain. Wax has industrial use. Larva is fed to the fishes. Pollen is used in medicine.*
- *How stinging of bees can be treated ?*  
*Administering the extract of Bish Kanthali & Basil leaf, baking soda, extract of unripe onion etc can be used to treat bee stinging.*

□ From One of Techer's Reports

Bees live in groups. Generally bees are of two varieities, small and big. Hives of big bees are large. In each hive bees are of three types, worker, queen and male or drone. Like humans, bees do not go out to work on rainy days, and sleep off. During favourable climate they forage in groups. This quality is also similar to human. **Bees are seen in great numbers in Mango tree in January-February, in Mustard flower in September-October, in coriander flower in March-April, in sesame flower in May-June etc.** We get honey, larva, pollen etc from honeycombs. Of them honey is used for patients, larva is fed to fishes, wax is used in making candles and pollen is used in medical industry also. Although bees are extremely beneficial we are actively destroying the niche of bees, through burning the hives, using excessive pesticides in Agriculture etc. As a result the crops, like papaya, gourd, pumpkin, bottle gourd in which bees acts as agents for pollination, are tremendously affected. Several other incidents are also surfacing like price of honey has shot up from Rs. 75 to Rs. 100 per kilogram. The plausible alternatives are to stop burning the hives, increasing the flower cultivation, rearing of bees etc. by which the decreasing population of bees can be checked.



Local data of 'Bees and Plants Calendar'



## Children's Work

- ☺ Report of one student is given (**Baby Goldar, class VIII, teacher - Sudip Kumar Mondol, Swanirvar**). She has written her account on bees in question answer style. She has also written some poems on the bee.

### Bees

The nests of the bees are called hive. Bees make hive on the branches of the trees and dilapidated houses. bees are of three types, male bee or drone, queen bee and worker bee. There are many bees in a hive and most of them are worker bees. They roam about in search of forage. Bees give us wax and honey. Bees collect the extract of flowers. They make honey from this through a special process. The other bees feed on this plant extract and pollen, collected by the worker bees. The remaining amount, they store for the future. The worker bees build the nest or hive by wax, which is produced from their body.

### Uses

Honey - It comes to various uses. It is used as a sweetener in place of sugar and molasses. It is used in manufacture of biscuit, sweet meat and sweet bread. Honey is useful for sportspersons and those who engage in physical labour.

Wax - We get wax from hive. It is used in manufacture of cosmetics, nail polish and other materials. Candles are made from wax.

The poison of the sting is used in making various homeopathic medicines. Other painful ailments are treated by this.

1) How many types of bees are seen ?

Ans : Three types of bees are seen.

2) What are the types of bees found in the hive and in what number ?

Ans : Queen bee, Male or Drone bee and Worker bee can be seen.

3) Where does bee make their nest ?

Ans : They nest in tree branches or the crevices in the tree.

4) At what time and what trees does the bees mostly make their nest ?

Ans : Drumstick, mango, banyan are the trees in which the bees mostly nest in winter.



5) When do the bees collect honey ?

Ans : Bees collect honey in the morning.

6) Have the number of bees increased or decreased in the last ten years ? What is the reason ?

Ans : The number of bees have gone down in the last 10 years. The reason behind this is the loss of trees.

7) What do we get from the hive ?

Ans : We get honey, wax and poison of the sting from the hive.

8) What is the present price of honey ?

Ans : The present price of honey is Rs. 100/kg.

9) Does all types of honey have the same colour ?

Ans : No, all types of honey does not have the same colour.

10) Does all types of honey have the same odour ?

Ans : No, the odours are different. It differs according to the types of flowers from where they are collected.

11) Are the bees beneficial or harmful ? How are they harmful or beneficial ?

Ans : Beneficial points :

Honey of bees caoes to various uses. 1) Honey is used in festivals. 2) Honey is used in coughs and cold or in some other ailments. 3) The hive devoid of honey yield wax. 4) Selling of wax can earn living for many. 5) In serious cold, extracts of basil leaves and one teaspoon of honey yield good result.

6) Administering extract of shiuli leaf, kalmegh leaf, basil leaf and bael leaf along with 2 teaspoon of honey two times a day gives good result. 7) Application of extract of Datura leaf, 2 teaspoons and 1 teaspoon of honey on mumps give good result. 8) Various medicines are made from poison of bee.

Harmful points :

1) If the hive is disturbed, by human or any other animal, the bees sting them which is very painful.

12) In which season and when do the bees collect honey ?

Ans ; The bees collect honey in the summer months and that too in the morning.

Honey bee, Honey bee,  
flowers have blossomed in  
the garden  
Come along  
Lets collect the honey  
And come back home  
with fearless mind

Honey bee, Honey bee  
For days on end  
Collect the honey  
Come back home  
And store the honey  
For future to come



## Sharing Ideas

The 'Q & A style' is commonly used in text book on "General Knowledge" subject. Children are forced to memorize just answer part. This is extremely opposite side of our approach.

In our action learning approach the process how these questions come from children is more important rather than the answers.

For example when we read Baby's note book we appreciate she studied a lot about bee. But we want to know more about the information source of those answers, and we want to know about her own experiences. In each her answers the subject of sentence is missing. As a result it is not clear who told so ? who thought so, who felt so ?

For example let's see again Baby's note.

Q1. *How many kind of bee can be seen ?*

Ans: *Three kind of bees.*

It might be wrong the way of set up this question. This is too general. Better question might be **'have you seen before ...?'**

Then automatically answer will be "I have seen - types of bee" and she might add like this. 'But I am not sure one of them are really bee or not. Because 'wasp' looks like 'bee' also.'

OR another question can be set up like "How many kind of bee can be seen **in this area ?**"

To find out this, she might needs to ask farmers, bee keepers in her area. We can expect her answer like "One group (four children) asked 8 farmers in our area. **According to them** there are three types of bees. They are called bee A, bee B, bee C. But **I** can recognize only bee A & B. I haven't seen bee C."

Another example

Q6. *The number of bee have decreased during last 10 years ?*

This is not easy for children to find out the answer. It is clear that children themselves can't answer this type of question. They need to ask many community members. Then they can conclude whether number is decreasing or not. In Baby's 'answer', the subject (who brought this answer & how) is missing.

Q10. *All honey's taste is same or not ?*

To answer this question Baby should be smiling & happy because we assume she was given opportunity to check each different honey by her tongue.

To set up the situation in which children can find out the fact through own experiences ... this is teacher's main role.



## INSECTS & WORMS — Step 3 — Activity (B)

### "Do we really need Pesticides ?"

How come some insects are called "pests" ? Let's learn about use of chemicals in agriculture, especially in pesticides.

[ 🏠 mainly for rural schools 😊 class 6 to 8 🗺️ group work, keeping records, school gardening, site mapping 📖 pest & pesticides (EVS), agricultural products (Social studies), Health, Art ]



### Objectives

- to learn about ecological balance through observing insect's role in agricultural field
- to grow children's awareness towards organic farming and gardening

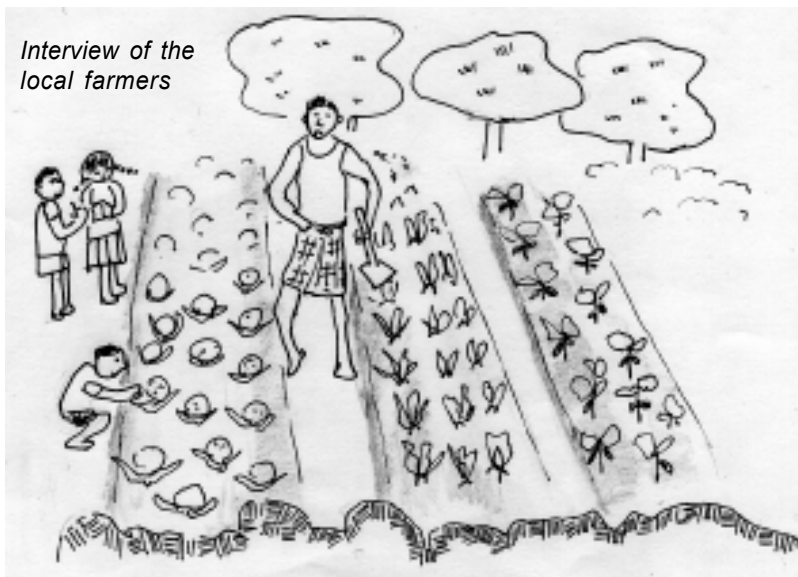


### Key Questions

Discuss the difference between insects and pests with the children. Find out what they think. Since our aim is to learn about pest control in agriculture, we should think of some questions that we would like answered. Make a list of all the points of inquiry in this way:

- What kind of insects can be seen in the agricultural fields (rice fields, vegetable plots, orchards) and gardens?
- Are all the insects there harmful to crops?
- In the case of insects that are harmful, are they so in all seasons? what about in different stages of their growth?
- What kinds of pesticides do farmers use to control insects? which pesticide for which insect?
- Are there any other ways of controlling pest attack?

*Interview of the local farmers*





### Information Collection

Divide the children into groups so that they can each cover different areas like rice fields, vegetable plots, orchards and home gardens.

Each group should develop a questionnaire in preparation before conducting the interview. Each group is to interview at least 3-4 farmers (they should remember to find out the names of the farmers as well!!)





The children can also collect articles on pesticide from newspapers and magazines etc.

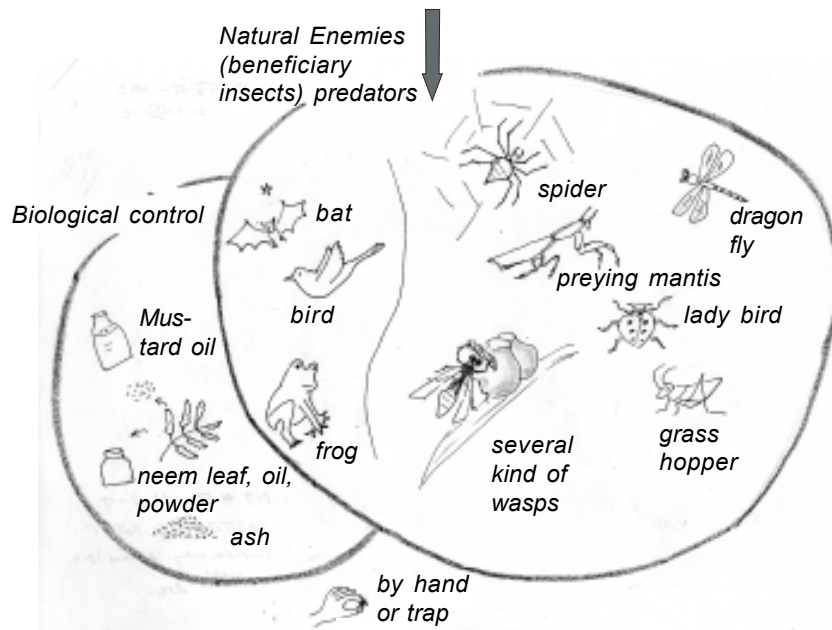
When they visit different fields and farmers while collecting information, the children should try to find out if there are any farmers who do not use any chemicals in their farms. If they are able to identify any, the children can then visit these farmers, interview them and find out their reasons for not using chemicals.



### Summary of Information

Together with the children, you can make a summary chart for the information collected like the one shown below:


	Rice fields (8 farmers)	Vegetable plots (10 farmers)	Orchards (5 farmers)
Insects that can be seen (own observation)			
<b>Pests</b> (which damage crops)		 caterpillar  cut worm   snail  Aphids ( can be seen where tomatoes,cauliflower, cucumber, beans, potatoes, water-melon etc are grown) 	
<b>Natural enemies</b> (insects that control pest population)			
Relationship between pests and crops			
Pesticide use			
Alternative ways to control pest problem			
Comments			



Bring together and share data that has been collected so far. Analyse these according to some of the “key questions” or issues below.

- What kinds of chemical fertilisers and pesticides are used on these crops?
- Has applying these agricultural chemicals been effective in assuring better crop production or not?
- The effect and problems related to chemical pesticides.
- What kinds of trees/plants are able to protect themselves from insect attack?
- Which are the insects, birds, aquatic animals, or even humans, that will be adversely affected by the use of pesticides? Which are the species that will not be affected?
- Did we understand the meaning or grasp the concept of “biological control”, “beneficial insects”, “predators”, “natural enemies”, “organic pest control” and “pesticide resistance”?
- What is a good preventative measure for avoiding pest attack?
- How can we increase the number of “natural enemies” in a garden or an agricultural field?

**Friend of Farmers** (answer for p.40)



**The Potter Wasp**

*The potter wasp lays eggs in each pot and pops in a live caterpillar before sealing the pot. When the baby wasp hatches, its food is ready and waiting! For this reason, the potter wasp is called a “friend of the farmer”*





### Further Activity: Writing a Report

- Based on these points of analysis, ask the children to each to write an individual report. This is a good way to help them assimilate the ideas and digest the issues brought up. It is also good practice for developing logical thinking skills and writing abilities.

It is not advisable to have them write on “big” themes like “Pesticide use in Agriculture”. A better option is something with a more narrowed down theme which will make the focus more clear. For example, they can write on:

- Pest and pesticide use in vegetable plots of our village
- The effect and problem of pesticides
- Natural pesticides for growing rice
- Natural enemies in the vegetable plots etc...

A good report should include:

- Background (why I chose to take up this issue)
- Object (what I want to know)
- Content (how I went about it - survey/observation - using data and illustration)
- Result (what, how, who, when, where)
- Conclusion (what I can say)
- Comment (how I feel, what I think)



- Encourage children to find out the extent of pesticide use in state / India and how pesticides damage environment and human health etc. Suggest children to collect various useful information from newspapers & magazines.

Later children can report what they found out.



- Start school garden with children by organic way.

Encourage children apply & try out all things what they have learnt from their activity to create 'pest-balanced garden'.

This will help for children to raise their awareness & interest on 'organic farming' practice. And both urban & rural school children can try out as a project work.



## Feedback

### Step 3 — Activity (B)



This activity involves many enquiry skills. Children need to prepare the questionnaire for farmers and go to interview for information collection.

They need to write down their interview result and analyse them.

It might be a little bit hard for children, but through this activity children can learn the logical thinking way based on the actual data as well as own observation.

After this activity, if children can get interest about organic farming way which farmer can use natural resources like insect / herb for protecting crops rather than using chemical for killing pest, and if children can find out the agricultural chemical which kill pest (insect) must be harmful also for human beings and other living things because everything is connected in our environment. This activity is successful.



### Feedback Summary

	Swanirvar	Swanirvar	Gandhi Vichar Parishad
1)Village	Gokulpur	Bajitpur	Not mentioned
2)Children's class / number	class V - class X 20 students	class V - class X 19 students	Not mentioned 16 students
3)Class / period	6 periods	5 periods	8 periods
4)Products/Result	Students have prepared a list of 21 questions for interviewing the farmers. The rest of the work is in progress.	Students have prepared a list of 9 questions for interviewing farmers. They also have the report.	There is the list of questions & a summary chart.
5) Children's interest	They enjoyed doing the work.	They enjoyed doing the work.	They enjoyed doing the work since it was new to them and they love to question other people
6) Teacher's opinion / difficulties	No problem was faced to do the work.	No problem was faced to do the work.	No problem was faced.



## Summary Chart

- Gandhi Bichar Parishad has prepared a summary chart of the insects observed in crop field, vegetable garden and flower garden. [It is not clear from the chart as to whether the farmers use chemical fertilisers or not]

*Chart of the Insect Pests*

<i>Place</i> <i>Insects</i>	<b>Rice Field (8 farmers)</b>	<b>Vegetable Garden (10 farmers)</b>	<b>Large Orchard (5 farmers)</b>
Harmful Insects (those who damage crops)	Majra poka Pamri poka	Caterpillar Katui poka Snail Aphid (tomato, cabbage, cucumber, pea, potato, water melon etc are attacked by Aphids)	Katui poka Aphid
Insect Predators (those who control the pest population)	Spider	Grasshopper	Dragonfly
Relationship of insect pest with the crop	Negative	Negative	Negative
Other process controlling the insects	Rearing of beneficial organisms (Toad, bird, spider)	Use of Neem oil, Mustard oil etc	Use of Neem leaf, Tobacco leaf etc.
Comments	It is better to rear beneficial insects rather than use insecticides	Controlling pests in the organic way	To increase the number of friendly insects



## Feedback Report from Teachers

- **Amal Sarkar** has prepared a list of several questions and found the answers with the students to explore the present insect infestation and farmers' idea of use of chemical pesticides.

Q - What insects are normally found in crop fields (rice field, vegetable field) ?

A - Insects seen in rice field

Leaf winer insects, leaf roller insects, majra insect, leaf sucking insect, grasshopper, sakhi poka etc.

Insects seen in vegetable field

Leaf sucking insect, stem sucking insect, caterpillars, yellow bug, mole cricket, grasshopper, snail, spiders, ants etc.

Q - Does all these insects cause damage ?

A - No, all insects do not cause damage, but all insects are killed due to the random use of pesticides.

Q - Do these insects cause damage throughout the year ?

A - The farmers do not have this knowledge.

Q - Do these insects cause damage at every stage of their lifecycle ?

A - No. Specific knowledge is available, but in case of Majra, when the eggs hatch and moth come out, the farmers apply pesticide.

Q - How do the farmers control the insect ?

A - Pesticides in vegetable field — for Brinjal pest they use Sukuin, Metacid, Echlas, Superquilar etc.

In bittergourd they use Metacid.

For others they use Metacid and Jhiodon, Pherodon, Folidovus etc.

Pesticides in Rice field

For Sakhi, leaf roller, leaf miner, sumidon, hildon, jhio etc are used.

N.B. Presently a solution of garlic and kerosine is used by farmers.

For leaf bight, rust disease, Hinosun is used.

N.B. Presently farmers are using the solution of  $KMNO_4$  and Calcium Hydroxide.

Insects can also be controlled by using organic means but farmers express that the main reason for using chemical pesticides is lack of time.

Q - How much experience does the farmer have ?

A - Farmers are engaged in Agriculture for last 25-30 years.

#### □ **Sudip Kumar Mondal**

- According to the interview taken by Sudip and his students, wheat, rice, brinjal, bottle gourd, potato, yam, cabbage, radish etc are cultivated in their area (as their farmers said). The farmers use urea, potash, phosphate, sulphate, sufala, thiodin, sumidon and some other fertilisers and pesticides to protect and enhance crop production.
- The farmers feel that application of chemicals have increased the production.
- At the same time, they feel, that chemicals largely affect water, soil, air and this is cause deaths of birds, animals and human as well. Animals are attacked by unknown disease, fishes are getting killed, to add a few. Unlikely new varieties, more stronger pesticides are evolving, for which environment is getting badly damaged.
- Neem, Basil, Marigold, Wild Plants, Nigej, Bhat are some of the plants found in our locality which have insecticidal and insect repellent properly.
- Long term and random pesticide usage are killing the domestic animals like dogs and cats. Besides the population of beneficial insects the bees, spiders, butterfly and earthworm are severely affected by pesticides.
- The plausible alternative from such disastrous effects are increasing the number of friendly predatory insects, use of organic pest repellents and organic fertilisers.

#### □ **Moloy Chandra Goswami**

##### **Effects of pesticides and its Related Problems**

Harmful insects are eaten up by beneficial insects and they can also be controlled by organic ways (mustard oil, extract of neem, ash, tobacco leaf). Farmers have commented that the crop produce is going down through use of chemical compounds. When asked for alternatives farmers suggested that biocontrol can be the way.

Some farmers have said that, they have small area of land and the part of the produce is sold off and the rest is kept for the family. They believe in taking fresh poison free vegetable rather than contaminated ones.

Children were divided into 4 groups and they questioned the farmers on pesticides, whether they use it or not. If not why they have stopped and what alternatives they use etc.



#### **Children's Work**

We show the records kept by the students of Gandhi Vichar Parishad.

#### ☺ **Haradhan and Gita** (Teacher - Moloy Chandra Goswami, GVP)

Our teacher asked us to request the farmers not to use chemical pesticides. Questions like 'do we have any alternatives to insecticides?' 'what should be our role in that case etc were asked to the farmers. The teacher also asked to request the farmers to compare the amount of crop yield produced by the application of chemical fertilisers and pesticides and cowdung and its related products.

Names of the farmers who have been interviewed are Ashish Shit, Sudhir Shit, Manik Shit, Joyram Karak



## Sharing Ideas

When we do this activity with children one of important thing is teacher should not impose the idea that 'Using Pesticide is bad'.

First children need to listen farmers experience sincerely and record them clearly.

Some farmers might use pesticide without any consideration & some farmers might have some reason for using pesticide though they know the pesticide is not good for peoples health etc.

We need to know the present situation in each local through children's survey.

Teachers role is to guide children to use own observation, to collect information from various sources and to make children think about the relation & effect between insect (pest), pesticide & other living things including human beings.

Then teacher can provide the idea of organic / natural farming for children.  
(see teacher's note too.)



Photo from SAN Project, DRCSC

*Farmer who practices IPM (Integrated Pest Management) checks beneficial insects & harmful insects in his rice field. The water with a few drops of kerosene in his plate does not allow collected insects to fly away.*

*If he finds the number of beneficial insects are much more than the pest, he does not need to apply any chemical/botanical pesticide in his field.*

*We can understand the natural balance of eco-system is the best pest management.*

## Pesticide & Our Environment : Some thoughts and information

### What are Pesticides ?

Any chemical used to kill or control insects, weeds, bacteria, fungi, nematodes, snails, rodents etc are broadly called pesticides (the correct broad term should be 'biocides' - but that perhaps would sound too scary; farmers in India have been tutored to refer to pesticides as 'medicines' not 'poisons').

Pesticides are poisons. They are classified in several ways. One of the classification used worldwide is based on **acute toxicity** of the compound, category 1, 1A, 1B are the most toxic and hazardous chemicals. Another way is to classify pesticides by their **mode of action** eg. contact pesticides, which enter body through skin; stomach pesticides, which enter insect body through their mouth; nerve poisons, which are inhaled etc. Pesticides can also be classified based on **their ingredients**. Some are made from natural minerals, such as limestone, wood ash, copper sulphate etc; some are made from plant materials such as garlic, chillies, basil, neem, jatropha etc. these are called 'botanicals'; the commonly used pesticides by farmers & gardeners are synthetic compounds. These do not occur naturally. DDT, HCH (BHC, Gamaxene), Aldrin, Endrin, Dieldrin, Chlordane, Heptachlor etc are called 'organochlorines'; Malathion, Parathion etc. are called 'organophosphates', another group of pesticides is called 'carbamates'. These synthetic pesticide compounds have caused major health & environmental problems as they do not degrade easily & accumulate in the soil & water, killing beneficiary bacteria, earthworms etc. thereby reducing soil fertility. They kill or cripple fish, frog, crab etc & reduce food supply, especially for the poorer section of community. They keep moving through the food chain, the pesticides in the body of dead insect are passed onto the bird or fish who eat them, and later to humans who eat the eggs or flesh of the chicken, duck, fish

etc. When enough quantity is accumulated in human tissues, they can cause liver damage, cancer, impotency, birth defects etc. The insecticides & herbicides spread on field also remain in crop residue & accumulates in milk of cow, goat, sheep etc. and are passed on to consumers. Studies in India have shown that even newborn babies have pesticides in their tissue passed on by the mother, and whether they drink breast milk or canned milk, they shall start with daily dose of poison. These early doses of poison can cause physical as well as mental disabilities. This is why many countries have banned or severely restricted the use of many pesticides.<sup>1</sup>

### Who are the main users ?

Many of the synthetic pesticides were originally developed for military use. Nerve gases were made into organophosphate pesticides; 2-4-D & 2-4-5-T mixture ('Agent Orange') was used in Vietnam by the US Army to destroy their forests & farms and 2-4-D is being used now in many Asian countries & India as herbicide.

Once the chemicals were available, many of them were used by public health authorities to control mosquitoes, flies, rat etc and many pesticides that have been banned for use in farms are still used by health departments / public health authorities. In India 4400 metric tonnes of pesticide was used for public health & about 100000 MT was used for farm (year 2000).

The major users of pesticides in terms of quantity are farmers. Average application of pesticides per Hectare was estimated at 500 gms/ha in the late nineties, this may seem to be a low figure but not all farmers use pesticide & not all regions use equal quantities. **Cotton** cultivators are the highest users of pesticides (using about 45-50% pesticide for only about 15% of cultivated area) followed by **rice-growers** (using 23-



25%). Fungicides are used in large quantities by potato, tobacco & grape cultivators & vegetable growers; tea-coffee plantations are the largest users of herbicides. Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Maharashtra & Punjab use more than 60% of all synthetic pesticides used in India.

The other major users of pesticides (mainly fumigants) are Food Corporation of India, various companies involved in storage of food grains & vegetables and companies involved in seed trade.

Many 'Pest Control' companies have started business in last 10-12 years & they use large quantities of pesticides. Finally wide range of pesticides is used by urban & rural families to get rid of termites, cockroaches, flies, mosquitoes, rats etc.

In 1948 DDT was first imported and the first pesticide factory in India was established in 1954. In 1954, total quantity of technical grade pesticide used in India was 434MT which rose rapidly to about 75,000 MT in 1989 & 82,000 tonnes by 1991 (in 80's pesticides was applied on 6,000,000 Ha of farmland and in the 90's 125,000,000 Hectares were sprayed with poisons.

### Who manufactures / supplies & profits from the trade in poisons ?

According to a industry report, 350 companies in India were marketing 130 types of pesticides in Indian market by 1989. The market in India, like the markets all over Asia, Africa & South America are dominated by 5-6 multinational corporations (who often keep changing their names & operate through their local subsidiaries) BAYER, SUMITOMO, MONSANTO, HOECHST, CIBA-GEIGY, UNION CARBIDE (changed name after Bhopal disaster, merged with DUPONT) are some of the major players in India. Pesticides business in India is a big one, the current demand is worth about Rs.30 billions.

Many pesticides which have been banned in more than 20 countries for more than 15-20 years are still being manufactured & exported by Indian companies or Indian subsidiaries of global corporations. India, along with Mexico & China manufacture & export 'Persistent Organic Pollutant's such as DDT, BHC etc. our export of such chemicals is about 800,000 kilos / year, according to a Greenpeace report.



## Why do we need to look for alternatives ?

(i) Because pests are developing resistance rapidly. 233 insect pests have become resistant to DDT. 273 weeds have become resistant to herbicides. More than 1000 insect species have become resistant to at least one pesticide. Increased use of chemical pesticide does not necessarily result in lower crop loss. For instance, in the U.S. between 1994 & 1989 crop losses due to insect almost doubled from 6% to 13% despite 10 times increase both in quantity & toxicity of insecticides used. Yield losses to weeds decreased slightly from 14% in 1942 to 12 % in 1989, but this required 100 fold increase in herbicide use. Overall crop losses in the United States, due to insects, diseases, and weeds is still around 37%, about the same level as India, though the U.S farmers use on average about 20 to 30 times biocides than the Indian farmers. **Globally, more than 500 insects, 150 plant disease pathogens & 270 weeds are now resistant to most pesticides.**

(ii) Because predators like spiders, wasps, dragon flies are being killed and secondary pests are often causing more crop loss. Take the case of Indonesia, they became self sufficient in rice by 1984 (Govt. heavily subsidized & promoted fertilizer and pesticides, selling them at 15% ~ 20% of market price). The farmers & scientists were happy about their success, but the euphoria did not last long. A secondary pest Brown Plant Hopper, became a major pest partly as it became resistant and partly because their main predator, spiders, were decimated. Surveys showed that 700% more BPH eggs survived in the sprayed fields. Sounds familiar story; well, India is not so far from Indonesia. What happened next, became a model for many countries. Majority of the pesticides were banned (and unlike our country, the ban was enforced), farmers were trained to recognize pests, predators and other beneficial insects; pesticide use in rice went down by about 70% (since 1987) and the yields increased by about 25%, the idea of

**Integrated Pest Management & Farmer Field Schools** were born and the FAO tried to promote the idea in many other countries, including India. The Problem is that majority of our agricultural officers talk about IPM once or twice a week and distribute free or subsidized fertilizers & pesticides on the remaining four or five days.

(iii) Because bees and other **pollinators are disappearing** and yields of many vegetables and fruits declining , despite increased use of fertilizers

(iv) Because **fishes, crabs, shrimps**, frogs etc are disappearing from rice fields & wetlands of India, severely limiting a free source of valuable protein for the rural poor. Insects eating birds like sparrows, heron, king crow and rat hunting bird like owl, kite etc are also disappearing fast.

(v) Because **health related problems** are increasing. Residues of pesticides are now found in not only surface water but even in underground water which we assume is safe to drink. The amount of DDT & BHC a rural mother in India passes on to her baby everyday while breast feeding, is often 10-12 times the safe level defined by the WHO. Samples of vegetables, eggs, milk, fish, food grains, pulses & oilseeds etc. collected from markets all over India (mainly from city & town markets) have shown that 60 ~ 80% of the samples contain high levels of residues of cancer causing pesticides like HCH, DDT, Monocrotophos, Aldrin, Endosulfan etc. in 25 to 30% of samples pesticide residues were 10 to 40 tonnes above the tolerance limits. These studies were done by reputed Govt. institutions like ICMR, ITRC, DST etc. Worldwide more than 3,000,000 cases of pesticide poisoning are reported every year and about 220,000 deaths are recorded. Developing countries like India, China etc. use 25% of worlds pesticide but 50% of acute poisoning & 73-99% of the fatalities among farmers / applicators occur here

(vi) Because **rules & regulations are not working**. In India officially 24 pesticides and 4 formulations are banned for manufacture, import & use, 3 are banned for use but can be

manufactured for export, use of 7 pesticides are severely restricted, 18 pesticides have been refused registration, use of 40 such as Carbofuran & Endosulfan are under review. In practice, most of these restricted & banned pesticides are easily available in market. Several surveys have shown that 50-60% of the chemicals used by farmers & 80-90% of pesticides used by health authorities are of hazardous type. Ten of the twelve, 'dirty dozen'<sup>1</sup> banned almost world over are still very much in use here. We hope you shall encourage children in your area to become aware of the important pests as well as predators, pollinators & other beneficial insects of the area, and encourage them to document the various cultural practices, physical, botanical & biological control methods that are / can be used as alternative to synthetic pesticides which cause more problem than what they solve.

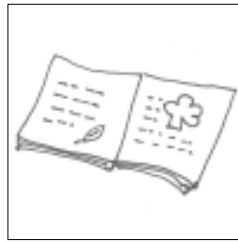
<sup>1</sup> The 'dirty dozen', were selected originally by Pesticide Action Network in 1985 as most Hazardous Chemicals which should be totally eliminated, now the list includes 18 pesticides i.e. Aldicarb, Camphechlor Chlordane, Hptachlor, Chlordimeform, DBCP, DDT, Aldrin, Dieldrin, Endrin, EDB, HCH/BHC, Lindane, Parathion, Pentachlorophenol, 2-4-5-T etc.

FAO : Food & Agricultural Organisation  
WHO : World Health Organisation  
ICMR : Indian Council of Medical Research  
ITRC : Industrial Toxicology Research  
Centre  
DST : Department of Science & Technology

[This note is prepared by Ardhendu  
S. Chatterjee, Director, SAN  
Network, DRCS]



## Resources



*for strenghtening your guiding role*

# PEEP INTO THE AMAZING WORLD OF INSECTS

by Parthib Basu

Insects far outnumber any other animal both, by the number of individuals and by the number of kinds or species. They also occupy the most varied types of places on earth as can be imagined. They are in water, they are in the air and they are of course there in every possible places on the land. They can live below the soil and they are also found at great mountain heights. Our scientists have found them living even in the ever snowy Antarctica! Insects are also one of the most extensively studied group of animal and are still subject of interesting researches; so much so that a whole branch of biology called **Entomology** has developed that deals with biology if insects!

They have been living on this earth for a long 35 crore years. They were also the first to grow wings and take to air long before the birds started to fly. A pre historic dragon fly supposedly had wings 2.5 feet across!

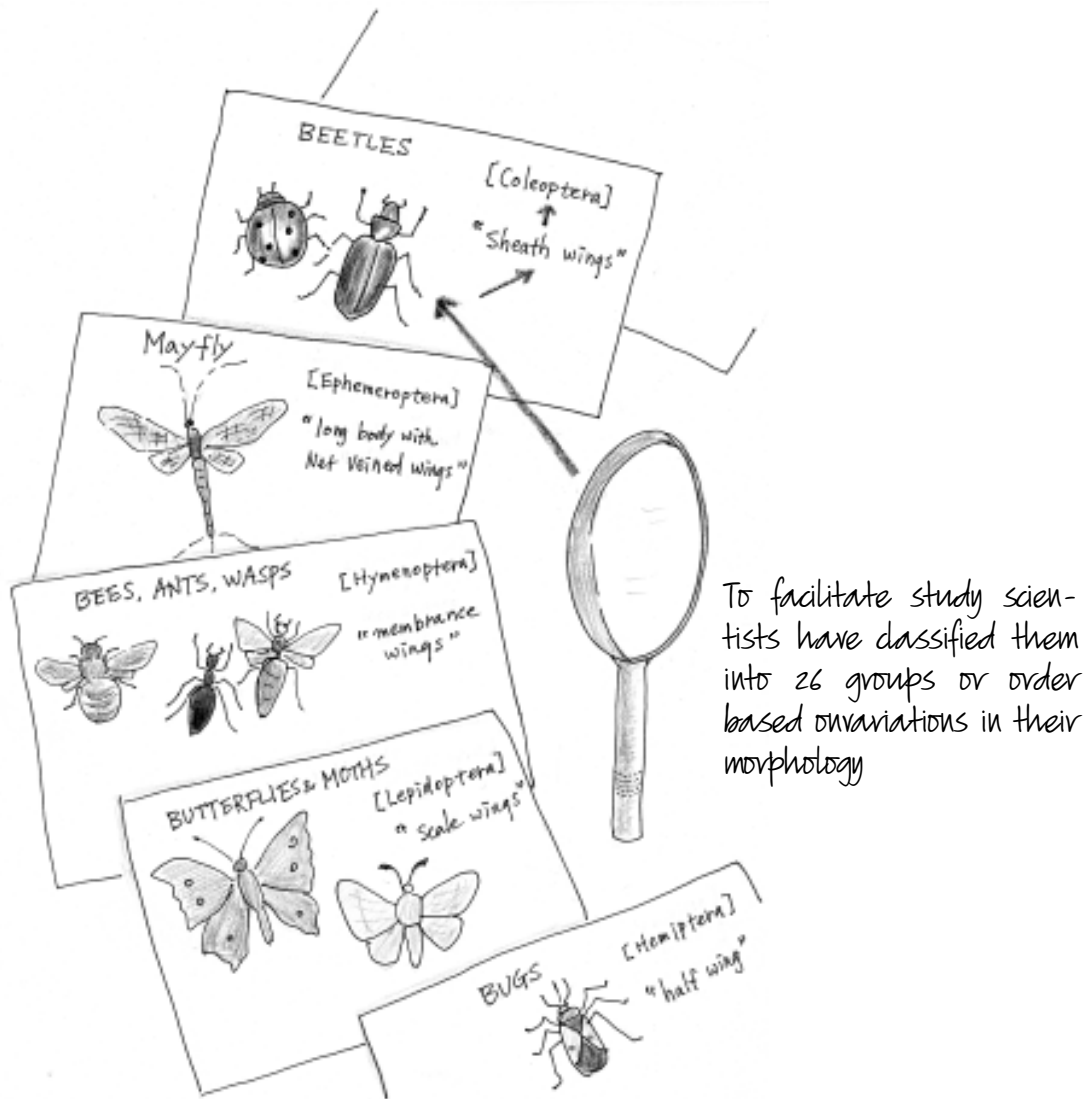
## What Kinds of Animals are these Insects ?

Broadly they belong to a group of animals called Arthropoda that have jointed legs. There are various kinds of Arthropods. Spiders, crabs, millipedes- they all are Arthropods but not insects! Insects are distinct from them. It has just three pairs of legs, a tough covering on their body and barring a few kinds, most have wings.

There are many kinds of insects. To facilitate study scientists have classified them into 26 groups or orders based on variations in their morphology. Two broad classifications have been made depending on whether the insects have wings or not. Under the unwinged group, known as the Apterygota there are 3 sub groups or orders as they are called.

Under the winged group or Pterygota there are 23 orders. Beetles are classified into a group called Coleoptera (their two front wings are modified into thick protective covering) which is also the largest group of insects with over 3,00,000 species; May flies are grouped under order Ephemeroptera (long body with net veined wings and are very short lived); bees, ants, wasps together are a group called Hymenoptera; all butterflies and moths belong to a group called Lepidoptera (wings covered with scales); all the bugs are classified under order Hemiptera (with half elytra or protective covering), Mosquitoes and flies have been grouped under order Diptera (insects with two wings instead of usual four) etc. Any standard book on Entomology would have a guide to the classification and identification of insects.

An insects life is divided into four distinct stages. An adult insect develops gradually from the eggs that the mother insect lays. This phenomenon of the gradual becoming of an adult from the egg is known as Metamorphosis. The egg develops first into a larva. The larva eventually develops a shell around itself and further development continues within this shell- this stage is known as pupa. Finally the adult insect emerges from the pupa. Many insects spend most of their lives as larva and pupa and spends only short period as adult during which they find mates for each other and reproduce.



They eat a large variety of foods. Different insects have developed specialized kinds of mouthparts suiting various food types. Mouthparts of some insects like butterflies are of sucking type, mosquitoes have piercing mouthparts and yet some, like bugs and leafhoppers may have mouthparts suitable for chewing. Mouthparts of some insects may even be suitable for more than one type of function; for example there may be a combination of chewing and sucking as in case of bees, cutting and sucking or piercing and sucking etc.

Plants provide food for most insect groups. Some insects are specialized to live on a single kind of plant while some are more flexible as they live on a variety of plants. Leaf of a plant is the most preferred food. Some insects are again specialized to feed on different parts of the leaf. Some insect larvae even make mines between the upper and the lower skin of the leaf and feed through the tissue.

Some insect groups like the ants, bees, wasps and termites live in societies. These insects are called social insects. Social insects form colonies where a large number of individuals live inside a single nest. The organization of these insect societies is amazing. Different individuals perform different duties inside a colony. A group of individuals performing a specific type of duty belongs to a specific caste. The different castes in a social insect colony are workers, soldiers and the queen. Workers collect food for the colony, feed the young ones, attend to the queen and keep the nest clean. Soldiers guard and protect the colony. But the sole task of the queen is to just lay eggs. The structures of nests of the social insects are also examples of their ingenuity. Bees make hives with exactly symmetrical hexagonal cells, termites make mounds on the soil which extends below the ground as long network of tunnels and chambers, ants also make nests below the ground with complex network tunnels and chambers.

## **Insects and Us**

Insects affect our lives too in a variety of ways.

Some of them are harmful and brings curses to us while there are many who can be extremely beneficial for us. Man has learnt ways to extract benefits from them to reap economic gains.

There are insects that harm our crop fields; and if the damage they make is extensive and brings economic losses for us then they become pests. Termites cause extensive damage to the woods and wooden structures. Book worms are always the enemies to book lovers !

Insects often are carriers of germs of various diseases. Such insects are known as vector insects. For example, mosquitoes are vectors of the parasitic micro organisms that cause malaria. Insects like louse also remain as parasites on human bodies.

On the other hand, there are insects which can be beneficial too. Insects are the most important pollinators of plants. They also are the key pollinators for many of our crop plants. Some insects are predators of the other harmful insects and naturally help keeping the population of harmful insects in the crop fields under check. Termites, by virtue of their ability to make tunnels and chambers below the soil, move enormous amount of soil, thus making the soil fertile. Termite worked soil is generally highly rich with plant nutrients.

We have learnt to extract benefits from the insects also. Bees are reared and kept in special boxes to harvest the honey they gather in their hives. The history of bees keeping is very old and although modern bee keeping boxes are now available, in most countries there are many traditional ways of keeping bees. Two other insects that we rear and keep are the Silk Moths and the Lac insects. The pupae of the silk moths prepare the shell around their body with a secretion from their mouth- the silk. We have developed techniques to extract these silks and make fine threads out of it to make cloths. We have also learnt to extract another useful substance called lac from the lac insects.

Some insects are also used by humans as food. You can find out some examples or you can also try it on your own.

Many kinds of medicines are also prepared from insects.

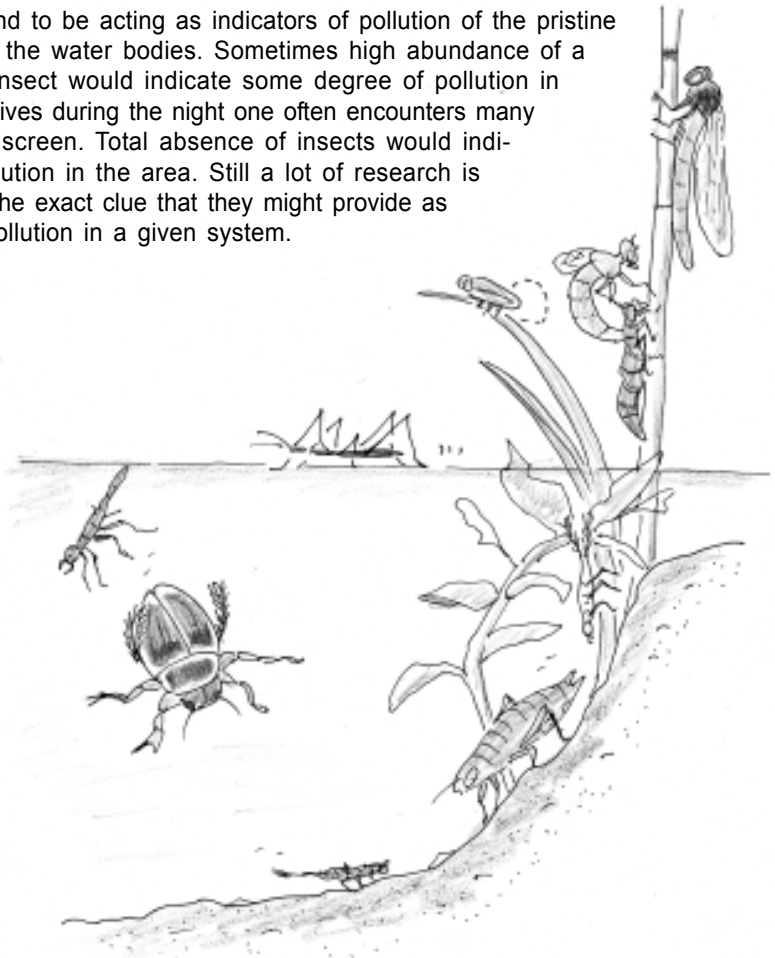
## Insects Maintain Ecological Balance

Insects are one of the important player in maintaining the ecological balances in nature.

- They pollinate plants
- They are important predators for many insects
- They are also the prey for many animals- from other arthropods like spiders and ant lions etc. to birds to the large animals like the Chimpanzees and Ant eaters. Many animals will die of starvation if insects are wiped off from the earth as they cannot eat anything but insects and only insects!!! (As they have so many enemies, insects have also devised many ways to either fool their enemies or to shoo away the enemy by means of chemical defence).
- Many insects are parasitic especially on other insects and thereby keeps the population of many insects under check.
- Some insects assist in recycling organic matter or aerating soil.

Insects have often been found to be acting as indicators of pollution of the pristine natural systems, particularly the water bodies. Sometimes high abundance of a particular group of aquatic insect would indicate some degree of pollution in the water body. When one drives during the night one often encounters many insects dashing on the windscreen. Total absence of insects would indicate some form of toxic pollution in the area. Still a lot of research is being carried out to inspect the exact clue that they might provide as indicators of the nature of pollution in a given system.

*Insects have often been found to be acting as indicators of pollution of the pristine natural systems, particularly the water bodies*





## It is Fun Knowing Them

The above discussion is just a peep into the wonderful world of the insects. It is both fun and a great learning experience if they are observed carefully. A word of caution — insects don't like being meddled (so do you); so

be careful when you observe them. Their stings or bites can be painful. It is better to know them better than to ignore or keep them at a safe distance !!! Life without insects will be impossible !

**Parthiba Basu** teaches ecology at the undergraduate and post graduate level in Ashutosh college, Kolkata. He has been involved in ecological research of various social insects like ants, wasps and termites. His other interests include sustainable natural resource management and restoration ecology. He is associated with a number of groups involved in environment activism and Science Communication.



## References

To develop lesson plans on INSECTS we have looked through the following resources. If you are interested to see these materials, all resources listed here are available through ENRE resource centre EEL (Environment Education Library). EEL also stores topic related articles from several magazines and newsclippings. Please enquire with us.

### Books and Booklets on Insects & Worms :

For your convinient we put some categories.

Category (A) useful for producing materials, (B) useful for teachers & (C) materials for children.

✿ recommended materials for Environmental Education

☆ recommended for school library

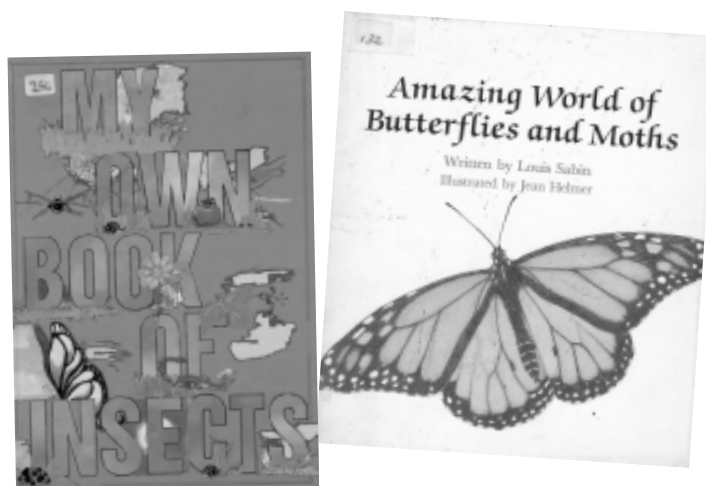
- INSECTS / M.S. Mani, 1971, NBT, 162p. ; (A) ☆
- Hong Kong Pests,the / 1989, Urban Concil Publication, 60p.
- SPIDERS : An introduction / K. Vijayalakshmi et al.,1993, Cre-A, 112p. ; (A) (B) (C) ☆
- My Own Book of Insects / Arthy Muthanna Singh, TATA Donnelly Ltd., 40p; (A)(B)(C) ☆ ✿
- My Big Book of Insects & Reptiles / Ved Prakash, 1993, Dreamland, 48p.; (A)(B)(C) ☆
- 'Getting the Bugs Out of Your Garden' ("Down to Earth: Vegetable Growing –Know How") / Dick Raymond, 1975, Garden Way, 140p. ; (A) (B)
- 'Insects are Animals' ("You Can Do ; Teacher's Edition") / John W.Wick, 1979, Steck Vaughan Company, 96p.; (A)(B)
- Joy of Learning; Standard 3 to 5 ( Activity : 41, 61, 67) / 1995, CEE, 87p. ; (A)(B)
- Joy of Learning; Standard 6 to 8 ( Activity : 7, 15, 31) / 1996, CEE, 67p. ;(A) (B)
- Focus on Life Science / Charles H. Heimler, 1974, Merrill Co. , 534p. ; (A)
- NEEEM – A User's Manual / K. Vijayalakshmi et al., 1995, CIKS 96p. ; (A)
- Pests & Disease / 1997, DK ; (A)
- The Facinating World of SPIDERS, / Maria Angels Julivert, 1992, World Lock 32p. (C)
- Amazing World of Butterflies and Moths / Louis Sabin , 1982, Troll Associate, 32p; (A) (B)(C) ☆ ✿



- Amazing World of Ants / Francene Sabin, 1982, Troll Associate, 32p. ; (A) (B)(C) ☆ ❁
- People's Farming Work Book / David Philip, 1995, Environment & Development Agency Trust, 250p. ; (A)
- 'How do Bees make Honey ?' ("Life On Earth") / Calayboure Anna, 1995, USBONE, 128p. (A)(B)(C) ☆ ❁
- I Wonder How Spiders Spin Webs / Amand O' Neill, 1995, Kingfisher, 32p. (A)(B)(C) ☆ ❁
- Earth User's Guide Book to Permaculture/ Rosemary Morrow, 1993, Kangaroo Press, 152p.; (A)
- 'Earthworms' (" Free from School ") / Rahul Alvares, 1999, Other India Press, 111p. (A)(B)(C), ☆ ❁
- Book 6- Living Resouruces ' Inssect Watch' / The School Environment Network, 1993, 20p.; (A)(B) ❁
- Fact Sheet – ANT / CEE, 8p.; (A)(B)(C) ☆ ❁
- Poster – INTRODUCING INSECTS / CEE ; (A)(B)(C) ☆ ❁
- BIG BUG FUN / Joanne Oppehein , 2000, Scholastic ;(C) ☆ ❁
- Insect Life / 1984, Scholastic (A) (B) (C) ☆ ❁
- The Wonderful World of Insects / Harrinder D. Mothar, 1996, NBT, 40p. (A)(B)(C) ☆ ❁
- Simon & Schuster's Guide to Insects / 512p. (A)(B)(C) ❁
- Living soil –Home garden series No.5/J.Ironside & A.S. Chatterjee,2000,TRC,42p. (A)
- Eyewitness Guides : INSECT / DK, 63p; (A)(B)(C) ☆ ❁
- Science is ... / Susan V. Bosak, Scholastic, 1991, 515p; (A)(B) ❁

### Bengali Books

- Phashaler Bandhu Poka / DRCSC, 19p (A)(B)
- Basatbari Gudam O Phashaler Samannita Balai Byabasthapanana / 1997 (A)(B)
- Bipajjanak Kitnashak O Tar Bikalpa / DRCSC, 1994, 28p (A)(B)
- 'Saksabji Phalano' ("Amar Bandhu - Kajer Pata) / CCRC-Sahai, 1993 (A)(B)



## Interesting Lesson Plans on Insects

You can find out a lot of Web sites on Environmental Education and related activities. The following are the examples of some useful lesson plans. You can directly access to each web site or contact us for the detail.

Lesson plan	Level	Source	Web site
A Project on Ants	lower primary	Project-approach	<a href="http://www.project-approach.com">www.project-approach.com</a>
Bugs and Butterflies	primary	Kidsdomain	<a href="http://www.kidsdomain.com">www.kidsdomain.com</a>
Insect Book Comprehension Activity	lower primary	Teachers Net	<a href="http://www.teachers.net">www.teachers.net</a>
Where do butterflies come from?	lower primary	Cool science	<a href="http://www.hhmi.org/coolscience">www.hhmi.org/coolscience</a>
Children's Butterfly Site	primary	USGS	<a href="http://www.mesc.usgs.gov">www.mesc.usgs.gov</a>
The Life in Your Garden	primary	coglife	<a href="http://www.pcug.org">www.pcug.org</a>
Very Cool Bugs	class 5-8	insects	<a href="http://www.insects.org">www.insects.org</a>
Entomology for beginners	class 5-8	bijilmaker	<a href="http://www.bos.nl">www.bos.nl</a>
The Butterfly and Moth Life Cycle	primary	USGS	<a href="http://www.mesc.usgs.gov">www.mesc.usgs.gov</a>
..of Bees , Beekeepers, and Food	class 5-8	queenbjan	<a href="http://users.sol.com:80/queenbjan">http://users.sol.com:80/queenbjan</a>
Nutritious Value of Various Insects per 100 grams	class 5-8	iastate	<a href="http://www.ent.iastate.edu">www.ent.iastate.edu</a>
Amazing Insects : An Insects Project	primary	globland	<a href="http://www.minnetonka.k12.mn.us">www.minnetonka.k12.mn.us</a>
Lesson Plan on Bee	primary	DRCSC	(paper in EEL )
Protecting Plants from Pests and Disease	for teachers	DRCSC	(paper in EEL )
Welcome to the Dragonfly Web Pages	class 5-8	miavx1	<a href="http://miavx1.muohio.edu">miavx1.muohio.edu</a>
Bee Study Lesson Plan	class 5-8	'Skipping Stones' vol.14no.2 ,p.35	
Getting Worms to Work for you	class 5-8	'OUTREACH soil series, Improving & Maintaining Tropical Soil Fertility'	(paper in EEL)
The Living Soil for you		'OUTREACH soil series, Understanding Soils'	(paper in EEL)

## Books and References on Environmental Education & creative lesson plans (Concept, Ideas & Theory) :

- Chapter / Book "What is Environmental Education' ("Environmental Education in Schools") / Judy A. Braus / 1993, Peace Corps / p.p.5-14 (A) (B)
- Booklet "The Green Reader – An introduction to Environmental concern and Issues" / Meena Raghunathan / 1999, CEE / 204p/ (A) (B) ✿
- Booklet "Environmental Orientation to school Education : A Programme of Ministry of Human Resource Development – Some experience and learning"/Meena Raghunathan / 1999, CEE / 92p/ (A)
- Handbook "Green Minds : A Reference Handbook for Environment Educators in Kalimpong" / Yusuf Simick / Ashok Trust or Research in Ecology and the Environment ( ATREE) (A) (B) ✿
- Picturebook " PACHAMAMA : Our Earth Our Future – by young people of the world " UNEP/1999, Evans / 95p. (A) (B) (C) P
- Book "Environmental Education An Approach to Sustainable Development " OECD/ 1992 (A)
- Guidebook " Idea's Environment Action Program , Issues, Approach, and Initiatives towards Sustainability " CEE 1995 (A) (B)
- Guidebook " The Green Club : A Guide to Setting Up and Running Clubs for the Environment" / CEE 1999 / 78p (A) (B) ✿
- Guidebook " The Green Action guide : A Manual for Planning and Managing Environmental Improvement Projects " CEE, 1997 / 92p. (A) (B) ✿
- Guidebook " A Guide to Green Material ; Experience and Learning in Developing Effective Environmental Education Materials " CEE, 1999 / 66p. (A) ✿
- Report " Environment & Development : Traditions, Concerns and Efforts in India" (National Report to UNCED, June 1992 / Ministry of Environment and Forest – govt of India / 63p. (A)
- Handbook "Ecology : Principles and Applications " J.L. chapman et al, 2000, Cambridge University / 330p. (A)
- Handbook "Earth Education : a New Beginning " Steve Van Math, 1999 / 334p. (A)
- Curriculum guide "Connections , Cycles, and Cities ' ( " Living Lightly on the Planet – volum 1, Grades 7-9 – Unit 4 " Haura O'cinnor, 1985, Schillits Audubon Center / p/p/ 76-98 (A) (B)
- Book 'Curriculum Planning' ( " A Children's Food Forest " Carolyn Nuttall, 1996, FeFI Books / p.p 53-72 (A) (B) ✿
- Booklet "Toward a Green Future : A Trainer's Manual on Education for Sustainable Development " CEE, 1999 / 111p. (A) (B) ✿
- Handbook "Treasured Islands! An Environment Handbook for Teachers in Andaman & Nicobar Island " Sunita Rao, 1996, Kalpavrksh Anet / 94p. (A) (B) ✿
- Handbook "Our Ecological Footprint; think of Your City as an Ecosystem " CSE, 2000 / 61p. (A) (B) ✿ ✿
- Handbook "Basic Instructor Orientation Scheme " WWF / 100p. (A) (B)
- Internet paper "Classroom as Learning Laboratories" & "Core Practices" / foxfire.org / 3p.
- Book " Science is ..." / Susan V. Bosak / Scholastic, 1991 / 515p. (A) (B) ✿ □



## ENRE Partner Organisations' Contact Address

- **Swanirvar**

(contact person : Mr. Samir Biswas)  
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- **Ashurali Gram Unnayan Parishad**

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South 24 Parganas - 743504  
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- **Kajla Janakalyan Samity**

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Midnapur - 721427  
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- **Gandhi Vichar Parishad**

(contact person : Mr. Kalyan Roy)  
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Bankura - 722101  
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- **Vikramshila Education Resource Centre**

(contact person : Mr. Atanu Sain)  
77 Maharaja Tagore Road  
Dhakuria, Kolkata - 700031  
West Bengal





## From ENRE

□ Forthcoming issue of 'Creative lesson plan -Basbhumii series' are

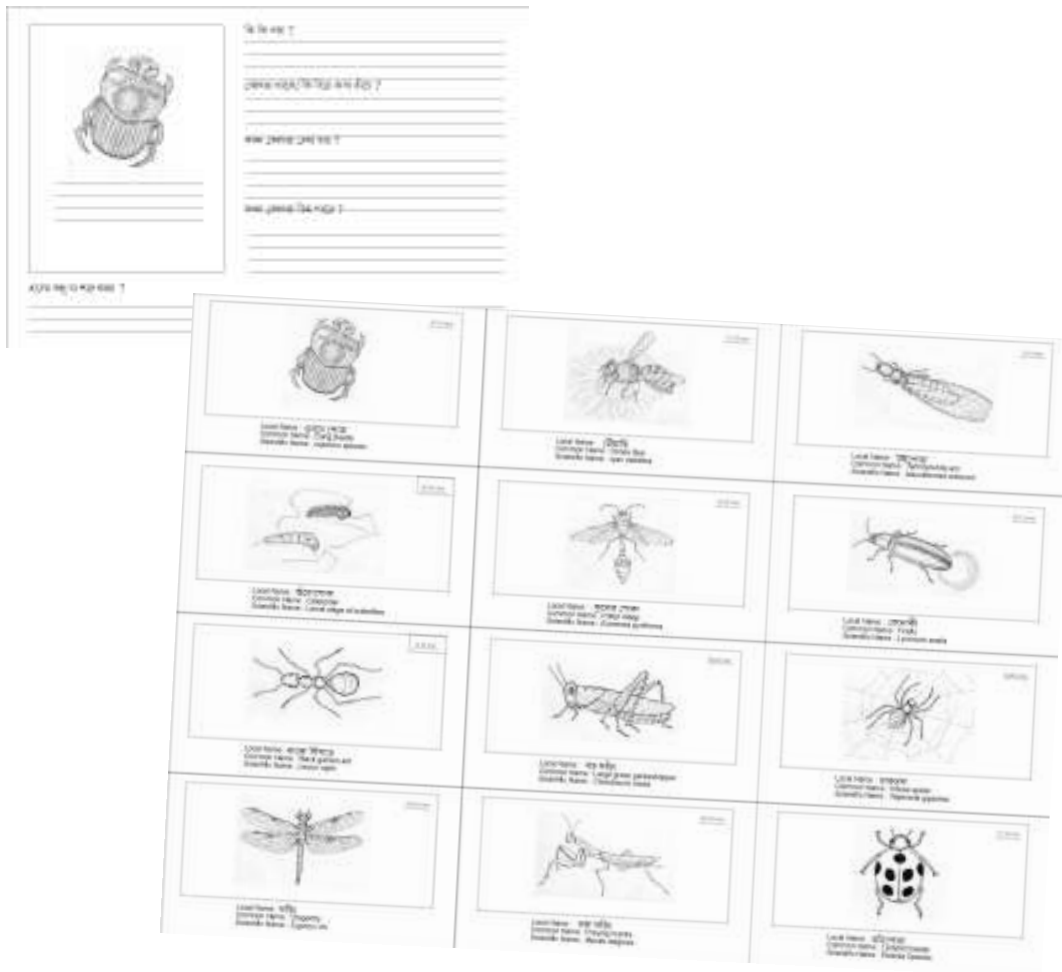
3) Water, 4) Medicinal Plants, 5) Birds, 6) Energy (Fuel), 7) Fish, 8) Rice culture, 9) Waste, 10) Vegetables, 11) Local market, 12) Community development work / NGO work

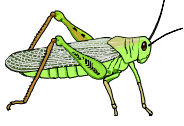
**Please send back the 'feedback slip' alongwith your comment and suggestion on this booklet 'Insect & Worms' to us. We will put your name on our mailing list and send you a free copy of the next booklet on 'Water' for your reference!**

□ Self learning materials

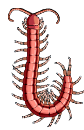
'Data cards & worksheet on Insects'

1 set (2 worksheets & 15 cards with 'How to use' note, Rs. 15)





# Memo Page





## Feedback Slip

Insects & Worms

If you would like to be included on 'Basbhum Series' mailing list and receive forthcoming Creative Lesson Plans booklet then please fill up this slip and return it, in the envelope address to :

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- You are going to use this Creative Lesson Plan booklet

as a  teacher  educator  community workers  
 parents  others

- In relation with your work & interest, you find out this booklet is

useful  not so useful  unsatisfied

because \_\_\_\_\_

- Are you going to apply lesson plans in booklet in your teaching work or in some other way

Yes, I'll try all steps  some part of lesson plan  no

because \_\_\_\_\_



- Among the topics of forthcoming booklets which topic are you interested in ?  
(Put ✓ in  as many as you want)

- 1. Tree     2. Insect     3. Water     4. Medicinal plants     5. Bird
- 6. Energy     7. Fish     8. Rice     9. Waste     10. Vegetables
- 9. Local Economy     Community Development

- Your contribution, if possible

- Exchange EE materials / booklet
- Exchange periodicals / newsletters of your organisation
- Others (donation, volunteer, sending your own lesson plans etc)

- Your comments / suggestions

- Do you want to place order 'Bashbhumi Series no. 1 - Creative Lesson plans on TREES'?  
(10% discount offered for more than 10 copies ordered)

Yes                      \_\_\_\_\_ Copies                       No

Date \_\_\_\_\_

\_\_\_\_\_  
Signature