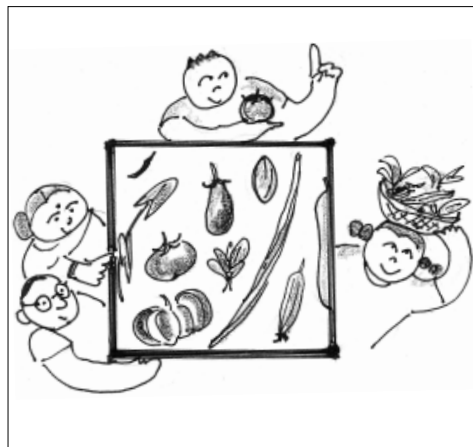


Creative Lesson Plan on

Vegetables



for teachers, educators and community workers

ENRE
(Ecology and Natural Resource Education project)
Development Research Communication & Services Centre

'Creative lesson plan on Vegetables' (Selections from 'Basbhumi' : booklet - 8)

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
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Contents

	PAGE	
Dear Teachers, educators, community workers and parents	4	
How a Lesson Plan can be 'Creative'	5	
Mind Map 'Garden Based Project'	6	
Overall goal and Activity steps	8	
We got Feedback from...	10	
Lesson plans and their feedback (Step 1) — Preparatory Work		
Activity (A) 'About Vegetables which Children Eat'	12	
Activity (B) 'Vegetables in Our Home Garden & Vegetables in Market'	20	
Review and Make Sure (Step 2)		
Vegetables & Season	26	
Vegetables & Nutrition	31	
How Safe are the Vegetables We Eat	34	
Lesson plans and their feedback (Step 3) – Investigation / Project Work		
Activity (A) 'Vegetable Market Survey Throughout the Year'	38	
Activity (B) 'Let's Grow Vegetables in School Garden'	49	
Resources		
Expert's view point :		
Growing Vegetables and Fruits can be Enjoyable and Educational	74	
Case Studies	78	
Summary Information of Vegetables Appeared in this Booklet	82	
Eco Gardening Techniques	84	
Books and other Interesting Lesson Plans	94	
ENRE Partner Organisations' address	99	
Back Issues of ENRE booklet	100	
Your Feedback Slip	101	

Dear Teachers, educators, community workers, and parents —

There are so many possible activities and lesson plans in relation with 'Vegetables'. Children can learn about plant science , nutrition, food map, centre of origin of vegetables, garden skills and so on.

Based on the experience of ENRE network members, this booklet focuses on 'Garden Based Learning' approach and helping children to get practical skills of growing vegetables organically. In school, community, and home, we hope this booklet helps you to nurture future producers and consumers who will be more conscious and caring about environment and safe food.

Let's try 'Garden Based Learning' approach —

As you can see the page 6-7 'Gardening project' can cultivate many aspects. This is the core concept of 'Garden based learning' (meaning the use of gardens as laboratories for practical learning of basic subjects such as biology, environment, mathematics, chemistry, language, art etc).

This has been quite a popular in the North where the gardening activity is used mainly for learning purpose. On the other hand, as FAO suggests, in the South the main objective has rather been 'School based food production' which has been proved unsuccessful to sustain. Therefore it is said that 'the new challenge for school gardens is to help students learn about food production, nutrition and environment education and personal and social development related with basic academic skills (reading, writing, arithmetic) while generating some food and income for school' ('School Garden Concept Note' / FAO, 2004).

You can see concrete examples in this booklet so you can easily adapt these ideas with your children. Most important thing is the various activities of 'Garden Based Learning' are enjoyable both for children and you as teachers / facilitators / parents, you too will agree, we hope.

How a Lesson Plan can be 'Creative' —

We think that good lesson plans should provide the opportunity of discovering and searching out the fact by the children themselves. Children can choose their own learning process and context. The teachers need to facilitate it only, rather than imposing an uniform style. The reason we call this 'creative' is because this kind of lesson plan can not only enhance the children's knowledge but also widen their 'perception'. Perception meaning How children look around their world ... this is an important goal for children as learners and future citizens.

Creative Lesson Plans should have the following aspects

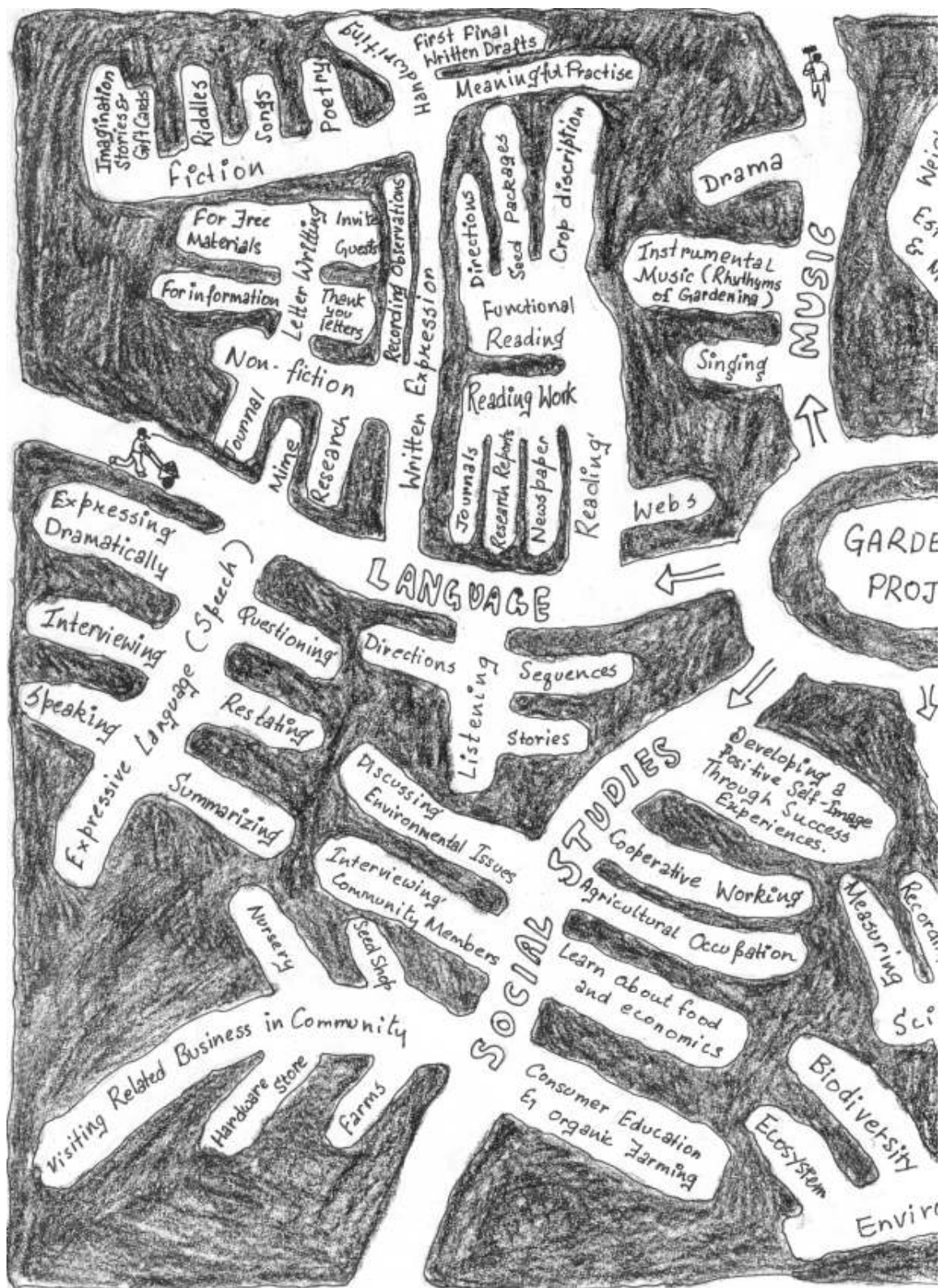
- ✓ **Starting from what children already know and what children have experienced / felt.**
These help to create and enhance children's interest about the topic.
- ✓ **Having the overall goal related to 'Social / Environmental Issue' and 'Scientific attitude'.**
Setting up these goals help to be aware that they can also do something to improve their environment and solve some of the social problems.
- ✓ **Children can have fun and enjoy the moments of discovery in their learning process.**
- ✓ **Activity should link classroom and community.** This is essential for Environmental Education, as we need more and more people's initiatives for better environment.
- ✓ **Using active and group based learning methods** by encouraging children's involvements.
- ✓ **Using local materials and examples for activities.** You can also make the activities low cost and eco-friendly by using waste materials.

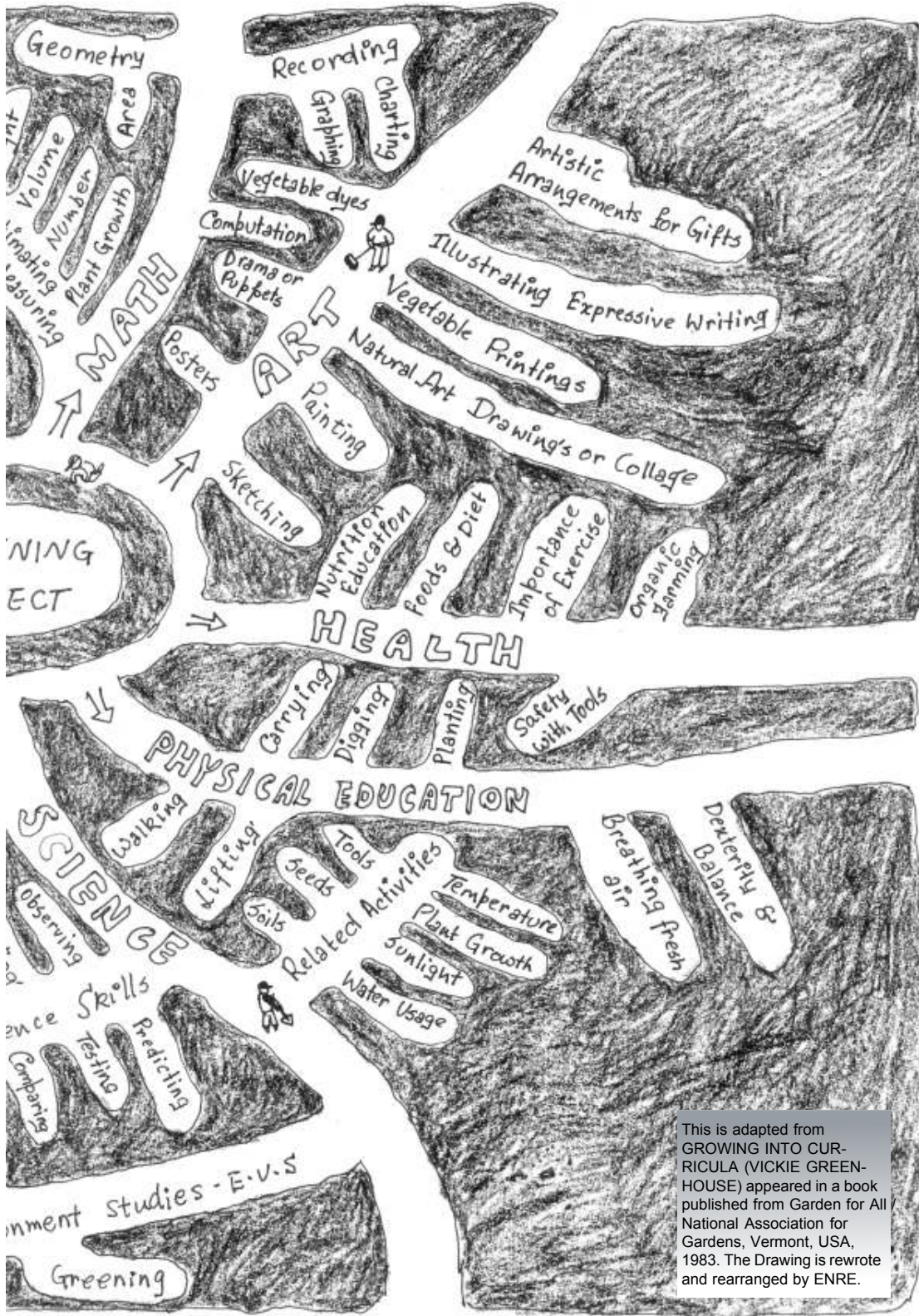


*asking good questions
is much more important
than seeking answers*



*'Link the classroom
and community'*





This is adapted from GROWING INTO CURRICULA (VICKIE GREENHOUSE) appeared in a book published from Garden for All / National Association for Gardens, Vermont, USA, 1983. The Drawing is rewrote and rearranged by ENRE.



Vegetables

■ Overall goal

Through a series of activities, children will be able to familiar with vegetables which they eat daily and will be able to recognize the suitable vegetables for home/school garden. To understand the concept of School /Home garden involving various ecological agriculture technique can be important task for both teachers and children. Also encouraging children to be 'Food producers' through gardening is main goal of this step- wise activities. If children enjoy various learning process relating garden work and if you can see the children to be proud of growing vegetables by their own hands, your activity would be successful.

■ Activity Steps



Step 1 Preparatory work

to build children's interest and to know what children already know. Children collect information / data through own observation and inquiry to family members & local community members.

Activity (A) 'About Vegetables which Children Eat'

✎ keeping record, listing, ranking
categorizing, graphing

Activity (B) 'Vegetables in our Home Garden & Vegetables in Market'

✎ keeping record, listing, ranking
categorizing, making profile, newsclippings

Step 2 Review & Make Sure

to make platform for further activities, organise a discussion with children to summarize & review preparatory work. Discuss about missing information and make sure that Children have →

■ Changes Expected

- Well designed and productive School & Home gardens shall become increasingly common in the rural areas.
- Children and community people will become more aware of the importance of eating organically grown vegetables and also the value of many self growing plants (weeds).
- The need to include fresh and seasonal vegetables and fruits in their daily diet will become clear to children & their parents / family members.



Step 3 Investigation/Project Work

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



Activity (A) 'Vegetable Market Survey Throughout the Year'

👉 information collection, interviewing, mapping, flow chart, gardening skill, group work

Activity (B) 'Let's Grow Vegetables in School Garden'

👉 observation, group work, cooperation, gardening keeping record, Math (Area measurement, average)

➔ learnt necessary points for the next step. Encourage childrens to raise further question and to take initiative towards finding solutions.

Concepts and techniques which you can develop in activities

Keywords	Step 1		Step 2	Step 3	
	(A)	(B)	(Make Sure)	(A)	(B)
Category of Vegetables	✓	✓		✓	✓
Plant science relating vegetables (Germination, Flower structure, Pollination)					✓
Vegetable & Nutrition			✓		
School Garden Concept & Design					✓
Seed Saving					✓
Harvest & Cultivation Calendar			✓		✓
Organic Vegetables			✓	✓	✓
Ecological agriculture skill (various garden skills for growing vegetable organically)					✓

We got feedback from different Organisations —

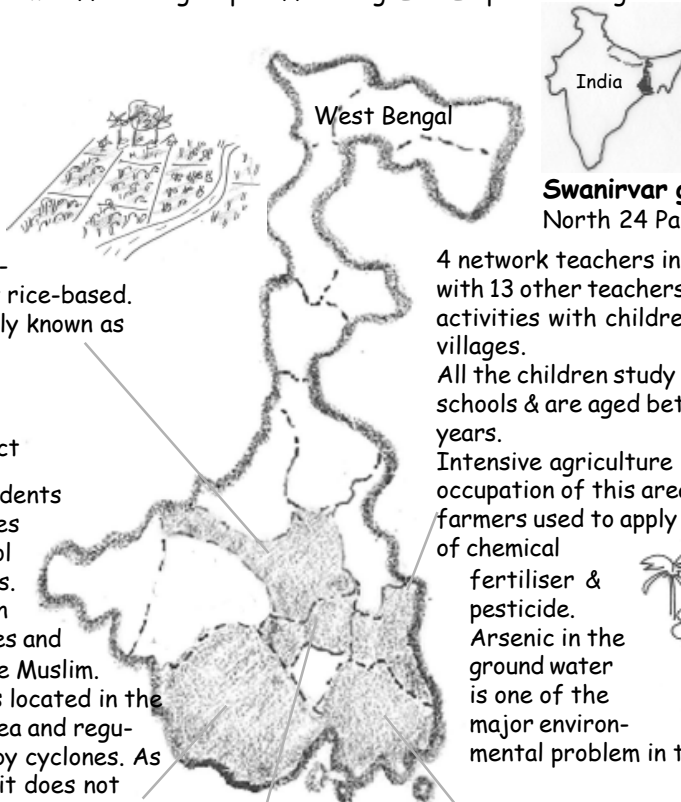
All the lesson plans included in this booklet were developed by ENRE team and tried out (and sometimes modified) by the teachers and children's groups of ENRE network. The teachers had tried out each activity with their students (targeted class 4-9) in their class or as extra curricular. You can see the survey results and children's work examples after each lesson plan. We hope these feedbacks help to create your motivation to conduct each activities and reflect them in your way.

We got feedback from different groups affiliating ENRE partner organizations.

Vikramshila group

Bardhaman district

2 teachers are involved in conducting various activities. This district is located in a gangetic alluvial plane. Agricultural system is mainly rice-based. This region is popularly known as 'Rice belt of Bengal'.



Swanirvar group

North 24 Parganas 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.



Kajla group

East 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.

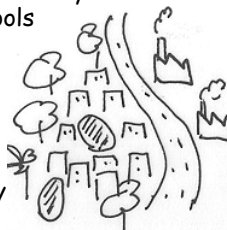


Agriculture, Small scale industries (handicraft) and fisheries are the main sources of livelihood in this area.

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 seen like in other towns in this district. Many commuters go to Calcutta everyday by train from here.



Phulbari Grameen Bikash

Kendra group

South 24 Parganas district

2 teachers conducted activity with 2 group of 20 children in three villages. This island has mainly agricultural land but industrial estate is also located nearby. This is a holy place for Hindu worshippers.



Step - 1
Preparatory Work



for growing children's interest

 **Lesson Plans**

 **Feedbacks**



Vegetables

Step 1 — Preparatory Work — Activity (A)

'About Vegetables Which Children Eat'

What kind of vegetables do children eat at home ? From where do those vegetables come ? Encourage children to know more about vegetable which they eat.

[🏠 for both rural & urban schools 😊 class 5 to 7 ✍️ keeping record, listing, ranking, 📖 average calculation (Math), categorizing, making profile, art (drawing) 🕒 2-3 periods (1.5 hours per period) & home work]



Objectives

- To create children's interest on vegetable through their daily food habit.
- To know about the present situation of children's diet in relation with vegetable.
- To be able to categorize vegetable by scientific points according growing place, plant's character, and its nutrition value etc.



Success Indication for Proceeding to the Next Step

- ➔ Children want to check vegetables which they eat in another **season**.

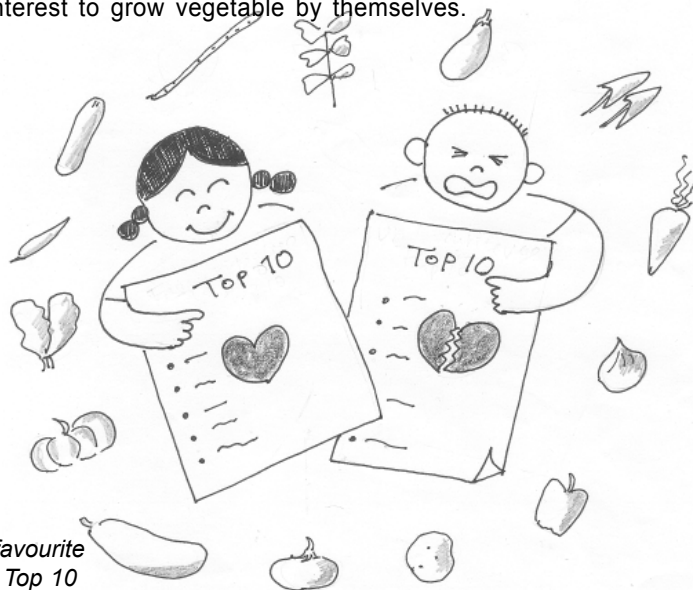
[For example, Season can be divided broadly :

Cool and dry season : October to February

Hot and dry season : March to Jun

Rainy season : July to September] see pg. 27 also

- ➔ Children show their interest to grow vegetable by themselves.



Favourite & unfavourite vegetables — Top 10

Activity



Creating Interest and Motivation

- ➔ Ask the children to name three vegetables which they like most & three vegetables which they don't like.
- ➔ Make the result into a chart / graph 'Our favourite and unfavourite vegetables - Top 10'



Collecting Information (through children's experience)

- Ask children to keep record for one - two weeks what vegetables (including edible weeds, herbs and tree leaves / flowers) they would eat.
- Children are asked to write for each day :
 - name of vegetables
 - from where it comes (purchased from market ? picked up from own garden / field ? collected from surroundings as wild plants ?)
- How it was cooked
- Whether they liked it or not

[Example of children's record note]

Date	Meal	Vegetable name	Source (from where)	Cooking way	Liked or Not ✓ Δ ✕
3.11.01	Morning	Yardlong bean	G	fry	✓
		Garlic	M		
		Cucumber	M	Salad	✓
	Lunch	Potato	M	'Chochchori'	Δ
		Pumpkin	M		
		Ceylon spinach	G		
		Green chilli	G		
		Bittergourd	M		fry
	Night	Brinjal	M	fry	Δ
		Neem leaf	C		
Potato		M	'Ghugni'	✓	
Tomato	M				
Onion	M				
4.11.01					

M - Market, G - Garden, C - Collected; ✓ - Liked, Δ - So So, ✕ - Didn't like
'chochchori' or 'ghugni' are Bengali dishes' name



Summarizing Information

Individual Work

After finish the recording, each children are asked to find out the following points from their own record.

- How many kind of vegetable did he / she eat each day ? (sub total of each day)
- How many kind of vegetables did he / she eat per day ? (average)
- List all the vegetables that appeared in the record.
- Divide those listed vegetables according to source (purchased from market, grown in own garden, field & collected from nature).

Class / Group Work

Based on each individual data, try to find out whole class summary.

- & b) → A) On an average how many kinds of vegetables do children eat per day?
- B) Find out the ranking of all vegetables which children ate during the record period.
- C) Categorize those vegetables according to source (from where the vegetable came) and find out which vegetables were growing in the gardens and which vegetables were purchased from market and which vegetables were collected from surrounding.

[example Summary Chart]

Source of Vegetables which we Ate during 3-19 November'01 (20 children)		
Purchased from Market	Harvested from Garden / Field	Collected from Nature
1. Potato [18]	1. Ceylon Spinach [12]	1. Thankuni [18]
2. Onion [17]	2. Pumpkin [8]	2. Neem Leaf [15]
3. Ginger [16]	3. Chilli [7]	3. Hinche [14]
4. Amaranth [12] [] []
5. Ladies Finger [11] [] []
.		
.		
.		
10. Pumpkin [5]		












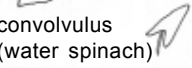

























ranking

The number of children

Step 1 – Activity (A)

- See the result and discuss with children about the various parts of plant are eaten as vegetable.
- Ask the children to make cards drawing the vegetables appeared in the List. Then categorise those cards according to 'plant parts' (Leafy vegetables, fruit vegetables, root vegetables, beans & legumes and herbs, medicinal plants, tree leaves etc and make a chart with drawing).

Category of Vegetables

Roots & Tubers	Leafy vegetables	Fruit vegetables	Beans & Legumes	Herbs & Spices
 carrot  casava  radish  sweet potato  taro  elephant foot  coco yam	 amaranth  ceylon spinach  jute leaf  pumpkin leaf  convolvulus (water spinach)  sweet potato leaf  fenugreek	 bitter melon  cucumber  egg plant  lady's finger  pumpkin  tomato  ridged gourd  pointed gourd  bottle gourd	 hyacinth bean  yardlong bean  french bean  sword bean  cluster bean  winged bean	 basil  mint  ginger  neem  pennywort  lemon grass  curry leaf  coriander



Initial Conclusion and Further Question

- Based on the result of information collected by children, discuss with children why we need to eat vegetables. Pick up children's opinions & their parents' opinion through the children.
- Teachers can explain about the daily diet & nutrition. Vegetables consist a lot of nutrient like vitamin, mineral & protein for building up a healthy body. Especially, children need a lot of vegetables during the growing phase.
- Categorise listed vegetables according to major nutrient value of each. Children can use 'vegetable cards' & put into the chart.
- After all activities ask children to write down what they have learnt and what new points they have discovered. Also they can write down what they want to find out more about vegetables.
(vegetable & Nutrition — see step 2)

Feedback

Step 1 – Activity (A)



Through this activity, children must increase their attention toward vegetables which they eat daily. Also this activity helps to identify common vegetables in your area. It is recommended to conduct this activity with children in different seasons to know about wider range of vegetables, though we could not get enough feedback as such.

To identify vegetables appeared in the following feedback, please refer the 'Vegetable List' (Page 82) in Resource section.



Feedback Summary

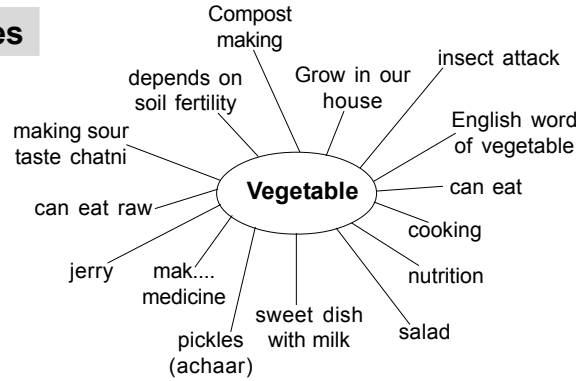
ENRE Partner organization (District)	Swanirvar (South 24 Parganas)	Swanirvar (South 24 Parganas)	Kajla Janakalyan Samity (East Medinipur)
Village	Baduria	Fatulyapur	Parulia & Hinch
School/ Group	Magurkhali Janakalyan Samity	Fatulyapur Gram UnnayanSamity	Parulia Mahasin KKB
Students	Total 36 (21 girls, 15 boys) into 3 grps	Total 20 (7 girls & 13 boys) - 2 grps	Total 13 (6 girls & 7 boys)
Class	Class 4-10	Class 4-9	Class 5
Teacher's name	Buddhadeb Halder, Reba Sahdukha	Tarun Mondol, Dhiman Mondol	Najnina Khatun
Activity duration (Class periods)	from 8 Dec. 2002-? (2 periods, 2 hrs/period)	1-23 Feb. 2003 periods (1.5h/p)	(10 periods)



Results

Brainstorming about Vegetables

- A group of 13 children of Parulia Mahasin KKB did brainstorming about 'vegetables' before starting their activity.



Vegetables which Children Eat

- Children from three groups' kept record for one-two weeks about vegetable which they ate daily. The result shows the variety of vegetable increase during cold season like February. Generally rainy season like July there is less availability of vegetable than cold season. If we had the information of Hot season like April-May, it would be interesting. Vegetable appeared commonly in three records in result are **Potato, Egg plant, Bitter gourd and Pumpkin.**

Kajla Pauria Mahasin KKB group	Swanirvar Baduria village	Swanirvar Fatulyapur Gram Unnayan Samiti
during two weeks July 2003	during last one week Feb.2003	10 children kept record for one week Feb.2003
1 Potato (96 times) 2 Egg plant (30 times) 3 Bitter gourd (29 times) 4 Ceylon Spinach (12 times) 5 Hog-plum (11 times) 6 Ridged gourd (9) 7 Pumpkin (6)	1 Pumpkin 2. Potato 3 Leaf onion 4 Green Papaya 5 Beet 6 Spinach 7 Bitter gourd 8 Cabbage 9 Hyacinth bean 10 Red amaranth 11 Tomato 12 Pointed gourd 13 (Helencha) 14 Indian Pennywort (Thankuni) 15 Drumstick 16 Green banana 17 Egg plant 18 Lady's finger 19 Bottle gourd etc.	1 Potato 2 Egg plant 3 leaf onion 4 Cauliflower 5 Cabbage 6 Bitter gourd 7 Green Banana 8 Green papaya 9 Ceylon spinach 10 Hyacinth bean 11 Red amaranth 12 Beet 13 (Chupri aloo) 14 Yard long bean 15 Pumpkin 16 Yam 17 Carrot 18 Peas

The vegetable names in brackets are in Bengali language.

Favourite and Unfavourite Vegetables

- The following is the survey results from the different groups. The children also drew pictures of these vegetables.

Swanirvar Magurkhali Janokalyan Samiti		Swanirvar Baduria village	Kajla Parulia Mahashin KKB	
36 children Class 4-10		21 children Class 4-10	13 children Class 5	
<p>Favourite Leafy vegetable</p> <ol style="list-style-type: none"> 1. Spinach & Red amaranth (12) 2. Ceylon spinach (10) 3.(9) 4. (Heldo sak) (6) 5. Bacopa monnieri (Brahmi sak) & Coccinia cordifolia (Telakucha) (5) 6. Pumpkin leaf, Bottle gourd leaf, (Shanty sak), Jute leaf (4) 7. Drumstik leaf , (Ghet Kol) (3) 8. Amaranth, Radish leaf (2) 9. Coriander leaf , (Ghadhmoni sak) (1) 	<p>Favourite Vegetable</p> <ol style="list-style-type: none"> 1. Cauliflower, Potato (9) 2. Beet, Cabbage (8) 3. Pointed gourd, Bitter gourd (7) 4. Pumpkin (6) 5. Green Papaya (5) 6. Carrot, Tomato, Hyacinth bean, Lady's finger, Yard long bean, Green banana (3) 7. Ridged gourd, Bottle gourd, Sweet potato (2) 8. (Kochuur Lati), (Methe Aloo) (1) 	<p>Favourite Vegetable</p> <p>Pumpkin, Bottle gourd, Culiflower, Cabbage, Green banana, Potato, Carrot, Egg Plant, Hyacinth bean, Yardlong bean, Ridged gourd, Pointed gourd, Bitter gourd, Ceylon spinach, Yam, (Gadhmoni sak), Spinach, Red amaranth, (Kata note), Green papaya, Indian pennywort (Thankuni)</p>	<p>Favourite Vegetable</p> <ol style="list-style-type: none"> 1. Potato 2. Brinjal 3. Okra 4. Ridged gourd 5. Sweet potato 6. Radish 7. Bittergourd 8. Spinach 9. Water Convolvulus 10. Amaranth 11. (Chikni sak) 	<p>Un Favourite Vegetable</p> <ol style="list-style-type: none"> 1. Carrot 2. Yam 3. Elephant foot 4. (Hinche sak) 5. (Kulekhara sak) 6. Bottle gourd leaf 7. Green papaya
			<p>The reason : These vegetables are more nutritious and good taste</p>	<p>The reason : Some of them are cause of itching throat, bitter taste, and not tasty</p>



Categorising Vegetables

- 3 groups of children in Baduria village listed up all vegetables which they eat and categorised them by eating parts and growing place.

► List of Vegetables made by Children

Leafy Vegetable (Sak)	Vegetable (Sabji)
Radish, Ceylon spinach, Spinach, Red Amaranth, Bottle gourd (Lau) leaf, Jute leaf, (Beto sak), Yam leaf, Amaranth, Drumstick leaf, (Brahmi sak), (Kata note), (Telakucha), (Polta pata), (Gadumoni), Coriander, (Helencha), (Piring), (Malancha), Indian pennywort (Thankuni)	Potato, Pointed gourd, Radish, Beet, Pumpkin, Bitter gourd, Egg plant, Hyacinth bean, Green Banana, Bottle gourd, Yard long bean, Elephant foot, Yam, Cabbage, Cauliflower, Ash gourd, (Kakrol), Lady's finger, Green Papaya, Spongegourd (Dhudul), Ridged gourd, Carrot, Tomato

↳ The word of 'Vegetable' is 'Sabji' or 'Sak Sabji'. 'Sak' is leafy vegetable and 'Sabji' is general term of 'Vegetable'. Therefore when children listed up vegetable they divided two types. Especially in leafy vegetable, there are many kind of local plants appeared in the list; the name in bracket. (Editors/ ENRE)

► According to the eating parts of vegetables

Leaf and Stem	Fruits & Roots	Leaf & Vegetables	Flower
Ceylon spinach, Water Convolvulus, Spinach, Amaranth, Red amaranth, (Beto), (Kulpi), (Brahmi), (Helencha), Yam leaf, Coriander, Indian pennywort (Thankuni), (Polta), Pumpkin leaf, Bottle gourd leaf, Jute leaf, (Kanta note), (Telakucha), (Pingri), (Ghadamoni), (Nalanscha)	Potato, Green Papaya, Green banana, Carrot, Beet root, Bittergourd, Ridged gourd, Pumpkin Yam, Radish, Egg plant, Hyacinth bean, Pointed gourd, Yard long bean, (Kakul), Elephant foot, Lady's finger, Gourd (Dhudul), Tomato	Radish, Pumpkin, Bottle gourd, Yam, Pointed gourd, Drumstick	Cauliflower*, Cabbage, Pumpkin, Drumstick, Banana flower

↳ Some information is not correct such as the category of Cauliflower. (Editors/ ENRE)

► According to the Growing Place of Vegetables

Home garden	Farm land	In water
Ash gourd, Yam, Green banana, Bottle gourd, Ceylon spinach, Drumstick, Hyacinth bean, Green papaya, Brinjal / Egg Plant, (Brahmi), (Kulpi), (Beto), (Helencha)	Potato, Radish, Spinach, Ceylon spinach, Cabbage, Cauliflower, Egg plant, Pumpkin, Carrot, Beet, Yard long bean, Ridged gourd, Bitter gourd	Water Convolvulus, (Kochuulati), (Nal ful), (Shanty sak), (Helencha sak)

↳ this information is also related with Activity (B) in Step 1 & Activity (B) in Step 3. (Editors/ ENRE)



Vegetables

Step 1 — Preparatory Work — Activity (B)

'Vegetables in Our Home Garden & Vegetables in Market'

Let's observe and compare the vegetables growing in the home gardens and vegetables sold in market. Can children notice the difference between them ? Let's find out how much safe vegetables we eat nowadays.

[🏠 both for rural & urban schools 😊 class 7 to 9 📝 keeping record, listing, ranking, categorizing, making profile, newsclippings 🕒 2 - 3 periods (1½ hours per peiod) & home work]



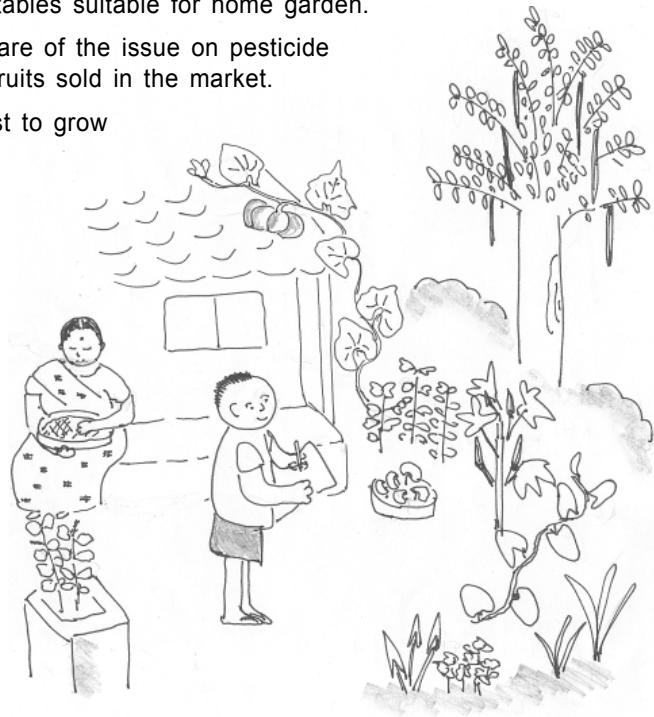
Objectives

- To create children's interest to study about vegetables through their own observation and experience.
- To find out the present situation of home garden in each children's household.
- To grow concern among children about the value of 'organically grown' vegetables.



Success Indication for Proceeding to the Next Step

- Children can identify vegetables suitable for home garden.
- Children became more aware of the issue on pesticide residues in vegetables & fruits sold in the market.
- Children show their interest to grow vegetables organically by themselves.



Activity



Creating Interest and Motivation

- Ask children to tell what vegetable (including edible weeds, herbs, tree leaves, flowers) did they eat yesterday and list them up in each notebook.
- Tell children to write down from where those each vegetable came (purchased from market ? picked up from own home garden / field ? collected from surroundings ?)
- Put together each childrens' record and see what vegetables listed up in class. How many kind of vegetables are listed ? Categorize these vegetables according to source (from market, from home garden / field, from nature)
- Ask children whether they have homegarden (including growing vegetables / herbs in pots, or roof) or not.
- Find out how many children's household has a home garden. And which family members mainly take care of the garden.



Collecting Information (from children's observation & experience)

There are two types of work which children can work out.

- a) **Home garden survey** for children who has homegarden / vegetable field ask the children to observe what vegetable plants are growing at present & keep record of them. Collect each vegetable leaves and put on the list.

Some points which children need to keep record;

- what • Name of vegetable / plant eat as vegetable (including wild grass also)
- where • Growing place (garden, field, pot, on the frame)
- how • Growing stage (ready for harvesting or not) (germinating, flowering, starting fruiting, harvesting, seeding etc)
- why • The reason why the vegetable are chosen to grow (opinion from family members etc)
- Childrens' comment or remarks

Name of children.....

Date of record.....

[example] 'Vegetables growing now in my home garden'

No.	Name	Place	Size	Reason	Remarks
01.	Ceylon spinach (pui sak)	from ground to climbing roof	ready to harvest	strong, easy to grow, tasty	
02.	Pumpkin & its leaf	from ground to climbing roof	pumpkin is not really but leaves are ready to harvest	they grow naturally	mouse comes for eating pumpkin
03.	Basil	pot	ready to harvest	Useful for medicine	Whole year available
04.	(Thankuni)	on the ground	ready to harvest	they grow naturally	
05.	Sword bean	on the ground to roof	not ready for harvesting (flowering)	strong, easy to grow	I don't like this bean

b) **Market survey** for children who do not have home garden / vegetable field / roof garden / pots in terrace...

Ask them to observe nearby market and list up what vegetables are sold & its price.

Each children / group (2-3 children) are requested to visit 3 different vegetable shops / sellers to collect information what vegetables are sold & from where those vegetables come.

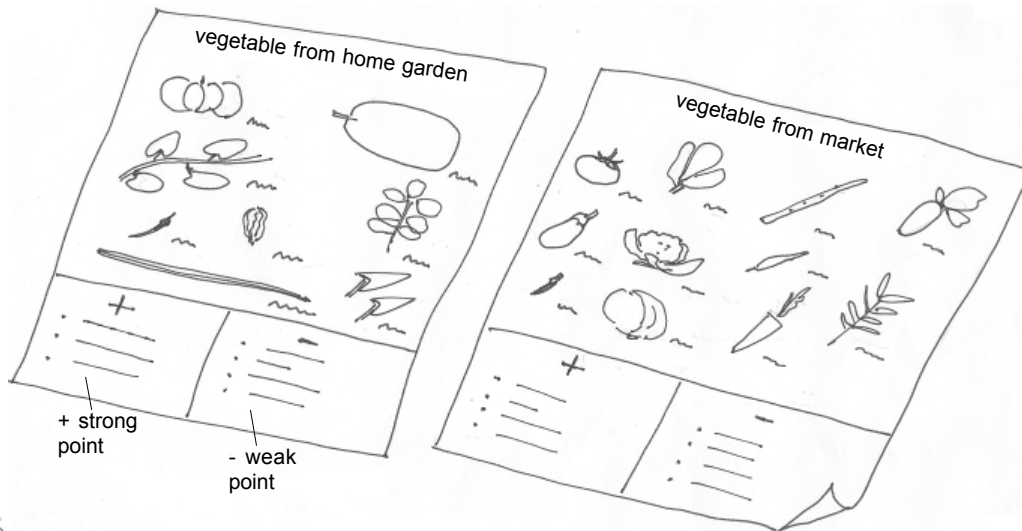
Veg Seller		Vegetables Name	Price	From where	Remarks
A	1	Potato (Joti) Potato (Chandra market)	Rs. 10 / Kg Rs. 12 / kg	Srerampur veg. market Srerampur veg. market	
	2	Onion	Rs. 12 / kg	Srerampur veg. market	
	3	Pumpkin		Own home	
	4	Amaranth		Srerampur veg. market	
	5	Tomato		Srerampur veg. market	
	6	Drumstick	Rs. 1.50 / stick	Farmers	
	7				
B	1.	Hinche	Rs. 0.5 / bunch	Own rice field	
	2.	Thankuni	Own rice field	
	3.	Kalmi sak	Own rice field	





Summarizing information

- Divide children into two groups, one for home garden survey group and the other is for market survey group.
- Each group are requested to put together individual records and make each summary chart of vegetables in home garden / market with drawings.
- Look at the summary charts and discuss with children what difference or similarity on vegetable between home garden vegetables and market.
- Discuss also about + (good points) and - (weak points) on each vegetable group.
- Ask children if they grow vegetable in home garden what kind of vegetables do they want to grow and why? Ask children if they were vegetable sellers, what kind of vegetables do they want to sell and why?




Initial Conclusion and Further Question

- Teacher can introduce the recent problem that some survey shows dangerous amount of pesticides residue in many kind of vegetables sold in the market of India. And also vegetables can be polluted if they grow in polluted soil. OR some colouring is done to vegetable to make them look fresh etc. Teachers can refer to some articles from newspaper.
Create discussion about how we can eat 'safe' vegetable. (see step 2 'Review and Make Sure')
- Encourage children to collect newsclippings on vegetables & pesticide residue and other issues related to vegetables.
- Teachers can introduce nutrition value of vegetables. (see step 2)
- Children may do a survey of pesticides used commonly in their own home gardens farms.

Feedback

Step 1 – Activity (B)



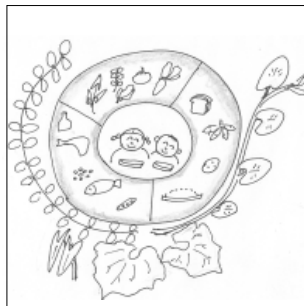
 This activity is to encourage children to observe and find out whether any difference between vegetables which are grown in Home garden and which are sold in local market. There is a certain difference between home grown vegetable and commercially grown vegetables. This activity is introduced as a preparation for 'Growing activity' especially focusing on Growing vegetable organically by children themselves which is described in Step 3 – Activity (B).

However we could not get the full feedback of this activity. Partly because it might be that the aim of this activity is unclear for teachers or there are not enough Home gardens among children's households. This suggests this kind of activity, the comparison of home grown vegetable and commercially grown vegetables, is much more difficult for urban school children.

As related feedback on vegetables in Home garden or Market, you can refer the result appeared in feedback Step 1-Activity (A) and Step 3 – Activity (A).

Step - 2

Review & Make Sure



for platform towards the next step



Review & Make Sure

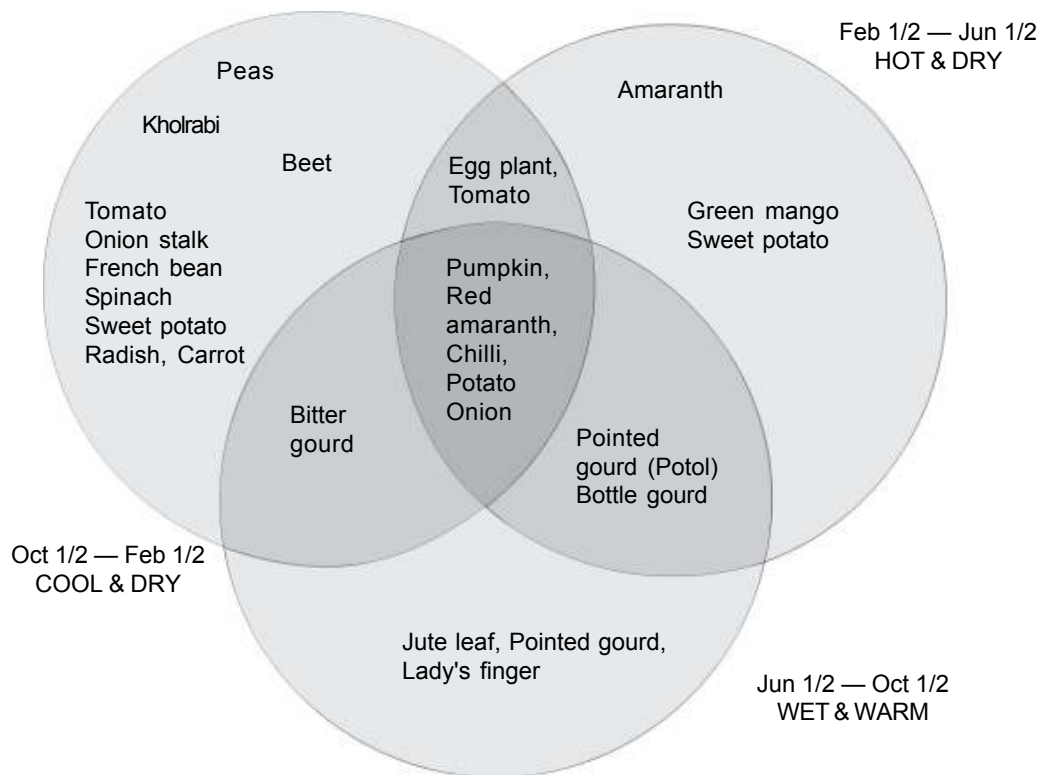
Vegetable & Season

Seasonal diagram




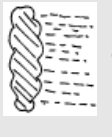




















Vegetables are seasonal crops. After primary data collection, children are asked to consider what kind of vegetables are most available in which season. Further data collection can be done in step 3 such as 'market survey through the year'. Before that it is good to make sure the seasonal diagram and the availability of vegetables. This diagram is like a 'Harvest calendar' showing which season the vegetable appearing in market/ home garden. Based on this teacher can guide children to prepare the 'Cultivation calendar' in next step, too.

In the next page the example of seasonal diagram in West Bengal is given. One year can be usually divided into 6 seasons.

When children make a 'Vegetable calendar', this seasonal diagram can be categorised more broadly into 3 sections. In the example there are 'COOL & DRY' (Oct-Jan), 'HOT & DRY' (Feb-May)', and 'WET & WARM' (Jun-Sep) seasons.

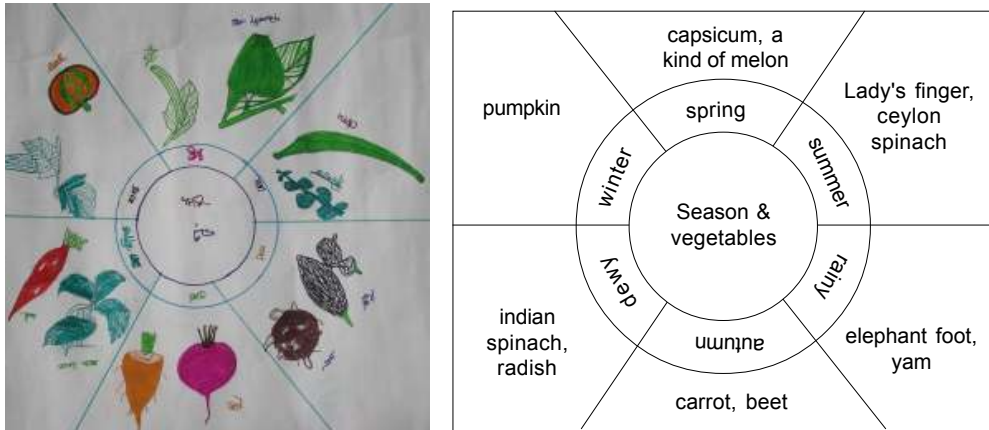


Season Diagram (Example : Central & Southern Region of West Bengal)

Climate	Dry Season												Wet Season																													
	Early			Middle			End			Early			Middle			End																										
	Dec	Jan	Feb	Phalgun	Chaitra	Baisakh	Jaistha	May	Jun	Jul	Aug	Sraban	Ashar	Shraavan	Bhadra	Ashwin	Kartik	Nov	Dec																							
Month (Eng)																																										
Month (Bng)	Poush	Magh	Phalgun	Chaitra	Baisakh	Jaistha	Summer																																			
Season	Winter						Spring						Summer																													
Rain		Very little							Usually no rain							Sometimes strong rain							Lot of Rain							Sometimes rain							Less rain, Dew					
Moisture		Low							Lowest							Middle							Very High							High							Middle					
Light		Day < Night							Day = Night							Day > Night							Cloudy							Slightly cloud							Day = Night					
Temperature		Cool - Cold							Warm							Hot							Hot							Hot & Stuffy							Warm-cool					
For Vegetable Calendar	COOL & COLD						HOT & DRY						HOT & DRY						WARM & WET						COOL & COLD																	

■ Examples from Children's work : Vegetables in 6 seasons

☺ Chart made by Antara Sarkar and Kumari Pampa Mandal (class 4, Shibganji village, South 24 Paragnas) of Champa Mahila Shamittee group.



☺ List made by 10 students (class 4-9) of Fatulyapur Gram Unnayan (Swanirvar)

Summer

Boishakh (middle Apr - May) : Bottle gourd ,Ridged gourd , Egg plant, Sweet pumpkin, Elephant foot, Radish, Sponge Gourd (Dhudhul)

Joishtha (middle of May - Jun) : Egg plant, Rainy season Pumpkin, Sponge Gourd (Dhudhul), Hyacinth bean, (Kankur), Snake gourd, Yam (Guri Kochu)

Rainy season

Ashar (middle Jun - Jul) : Bitter gourd, Bottle gourd, Yard long bean, Ridged gourd, Cauliflower, Hyacinth bean, Elephant foot Yam (Guri Kochu), Egg plant

Sraban (middle of Jul - Aug) : **Cauliflower, Cabbage,** Radish, Hyacinth bean, Potato, **Beet, Kohlrabi,** Tomato, Pointed gourd

Autumn

Bhadra (middle Aug - Sep) : Beet, Radish, Tomato, Bottle gourd, Pointed gourd, Lady's finger, Cabbage, Cauliflower, Kohlrabi,

Ashwin (middle Sep-Oct) : Beet, Bottle gourd, Peas, Kohlrabi, Cabbage, Cauliflower

Dewy season (Hemant Kal)

Karthik (middle of Oct - Nov) : Beet, Pointed gourd, Kholrabi, Pumpkin, Tomato, Cabbage

Aghrayan (middle Nov - Dec) : Bitter gourd, Bottle gourd, Potato, Beet, Pea, (12 Balo pata) Ridged gourd, Pointed gourd

Winter

Poush (middle Dec - Jan) : (Balo pata), Ridged gourd, Lady's finger, Egg plant, Round radish, Bottle gourd, Gourd (Dhudhul)

Magh (middle Jan - Feb) : Bitter gourd, Egg plant, Lady's finger, Ridged gourd, Bottle gourd, Pumpkin, Yard long bean, Gourd (Dudhur), Sweet Pumpkin

Spring

Falgun (middle Feb - Mar) : Ridged gourd, Pumpkin, Bottle gourd, Bitter gourd, Egg plant, Lady's finger, Yard long bean , Radish, Gourd (Dudur), Elephant foot

Choitra (middle Mar - Apr) : Egg plant, Lady's finger, Yard long bean, White radish, Ash gourd, Bottle gourd, Snake gourd, Bitter gourd, Elephant foot

Vegetables, Festivals and Old Sayings

It is interesting to see vegetables in festivals to reflect the seasonality. Also there are some old sayings/rules regarding vegetables in relation with some seasonality. Though children may not be familiar with them, they can listen to old family members and the wise in their local. Encourage children to know whether any scientific reasons behind them. Interestingly you can find most of them have some relation with healthy food habit and wise cultivation practice to conserve seeds etc.



In West Bengal the followings are commonly known/practiced.

□ In festivals

Gota Sheddho (boiling wholesome vegetables and pulses)

On the day of the Saraswati Puja (around early February), which celebrates the onset of Spring, various kind of pulses and newly harvested vegetables such as potato, sweet potato, tomato, egg plant, Sheem (Hyacinth bean) and peas are boiled together without cutting/peeling and eaten next morning with a little bit mustard oil and salt. This is good for health, too.

Choddo Sak (cooking 14 green leafy vegetables)

The night before on Diwali festival (in Kartik month, around end of October to early November), celebration of light, 14 candles are lighting and cooking 14 green leafy vegetables. Nowadays not so many people know what are the 14 leafy vegetables actually. You can buy a packet containing various green leaf pieces from vegetable seller that day. Originally most of these 14 leafy vegetables are medicinal plants. So you do not eat exact '14 sak', but eating some green leafy vegetables in this season is good for your health.

[14 leafy vegetables as 'choddo sak' – How many do you know among them ?]

Bengali Name

Ol
Keun
Betho
Kalkasunde
Sarisa
Neem
Jayanti
Shalincha (Shanche)
Guruchi
Patuk (Patol pata)
called 'palta pata'
Sheluka
Hilmochika (Hinche)
Bhantaki (Ghentu / Bhant)
Sunishannak (Sushni sak)

Scientific Name

Amarphophallus campanulatus
Costus speciosus
Chenopodium album
Cassia sophera
Brassica campestris
Azadirachta indica
Sesbania sesban
Alternanthera sessilis
Tinospora cardifolia
Trichosanthes dioica

Cordia dichotoma
Enhydra fluctuans
Clerodendrum infortunatum
Marsilea quadrifolia



□ In Old Sayings

Season	Characteristic Food habit	Sayings	Science behind
Summer Baisakh - Jaistha	Season of eating Sour & Bitter taste preparation & green leafy vegetables	<ul style="list-style-type: none"> Do not eat seem during Chaitra - Baisakh month 	<ul style="list-style-type: none"> For preserving seeds
Rainy Ashar - Sravan	Season of eating Khichuri (porridge with rice & pulses) & mixed curry	<ul style="list-style-type: none"> Do not eat yam leaf (Kochu pata) Don't eat potato curry, it may cause stomach upset 	<ul style="list-style-type: none"> because they might have insects potato often rotten
Early Autumn Bhadra - Ashwin	There is lack of fresh vegetables in Ashwin month. There is foodgrain shortage in rural area.	<ul style="list-style-type: none"> Do not eat pointed gourd (potal) and Water convolvus (kalmi sak) during Bhadra month because god Narayan comes down from the heaven & sleeps on the Kalmi sak leaf with potal as his pillow. 	<ul style="list-style-type: none"> During this period both plant of Potal & Kalmi sak produce sap therefore not to digest easily (taste also not nice).
Late Autumn Kartik - Agrahayan	Season between lack of food and harvest of new foodgrains	<ul style="list-style-type: none"> Increase vegetable variety (Cauliflower, tomato, beans, pumpkin, cabbage, egg plant) during Agrahayan month. 	
Winter Poush - Magh	Season of eating Pitha (rice dumpling) & bean seeds.	<ul style="list-style-type: none"> Leafy vegetables from Rabi (winter season) crops, lentils & pulses are eaten in Magh month. 	
Spring Phalgun - Chaitra	Season of eating carefully	<ul style="list-style-type: none"> Eat bitter vegetables (Neem leaf, drumstick leaves) for protection disease like pox and scabies in Chaitra month 	

(Source : 'Dinalipi 1404 (1997-98) / Naritrantha Prabartana)

Vegetables & Nutrition

Green vegetables are main source of vitamins, minerals and protein. Especially dark colour vegetables such as green leafy vegetables, carrot, pumpkin & capsicum are rich source of vitamin A. Lack of vitamin A causes nightblindness, skin problem, low disease resistance and body weakness.

Vitamin A is not destroyed by heat in cooking process. Also green vegetables provide vitamin C, that works in our body by protecting from disease and helping well digestion of protein & calcium. Vitamin C is weak to heat, so we must be careful not to over cook these vegetables.

Root vegetables provide us carbohydrates and also vitamins & minerals. Iron & other minerals are necessary to prevent Anaemia which are common even among children.

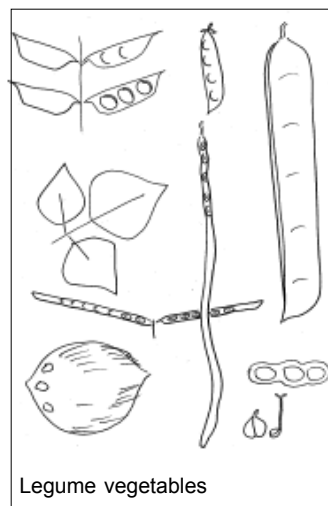
Most vegetables also have 'fiber' which contribute proper & smooth digestion in our body.

If children don't eat enough vegetables especially green vegetables, they might suffer from health problem.

Vitamin B (there are several types such as B₁, B₂, B₆, B₁₂ ... etc.) is contained mainly in whole wheat, whole grain and also in legumes vegetables such as beans & peas. Vitamin B has key role in healthy growth in our body.

Some data shows **one & half cup portion of vegetables from one garden can provide significant amount of a child's recommended daily in take of iron and vitamins.**

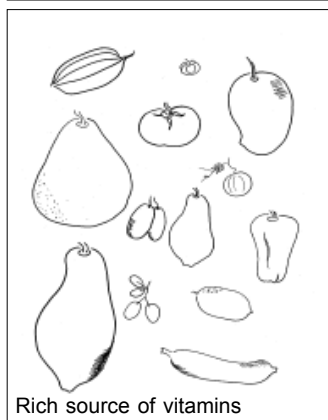
'Let's try to create 'vegetable rich diet' for our children. And encourage children to grow vegetables by themselves for next step activity.



Legume vegetables



Green leafy vegetables



Rich source of vitamins

Teacher's Note

Through rural development work in villages we sometimes encounter the situation that people think 'Fish & Meat' are nutritious and good food but vegetables are not so. People find less value in vegetables as food. Often people eat potato as main vegetable especially in dry land area, since potato is easily available than other green vegetables.

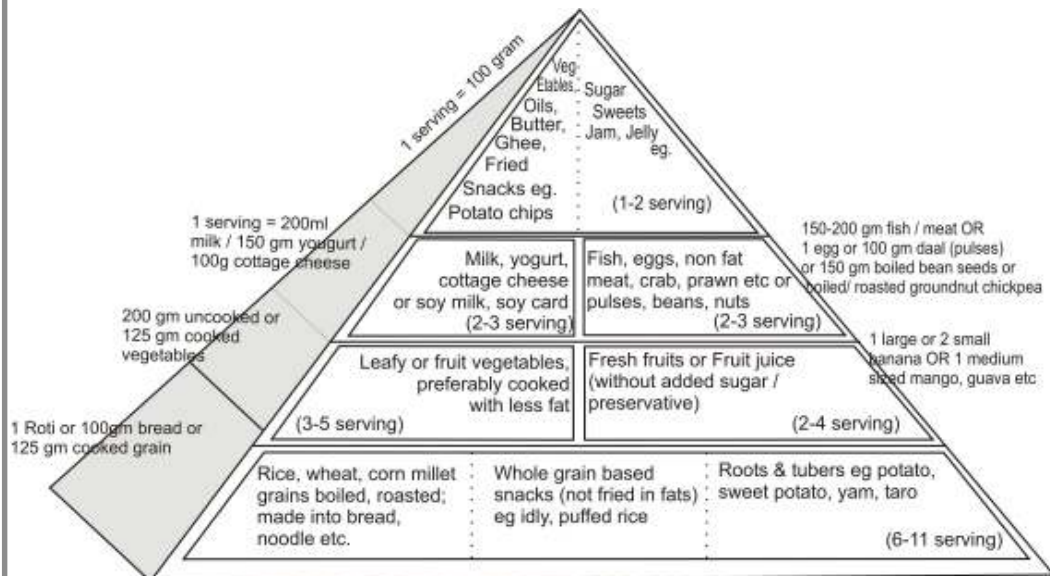
Also many children in urban area show less interest eating vegetables than meat dishes.

So, teacher needs extra effort to make sure that children realise the nutritious value of vegetables and eating vegetables is necessary in healthy diet.

Including vegetables all food we eat has some kind of nutrition. 'Nutrition' is about food and how it is used in body. If we want being healthy, we need to eat various food which cover all necessary nutrition for our body. It is important especially for children who are in their rapid growing stage.

As you know, 'Nutrition' is mentioned and taught in any school E.V.S text books.

Food is made up of nutrients such as carbohydrates, fats, protein and micronutrients (vitamins & minerals). These nutrients are needed for energy (for activities such as working, playing, running), for growth (building and maintaining the body) and for protection (against infection). Broadly food can be categorized into 'three food groups' (food for energy, food for growth, food for protection) but actually many foods belong to more than one food group and that we need to eat variety of foods to stay healthy.



► Food pyramid : A guide for selecting items in daily diet, higher no. of servings equivalent to about 2400kcal/day (working adult requirement)

► **Standard diet for Children (age 13-15) in India**

Balanced diet for children : How much and what should children eat ?



Food item	Examples	Food type	Quantity : g / day	
			Vegetarian	Non vegetarian
Staple food	Rice, wheat (cooked item)	Energy	430 g	430 g
Pulses	Dal (Mung, Musoor etc.)	Growth	70 g	50 g
Green leafy vegetables	Spinach, Pumpkin leaf, Drumstick leaf .	Protection	100 g	100 g
Other vegetables	Gourd, Eggplant, Carrot, Beans	Protection	75 g	75 g
Root vegetables	Potato, Yam, Elephant foot	Energy	75 g	75 g
Fruit	Mango, Papaya, Guava	Protection	30 g	30 g
Milk	Milk, curd, cottage cheese	Growth	250 g	100 g
Vegetable Oil	Ground nut/mustard oil, Ghee	Energy	35 g	40 g
Meat & Fish		Growth	-	30 g
Egg		Growth	-	30 g
Sugar	Sweets, Brown sugar, honey	Energy	30 g	30 g
Measurement indicator:				
1 cup of grains/rice = about 125 g				
A handful of pulses = about 40 g				
1 egg = about 50 g				

[Source : Pusti O Swasthya, Year of Scientific Awareness 2004, Ardhendu S. Chatterjee, ENDEV]

How Safe are the Vegetables We Eat

Vegetables are nutritious but other aspect that teacher needs to work with children is to raise concern about how safe vegetables are. Pesticides residue (observed into vegetables or remaining on surface of vegetables) in vegetables is big problem., because most farmers are using heavy dose of pesticides to increase commercial value of vegetables. Most of consumer prefer beautiful & big vegetables than small and ones eaten by insects. In same reason vegetables sellers put artificial color on vegetables to make them look fresh. You can easily find articles in newspapers which give us caution on this issue. Encourage children to collect information on vegetables sold in market.

After knowing the scaring situation of vegetables sold in market, have discussion with children what can be done. Teacher can introduce the value of Organically grown vegetables. There are several examples of organic farmers in India, but not so much popular than in developed country where people had faced pesticide problem earlier and realized to regain safetyness in food. Explain children vegetables can be grown organically by themselves in home garden and school garden, too. Also data shows organically grown vegetables contains more nutrients than vegetables grown with a lot of agro chemicals such as chemical fertilizer and pesticide. This can become a good motivation for children to implement own garden project in next step activity.



Let's Check Articles in Newspapers, Magazines, and Website



The fact on 'There is poison in our food'

- ✗ Chemicals for crops take a toll on tillers : chemical fertilizers used to grow crops and vegetables are not deadly for the consumers alone. ..they take a heavy toll on the farmers as well. .. a farmer on average uses 150kg of chemical fertilizers a year on a hectare of land. (Telegraph / 8 Aug, 2005)
- ✗ How to test for adulteration : Synthetic color are often used to brighten up green vegetables greener and saffron. 'Even green vegetables and fruits are not safe' ... (Hindustan times / 28 Dec, 2003)
- ✗ '75 % of food & vegetables samples (from Delhi, Bihar, U.P) contains significant level of pesticide residues'(Telegraph / 6 Aug, 2001)
- ✗ 'Every kilogram of food grain produced today uses five times more fertilizer and pesticides than before' (Telegraph / 14 May,1999)
- ✗ Specially 'Pesticide residue' are remarkably high in 'Green leafy vegetables'. Because most farmers put market value as their priority and they afraid of pest attack. They give over doses of pesticide and even spray pesticides just a few days before harvesting (Telegraph / 6 May, 1999)
- ✗ All in color: the chemical that makes tomato red can check cancer in the prostate.. (Telegraph, Know How/ 26 Apr, 1999)
- ✗ THOUGHTS FOR Consumers Day : Trace of toxic heavy metals like lead, cadmium and arsenic have been found even in green vegetables (Telegraph / 11 Sep, 1999)



The fact on 'Organic is good'

- ✓ Vegetables, dear but pure: Tastier and rich in vitamins, organic vegetables are now in great demand, though they are dear and not easily available in local bazaars .. (Telegraph / 3 Mar, 2004)
- ✓ Organic food is healthier: Organically grown crops contain more healthier compounds than conventional crops, perhaps because they are not exposed to pesticides .. (Telegraph / 9 Mar, 2003)
- ✓ Japanese data shows organically grown vegetable (as example on capsicum, sample in 1954) contains 13 times Vitamin A compared the vegetables grown with chemical fertilizers and pesticides (sample in 1982)

Organic food healthier

Washington, March 8 (Reuters) - Organically grown vegetables and fruits contain more healthful compounds than conventional crops, perhaps because they are not exposed to pesticides, US researchers report today.

There is organically and sustainably grown better and more abundant than conventional crops, says a report published in the journal *Journal of Agricultural and Food Chemistry*.

Chemicals used in growing crops can be harmful to the health of humans and animals, says the report. It also says that organically grown crops contain more antioxidants, which are thought to help protect against heart disease and cancer.

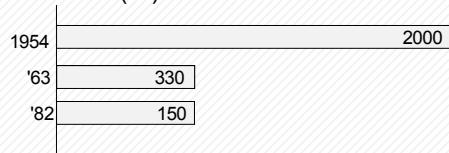
"This study shows that there is more research to be done," said Dr. David N. Ho, an associate professor of food science at the University of California, Davis, who led the study.

But from improved levels of total polyphenols and antioxidants, the authors conclude, it is not clear whether organically grown crops are healthier or more nutritious than conventional crops. The team found that the levels of polyphenols in organically and conventionally grown crops were 10 percent to 50 percent lower than in conventional crops.

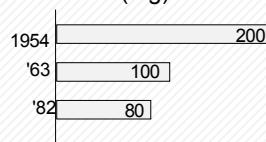
The study was funded by the USDA.

Organically grown crops contain more antioxidants, but they are not necessarily more nutritious than conventional crops, the authors say. The study also found that organically grown crops contain more antioxidants, which the body can use to fight disease.

Vitamin A (IU)



Vitamin C (mg)





Step - 3

Investigation / Project Work



for creating child oriented activity

 **Lesson Plans**

 **Feedbacks**



Vegetables

Step 3 — Investigation / Project Work — Activity (A)

Vegetable Market Survey Throughout the Year

To find the fact of vegetable and its seasonality, let's conduct the survey on vegetables in local market. Encourage children to keep their record for whole season by visiting the market regularly. Their record will become the valuable data on vegetables and seasonality in your locality.

[🏠 for both urban & rural schools 🧑 class 7 to 9 🗺 information collection, interviewing, mapping, flow chart, gardening skill, group work 📖 waste recycling (EVS), municipality administration relating waste management (social study) 🕒 class period required = 4-5 periods including practical work The related activity: Booklet 1 - Trees, Booklet 2 - Insect, Step 3 - Activity (A), Step 3 - Activity (B)]



Objectives

- To observe and keep actual record on availability of different vegetables in different season.
- To know about from where the vegetable comes to market.
- To be able to find the relation between vegetable's price and seasonality or any natural disasters.



Expected Products / Achievements through this Activity

- 'Seasonal diagram' & 'Cultivating area diagram' on vegetables available in local market.
- The line graph showing the vegetable price change throughout the year.
- Along with market survey, children could choose some vegetables which suitable for growing in school garden and started gardening.



Activity



Review & Discussion

Teacher is suggested to conduct short review of the preparatory work such as activity 'Step 1-A', children listed up the vegetables which they eat. Discuss with children, if they conduct the same survey in another season, what would happen. Some children might tell that it depends on which vegetables are cheap & easily available in those season. This can be one of the motivation to survey vegetable price in different season.

Make sure that children have learnt categorizing vegetable in their preparatory work, too. We have broadly divided vegetables into 5 categories; root crop, leaf vegetable, fruit vegetable, beans & legumes; herbs & spices. (see pg 15)



Planning & Preparation

Together with children, develop the Survey Sheet on vegetables sold in the local market. Think about how survey form can be designed to make keeping record easily.

Example survey sheet is on the next page (Teacher can also make xerox copy of this page and use it as a survey sheet, if necessary.)












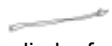


























Each simple illustration of vegetables on the survey sheet can help in recognizing vegetables easily.

Beside the price of vegetables, make sure with children what other information should be collected from vegetable sellers.

- eg.
- from where the vegetables come ?
 - Is there any chemical on vegetable ? (artificial colour, preservatives etc)
 - Any change - before and present (which variety is becoming less or lost, which variety is coming in market more & more).

**[Example of Survey Sheet]
Vegetable Price in Market**

Date _____

Vegetable	Price/ kg	Variety *	Vegetable	Price/ Kg	Variety	Vegetable	Price/ kg	Variety
A) Root Bulb crop			B6  Spinach			C10  Cucumber		
A1  Potato			B7  Cabbage			C11  Drumstick		
A2  Yam			B8  Hinche			C12  Cauli flower		
A3  Sweet potato			B9  Leaf onion			C13		
A4  Elephant foot			B10  Garlic leaf			C14		
A5  Raddish			B11			C15		
A6  Carrot			C) Fruit Vegetable			D) Beans & Legumes		
A7  Onion			C1  Pumpkin			D1  Hyacinth bean		
A8  Beet root			C2  Bottle gourd			D2  Long yard bean		
A9			C3  Ridged gourd			D3  French bean		
A10			C4  Bitter gourd			D4		
B) Leafy vegetable			C5  Snake gourd			D5		
B1  Amaranth (red)			C6  Pointed gourd			E) Herb, Spice, Medicinal plants		
B2  Amaranth (green)			C7  Lady's finger			E1  Garlic		
B3  Pui			C8  Brinjal			E2  Ginger		
B4  Kalmi			C9  Tomato			E3  Chilli		
B5  Methi						E4  Corriander		
						E5  Turmeric		
						E6		
						E7		

* Variety : a) Deshi (locally growing); b) Commercially growing, other District, hybrid etc



Investigative Work

- Divide 3-4 children into groups. One group takes responsibility for one vegetable seller / shop to keep record for one year from now on.
- Decide with all the groups how often they will visit their vegetable seller?
once a week ? twice a week ? once a month ?

It depends on children's decision, but they need to visit regularly according to their decision and survey for one year. Patience is required in this kind of survey. Generally more frequently data collection is more accurate to represent the situation.

Usually vegetable's prices fluctuate rapidly during festival (puja) time or time when natural disaster like flood and drought occurs.

Therefore we recommend that children keep their record at least twice a month.

- Each group find out own vegetable seller & request them to cooperate their survey. Children need to explain the vegetable seller why they do this, how they do this and what help they need from vegetable seller.
Each group can cover different areas of the market if possible.
- After each group get agreement from each vegetable seller, children need to make the profile of their vegetable seller. These profile is called 'informant sheet'. 'Informant' is the person who give us information during the survey.
- Start keep record by regular visit. Each time each group need to fill up the survey sheet.
If there are big change of the price compared the previous time, children need to ask the vegetable seller about the reason, too.




[Example of Informant Sheet]

Group no.

Vegetable Market Survey

- Name of Vegetable Seller (age)
 - ----- (-)
 - ----- (-)

- Location of Selling
 - _____ market
 - _____ street
 - _____ village / town


map

- Selling Time
 - everyday morning _____ am to _____ pm
 - everyday evening _____ pm to _____ pm
 - holiday _____

- How many years' selling vegetables on the location _____ years

- Stock Vegetables from _____

- House address of Vegetable Seller

- Others

- Survey Group Name & No.
Childrens' name (class)
- Survey duration : from Jan'02 to Dec'02
- Survey Visiting Schedule : eg. every 2nd & 4th Saturday morning 8 am.

Jan	Jan	Feb	Feb	Mar	Mar	Apr	Apr	May	May	Jun	Jun
✓	✓		✓	✓	✓						
Jul	Jul	Aug	Aug	Sep	Sep	Oct	Oct	Nov	Nov	Dec	Dec

- Comment :

for checking survey done / not done

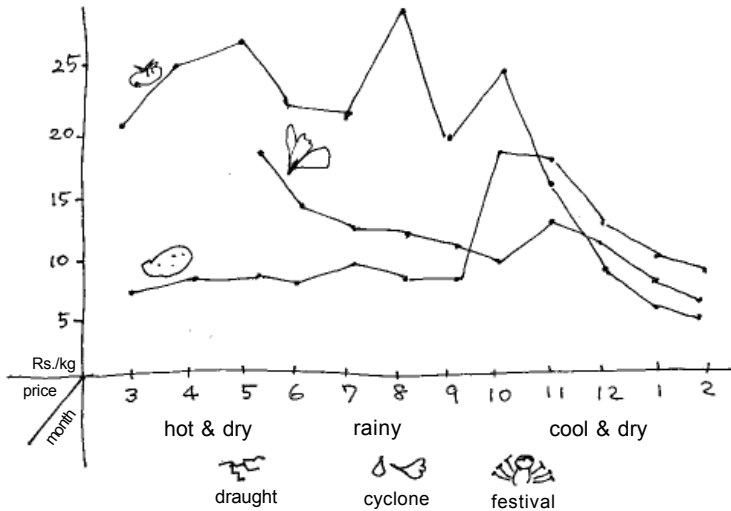


Reporting & Summarizing

- Survey is going on throughout the year. Teacher needs to encourage children to keep going on.
- In each season children had better to summarise their data instead whole one year after. Season can be divided broadly;
Cool & Dry season : Oct - Feb
Hot & Dry Season : Mar - June $\frac{1}{2}$
Warm & Wet Season (Rainy) : June $\frac{1}{2}$ - Sep

Each group are asked to make 'Line-graph' of each vegetable's price. Keep seasonal summarize for complete 'one year data'.

- Prepare Line-graph of 'vegetable price throughout one year'. Prepare diagram of 'season & vegetable available in market'.
- List up all points & information collected survey.
- Don't forget reporting to each vegetable sellers who cooperated to children. Children can show each vegetable seller the result of survey and tell what they have learnt from this survey activity etc.



Line graph can show how the vegetable price change influenced by natural factors (weather, natural disaster) & social event.





Toward Local Activity

- From 'seasonal diagram of vegetable in market', children can learn growing duration of each vegetable by counting backward of diagram. This can be useful for growing vegetable in school garden.
eg. Tomato is easily available in market & cheap in Jan & Feb. For this harvesting time when the seeds of tomato are sown ?

What vegetables are grown in local area? Children can try grow those vegetables too.

- If children are in rural area, teacher can conduct 'Vegetable field survey' alongwith marketing survey. Through the survey, children can become aware of the pesticides used in vegetable field, too.

Feedback

Step 3 – Activity (A)



The aim of this activity is to encourage children to collect detail information on vegetable through market survey. This helps to understand the variety of vegetables, their seasonality and the market price change. Other important point which children need to aware is the safety aspect of those vegetables. Along with the problem of pesticide residues, children must aware that nowadays several chemical applied vegetables to make them look good and fresh. In this activity teachers/facilitators are advised to treat children as future consumers, because to become wiser consumers links to promote Eco- friendly and healthy food production.



Feedback Summary

ENRE Partner Organisation (district)	Swanirvar (South 24 Pgns)	Swanirvar (South 24 Pgns)	Kajla Janakalyan Samity (East Midnapur)
Village	Beliakhali	Chandalatty	Parulia & Hinch
School / Group	Magurkhali Janakalyan Samity	Najul & Titumeer / KKB	Parulia Mahasin KKB
Students	Total 32 (15 girls & 16 boys) into 4 groups	Total 32 (27 girls & 5 boys) into 2 groups	Total 13 (6 girls & 7 boys)
Class	Class 4-10	Class 5-9	Class 5
Teacher	Abul Kalam	Fajlur Rahaman, Adhal Manik	Najnina Khatun
Activity duration (Class periods)	Reported Apr,02 (2 periods + project work)	Last week of Jul - 20th August, 2002 (3 periods, 2hs / p)	1 Sep - 18 Nov, 2002 (5 periods)



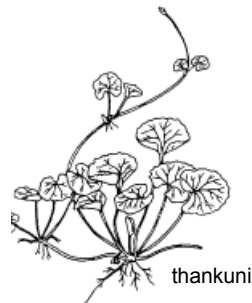
Results

Vegetable Survey in Market

- A group of children affiliated to Kajla Janakalyan Samity surveyed vegetables in local market in Pauria & Hinchu village, East Midnapur district. The price of each vegetable is the average of 10-12 days survey. The children noticed that the price of vegetables was not always same and usually when those vegetable were available more the prices were lower. [the price is per kg]

Potato	Rs 8.00
Okra	Rs 12.00
Bitter gourd	Rs 9.00
Pumpkin	Rs 8.00
Radish	Rs 12.00
Ridged gourd	--
Green papaya	Rs 6.00
Hog plum	Rs 10.00
(Chalta) / piece	Rs. 0.5
Ceylon spinach	Rs 8.00
Water convolvus / bunch(ati)	Rs 1.00
(Thankuni)	--
(Pilin sak)	--
Amaranth	--
Onion	Rs 12.00
Brinjal	Rs 7.00
Yam	Rs 8.00
Sweet potato	--
Tomato	Rs 16.00
(Hinchu sak) / bunch(ati)	Rs 1.00
(Gima sak)	Rs 4.00
Pumpkin leaf	--
Spinach	Rs 6.00

- The children collected information from the vegetable sellers about where these vegetables come from. They found 6 villages name.
 1. Parulia, 2. Hinchu, 3. Belcha, 4. Bagadari, 5. Pachilia, 6. Chunpara
- The Children also reported about some vegetables less available compared before, such as **(Amruli sak), (Brahmi sak), (Dabur sak), (Thankuni) and Snake gourd**.
The reasons are;
 - Not sold in local market,
 - Less demand
 - Nobody grows
 - Not so many people knows how to cook these vegetable



thankuni



brahmi sak



amruli sak



snake gourd

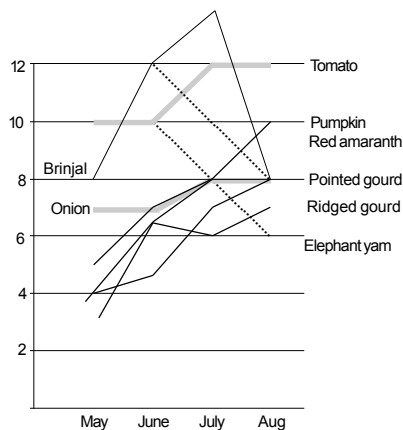
- ↳ There was no mention about date of survey. This activity was conducted from Sep to middle of Nov in 2002. (ENRE)

- Survey result on Vegetable price in market from May to August, 2002. (by children groups affiliated to Swanirvar, in Chandal Atty village, North 24 Parganas district)

Price of each month is Rs / Kg

Vegetable	May	Jun	Jul	Aug
Potato	5.5	5.8	6	6.5
Pointed gourd	4	4.5	7	8
Ridged gourd	3	6.5	6	7
Bitter gourd	12	13	12	15
Okra /Lady's fingers	5	6	8	6
Pumpkin	5	7	8	10
Bottle gourd	4	4	6	6
Egg plant/Brinjal	8	12	15	8
Ceylon spinach	1.5	1.5	2	2
Green banana (4 piece)	8	8	10	10
Red Amaranth	4	6	8	10
A kind of Yam (Guri Kochu)	-	12	10	8
Elephant foot	-	10	7	6
Snake gourd	-	7	5	6
(Kankur) a type of melon	10	8	6	6
Green Papaya	8	8	6	6
Onion	7	7	8	8
Chili	15	25	30	30
Ginger	25	30	35	35
Garlic	35	35	40	40
Tomato (Hybrid)	10	10	12	12
Cabbage	12	13	15	15

- ↪ The month of May is extreme hot & dry & rain starts usually in middle of June & continues till early September. Based on the data collected by children above, we can find most Gourd variety's price increase during this season and Yam varieties become cheaper. It is also interesting to see no vegetables prices remain same during this four months. Data processing as an example shown below. Teachers are recommended to analyse data with children & take out some conclusions which children learnt through survey. (ENRE)



- | | |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------|
| (A) increase price almost double during four months | pointed gourd, ridged gourd, pumpkin, chilli, red amaranth |
| (B) Steady increase | potato, bitter gourd, onion, okra, bottle gourd, garlic, ginger, ceylon spinach, green banana |
| (C) No change | |
| (D) Decrease the price | Yam, elephant foot, snake gourd, (kakur), green papaya |
| (E) Increase & Decrease | Egg plant / Brinjal |

- A children group affiliated to Swarnirvar, in Beliakali village, conducted a survey with vegetable sellers in local market. They raised further question through their survey what is the difference between Local variety ('Deshi') and Hybrid variety of vegetable.

Vegetable	Price (Rs./kg)	From where	Chemical applied on vegetable	Variety Deshi / Hybrid
Potato	4.5	Basir Bazar	Brik dust	D
Onion	6	Local & Kolkata	No	D * Hb
Garlic	50	Basir Bazar & Local	No	D & Hb
Chili	20-25	Local Village & Bazaar	No	D & Hb
Ginger	15-20	Kolkata & Local	No	D
Egg plant	12	Local Village Babur bazaar	No	D
Pointed gourd	6	Local village	No	D
Ridged gourd	7	Local	No	D & Hb
Bottle gourd	5 / piece	Local	No	D
Ceylon spinach	3	Local		
Red amaranth	1.5 / bunch (350 g)			

- The children Collected data form 10 vegetable sellers in Bagjola market.

Times to Sell	Everyday	2 days / week	Sell in other market	Permanent	Temporary
Number of Sellers	3	7	4	3	7



Vegetables

Step 3 — Investigation / Project Work — Activity (B)

'Let's Grow Vegetables in School Garden'

Through the growing vegetables by own hands children can learn many things. But the most important thing is children realize that gardening work is exciting & enjoyable. Children can be proud of themselves to produce own healthy food by environmentally friendly farming method.

[🏠 for both urban & rural schools 😊 class 5 to 8 🗨️ observation, group work, cooperation, gardening skills, keeping record, Math (Area measurement, average) 🕒 4-5 periods (1.5 hours per period) & regular garden care]



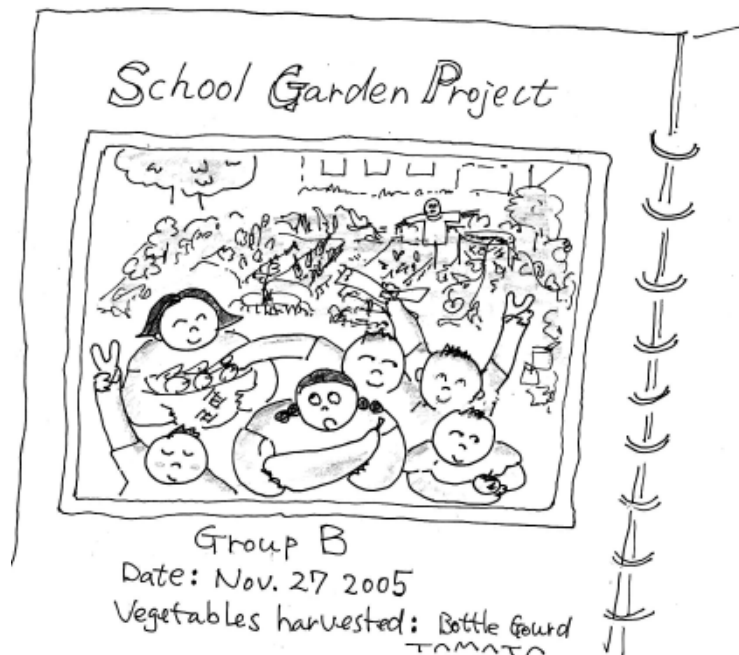
Objectives

- To develop gardening skills for growing vegetables
- To grow awareness of the value of Organic farming
- Teachers can try out 'Garden Based Learning' approach



Expected Products / Achievements through this Activity

- 'Growing record' of own vegetable garden.
- Well designed vegetable garden in school yard and children keep on care.
- Children can apply some garden techniques for saving their immediate environment (eg. compost making from kitchen waste, recycling of greywater from kitchen/bathroom etc).
- Art work from vegetables harvested from the garden.
- 'Garden fund-raising' activity through selling extra harvest or seeds.





Activity Steps

Review and Discussion

Teachers should conduct a short review of the preparatory work. Have a look again at the vegetable list, which are presently grown in home garden. Make sure with the children about the characteristics of those vegetables. Encourage children to grow some of those vegetables.

■ Vegetables suitable for home garden & school gardens :

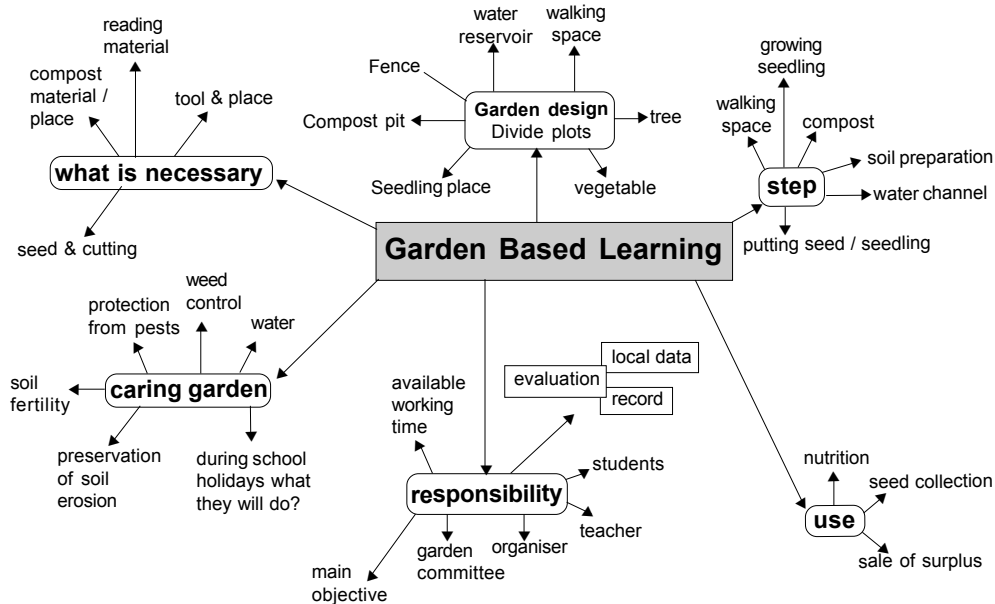
- Are easy to grow in wide range of soil & temperature
- Do not have any major insects or disease problem
- Keep yielding over a long period of time
- Are Nutritious
- Can be also used as medicine or other use
- Have more than one usable parts
- Can be easily propagated from seeds etc saved
- Children may also like to grow some flowering plants, fruit trees etc.

Have a discussion with children to define the objectives & goal of school garden project. Also make children have mutual understanding what responsibility they have to take for successful management of the garden.

(you can refer some points in the following 'Teachers Note').

Teacher's Note

□ Example of School / Home Garden Mind Map



□ Suitable Plants for School / Home Garden – You can select 2-3 plants from each group

➔ **Shrubs & Trees Around House / School Yard**

Banana, Papaya, Lemon, Kumquat (China lemon), Star fruit, Star gooseberry, Guava, Mulberry, Karaunda, Custard apple, Bullocks heart, Passion fruit, Drumstick, Curry leaf, Bauhinia, Hibiscus, Nycanthes, Jasmine, Marigold, Vasaka, Sesbania grandiflora

➔ **Beans**

Cowpeas, Hyacinth bean, Winged bean, Sword bean, French bean, Yard long bean, Green peas

➔ **Roots & Tubers**

Arum, Taro, Sweet Potato, Yams, Potato, Cassava, Elephant foot yam

➔ **Spices & Herbs**

Onion, Bunching onion, Garlic, Ginger, Turmeric, Mint, Lemon grass, Dill, Basil, Coleus, Corriander, African corriander, Mustard, Fenugreek, Anise, Mustard

➔ **Leafy Vegetables**

Basella, Amaranthus, Water convolvulus, Jew's Mallow, Sweet potato, Talinum
Young leaves of several cucumber family crops & beans are also eaten widely. There are many edible weeds which can be grown in small containers - centella, lambs quarters etc.

➔ **Fruit Vegetables**

Gourds / Cucurbits, Tomato, Egg plant, Chilli, Ladies finger, Roselle,

➔ **Trees with edible leaves**

Drumstick, Curry leaf, Tamarind, Neem, Sesbania

➔ **Trees that give Fruit Vegetables**

Plantain, Papaya, Jackfruit, Hog Plum, Karaunda, Star fruit

(Source : Training Note from Ardhendu S. Chatterjee / DRCS)



Preparation

[Seed gathering]

- Together with children, collect vegetable seeds from local home gardeners including children's home garden.
Along with seeds children need to collect information & tips from local home gardeners / farmers about sowing time & how to grow, too.
Children are requested to make a summary information sheet on collected seeds.
- Choose the vegetable seeds which they can grow in the activity season. (on other hand seeds can be kept till for proper sowing time).
< Refer 'Resource Page' p 60 also >



[Site selection]

- Decide & prepare the site of school garden, preferable in a sunny place. Consider the water availability and prepare a fence if necessary. Better start from small manageable scale.

[Compost gathering]

- Collect some good compost from local gardeners for immediate use. (Later children can try to make their own compost). [refer Resource page 86-89]

[Garden tools required]

- List up what kind of & how many garden tools are required. Be ready with them before the garden project work starts.





Investigative Work [Gardening work]

The following garden work can be done by all children together or group based activity.

a) Make garden design & prepare the vegetable beds.

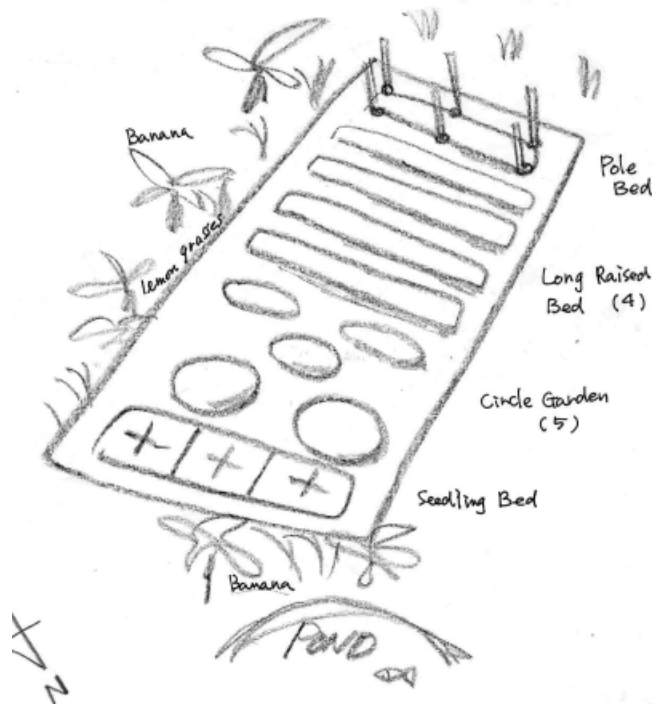
- Together with children, observe and analyse your garden site carefully and write down.
 - What kind of soil?
 - Water source ? How much water available everyday ?
 - Any shady place in plot?
 - Which direction the slope goes? (entry & exit points of water)
 - What kind of trees already exist on the site or nearby ?
 - Does the site need protection ?
 - How far from your classroom / school building? etc.
- Vegetable garden needs to have cultivating place of vegetables (bed) and walking space / pathways.

There are two types of beds which children can try — **Raised bed & Circle garden bed.** < ! Never walk on vegetable bed. >

Consider your garden space & sun direction, make rough garden design combining both these two types of beds.

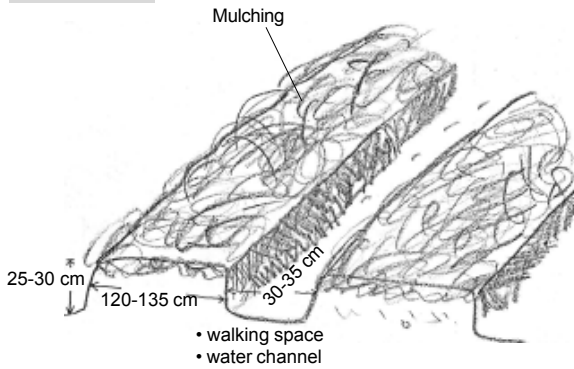
Even you can try with children more interesting garden design like a **Mandala Garden** which requires less space and provides big fun for children.

- Children are suggested to prepare the **Garden Map** & give numbers to each bed for recording.



[Let's try various types of vegetable beds]

Raised Bed

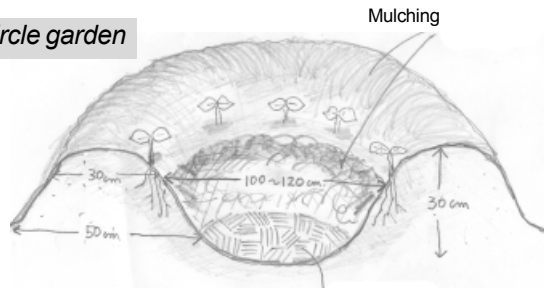


Mulching

Mulching is to cover the soil surface with 15cm or more of organic materials such as dry or green grass, tree leaves etc.

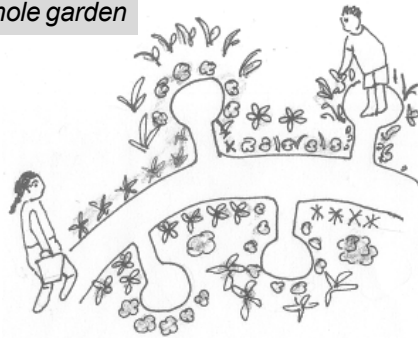
- to add plant nutrients
- to buffer soil temperatures
- to prevent erosion
- to promote soil life
- to control weeds etc.

Circle garden

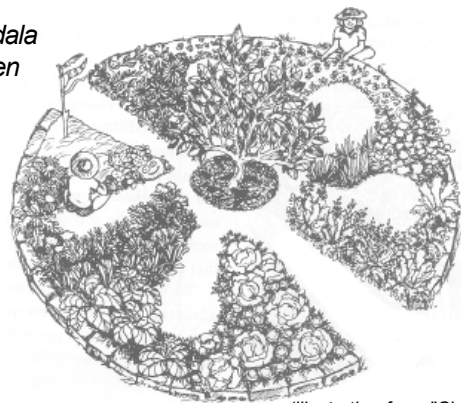


Compost
<How to make : see p 92>

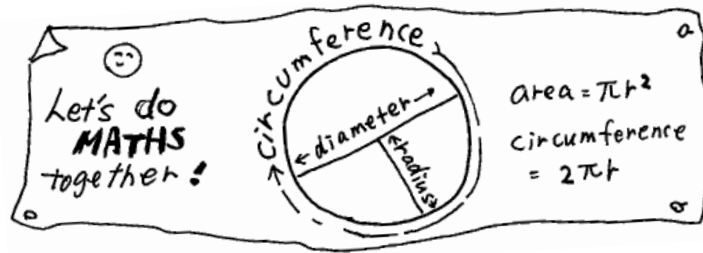
Key hole garden



Mandala garden



(illustration from "Children's Food Forest" pg. 43)



b) Sowing Seeds

Divide children into groups and each group takes responsibility for each bed for sowing seeds & taking care of.

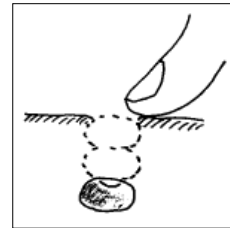
Depending on the vegetable variety there are two types of seeds. Seeds which can be put in the bed directly (**direct sowing**) and the other need to be grown as **seedlings first, then transplant**.

Most of beans & gourds are growing by direct sowing. For tomato, brinjal & chillies, you need to first prepare seedlings, then transplant them into the bed.

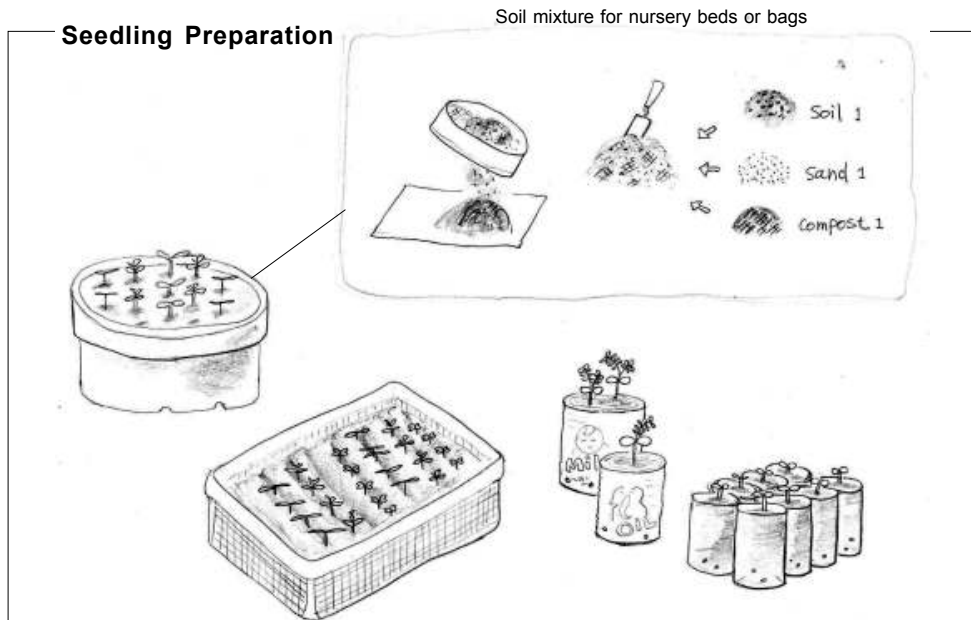
For planting seeds, teacher can advice & make sure again for children important points.

- at least 2-3 kinds of vegetables are grown in one bed. (for using space & water effectively, to avoid the pest problem).
- short height plant grow in front (or side of bed) and tall height plant grow in back (or in middle of bed) for easy harvesting.

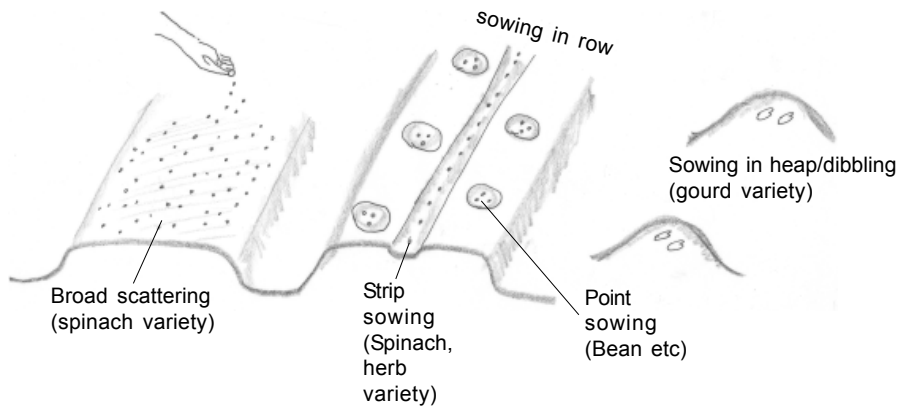
Besides seeds, some vegetables can be propagated from cuttings, runners, tube, bulbs etc.



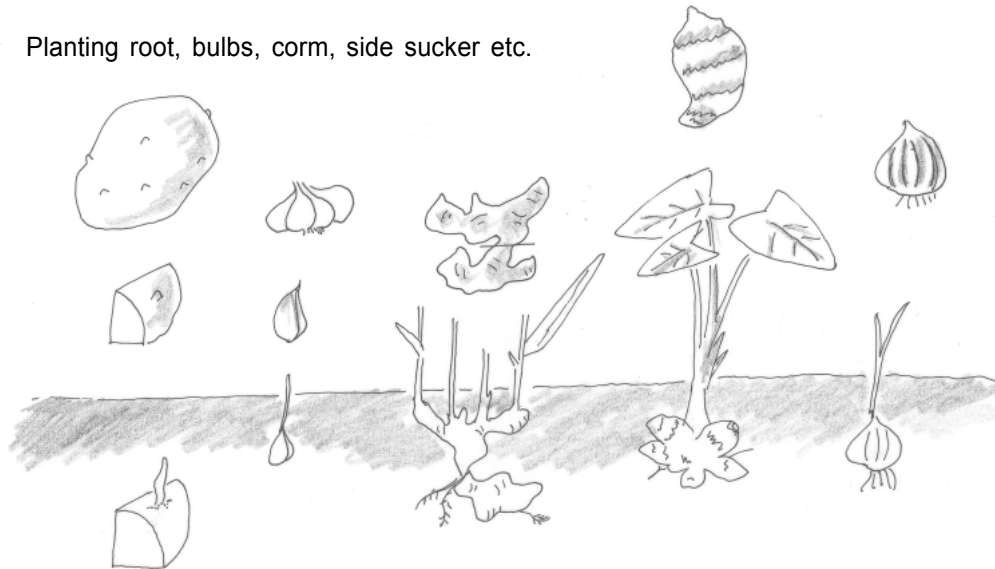
usually 3 times depth of seed



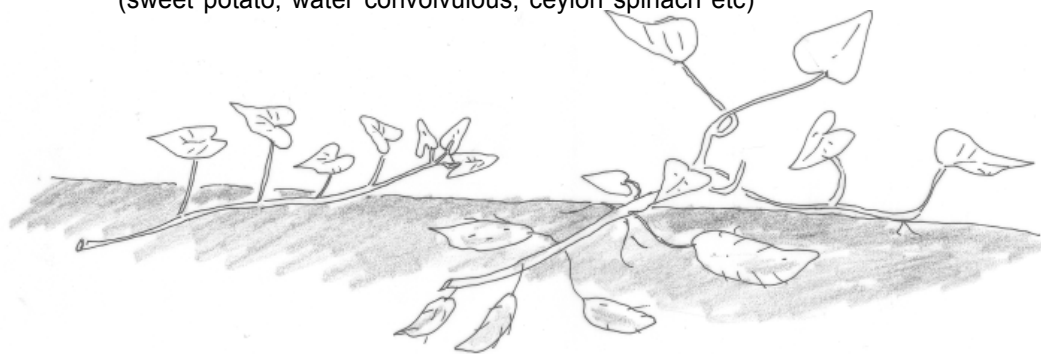
➔ Sowing position (Direct Sowing)



➔ Planting root, bulbs, corm, side sucker etc.



➔ Planting runner, stem or tips (sweet potato, water convolvulus, ceylon spinach etc)



c) Try out some 'Ecological Farming' technique

For growing vegetables organically (without using chemical fertiliser & pesticide), teacher can introduce some interesting method for children like 'using vertical space', 'compost tea' & 'vermicompost' making etc. Through such experiment children can detail on the technique, learn a lot of scientific facts & ecological concept as well. You can see more in Resource section.

- ▶ Use vertical space for increasing growing space

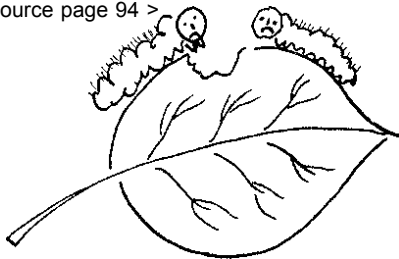


- ▶ Living fence by growing thorny plants, fruit trees and coppiced trees which even cut branches and trunk, again grows.



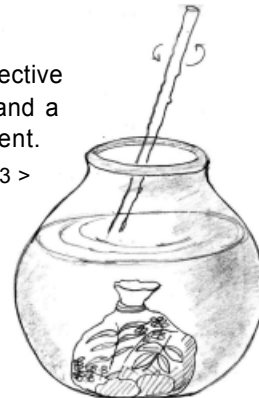
- ▶ Companion planting & Botanical pesticides to avoid insect attack.

< see resource page 94 >

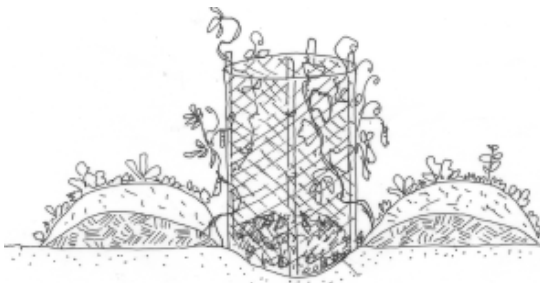


- ▶ Compost Tea is effective both as a manure and a disease control agent.

< see resource page 93 >



- ▶ Compost Net
Use compost net to increase growing space for climbing vegetables.



- ▶ Vermicompost
Help from Earthworm, we can make good compost < see resource page 88 >



d) Growing vegetables & keeping records

Children are requested to keep records on vegetables which they are taking care of.

They need to keep record from sowing to harvest, with measuring plant height, drawing of different growth stage of plant. They need to keep record on insects & other living things on plants etc.

Minimum basic records are 'date of sowing, germination, transplanting, starting flowering, starting fruiting & harvesting.'

Through growing vegetables, teachers can also teach plant science, like flower structure & pollination etc.

[Example of Record Sheet] — for Class V

<ul style="list-style-type: none"> • My vegetable is a _____ It was planted on _____ (date) _____ by (seed, cutting, tubers) _____ • It was planted in _____ (description of planting place) _____ • It was germinated on _____ (date) _____ after _____ days from sowing 	<p>Drawing / measuring</p> <div style="border: 1px solid black; width: 100%; height: 40px; margin-bottom: 10px;"></div> <p>(seed / tube / cutting)</p> <div style="border: 1px solid black; width: 100%; height: 40px; margin-bottom: 10px;"></div> <p>(Germination)</p> <div style="border: 1px solid black; width: 100%; height: 40px; margin-bottom: 10px;"></div> <p>(leaf)</p> <div style="border: 1px solid black; width: 100%; height: 40px; margin-bottom: 10px;"></div> <p>(flower)</p> <div style="border: 1px solid black; width: 100%; height: 40px; margin-bottom: 10px;"></div> <p>(fruit)</p> <div style="border: 1px solid black; width: 100%; height: 40px;"></div>																														
<p>Growth graph</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td style="text-align: center;">height (cm)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">(example)</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>											height (cm)						(example)				Date										
height (cm)						(example)																									
Date																															
<ul style="list-style-type: none"> • It started flowering from _____ (date) _____ • It started fruiting from _____ (date) _____ • Harvesting started from _____ (date) _____ • I harvested total (number) _____ vegetables from one plant • I ate my vegetables by (describe how they ate & how taste was) _____ • I could / could not collect seeds from my plant for next season <p>From my experience & observation :</p> <p>_____</p> <p>_____</p>																															
<p>Student name / class _____ Record sheet start from _____ to _____</p>																															

f) Seed Storage

At harvest time don't pick up all fruits, a few good fruits in a plant should be kept & allowed to ripen for harvesting seeds.

After extracting seeds, they should be kept dry & in a airtight container till next sowing season.

It is also interesting activity that extra seeds can be nicely packed & exchanged with other school garden groups.



Teacher's Note**Learning 'Plant Science' through School Garden Project**

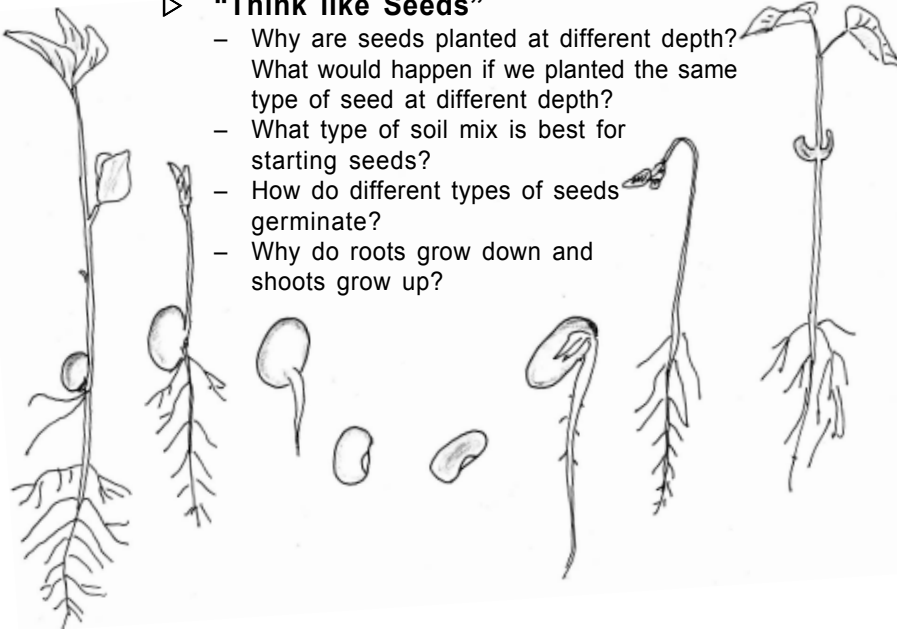
Through hands on gardening work, children have good opportunity to observe and work with plants more closely. Children must increase their appetite to know more about plants. This can help to make Science standards come alive and teachers should use this chance to connect Garden project, out door activity, with Class room lesson.

Some key concepts of Plant science relating various aspects of plants are ; Basic Needs (nutrients, water, air, and sun light etc and different ways of meeting these needs), Structures/Functions (leaves, stems, and roots as an energy producer & seeds, flowers and fruits help plants reproduce), Life Cycles/Changes (germinating and decomposing process etc.), Adaptations (for protection, meeting basic needs, reproduction, dispersing seeds etc.), Diversity (various types of plants from microscopic ones to the big tree), Interdependence (interact, cooperate, and compete as one of components in ecosystem), and Plants & Human affairs (appreciation for the role of plants in our lives as providers of oxygen, food, medicines, shelters, fuel etc.) and cultivating practice of plants etc.

Check syllabus of text book (EVS, Biology, Life science) and make plan how children can learn classroom lessons in relation with Garden project activity. Cultivate children's curiosity on plants and invite their questions & inquiries through own garden experience. A few examples are mentioned here for Classroom connections.

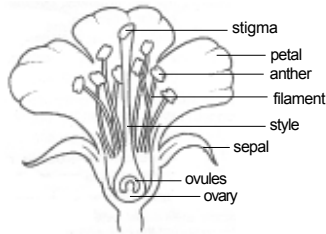
▷ **"Think like Seeds"**

- Why are seeds planted at different depth?
What would happen if we planted the same type of seed at different depth?
- What type of soil mix is best for starting seeds?
- How do different types of seeds germinate?
- Why do roots grow down and shoots grow up?



▷ **“From Flowers to Fruits”**

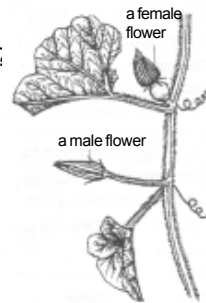
- How do vegetables start fruiting?
- Why do not all flowers in a plant become fruits?



Perfect (Complete) flower has both male and female parts.

Pistil (female part): stigma-style-ovary-ovules

Stamens(male part): another-filament-pollen



Imperfect (Incomplete) flower has only male or female parts.

Plant which has perfect flowers (tomato, beans, chilly, ladies finger etc.)

Plant which has imperfect flowers both male and female flowers (Pumpkin, cucumber, most of the gourds)

Plant which has imperfect flowers either all male flowers or female flowers (Spinach, pointed gourd)

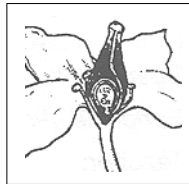
Vegetables and Pollination

The fruits (Vegetables) which develop from well pollinated flowers are well structures, heavy, and tasty. Others which do not develop from well pollinated flowers mainly cucumber and pumpkin detached from the stalk. Fruits which are not well pollinated or partly pollinated become rugged and less tasty or sweet.

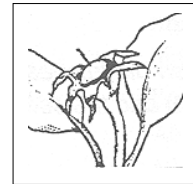
Most of the plants of cucurbitaceous family (Bottle gourd, Ash gourd, Cucumber, Water melon, Pumpkin, Ridged gourd, Bitter gourd etc.) do not have Complete flower. Therefore pollination is very important for them. Pollination by pollinators like bees or any other insects (ants, butterfly, wasps etc) is very important. Tomato, birnjal, lady's finger have complete flowers and they fruit without the help of bees or other pollinators, but formation of tasty and well structured fruit is only possible through pollination. The wind does the pollination for the crops of graminiae family (rice, wheat, meals etc.)



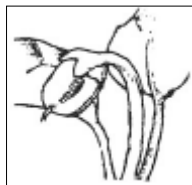
1. Pollen stuck on stigma



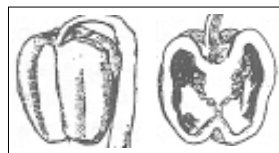
2. A pollen grain germinates, and sends down pollen tube to the ovary. Fertilizes the egg within.



3. The ovule grows into seed, and ovary becomes a fruit.



4. The ovary is a covering to protect the seed.



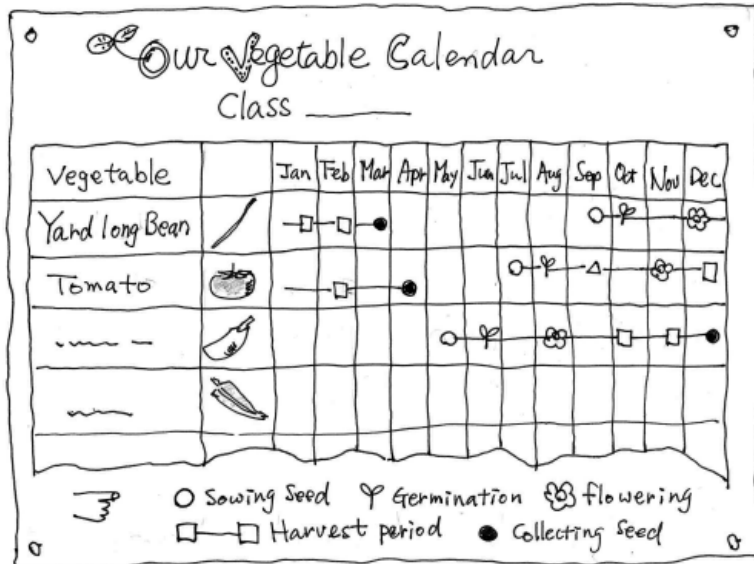
5. The mature vegetable houses seeds for the next generation.

[Reference : Outreach / Preserving Genetic Diversity of Crop Plants : Solution Pack ", Growing Ideas : A journal of Garden - Based Learning /Volumes 1-10", ENRE booklet No.2 Insect, note by Ardhendu S. Chatterjee]



Reporting & Summarizing

- Put together of each childrens record and prepare the 'vegetable growing calendar' on your school garden. Children are suggested to use the following symbols for their calendar.



- Prepare the 'vegetable profile' for each vegetable grown in your garden. This profile sheets are made based on each children's record and these profiles will provide useful information to other children groups who wish to start school garden.
- Summarise childrens' opinion & experience through gardening work.

Vegetable profile

Seed from _____ Name of Vegetable _____ work in field _____

General Information	Record in Our Garden
Local name _____	Date _____ work done _____
Scientific name _____	_____
Sowing Season _____	_____
Germination Period _____	_____
Harvesting Season _____	_____
Growing Condition	_____
☀ sunlight _____	_____
💧 water _____	_____
🌱 soil _____	_____
Nutrition fact _____	_____
Remarks _____	_____

Recorder name _____ Date _____



Towards Local Actions

- Encourage children to start also home-vegetable-garden in each house, by making compost with kitchen wastes & using wasted water.
- With children, make design of school garden's handbook / poster for promoting vegetable growing in community.
- Seed exchange with other school garden group & children's group.
- If you don't have enough space for school garden, try out container garden, roof top garden, no-dig garden with your children.
(see also 'Feedback' pg. 71 & 'Resource' pg. 91)



- Organise school garden exhibition / festival to share with other children in school.



Feedback

Step 3 – Activity (B)



This is one of main project work in 'garden based learning' activity. Through this 'food producing' activity, children can learn about basic gardening skills and designing concept for making a good garden. Children need to cooperate for taking care of own garden. Suitable season for this project work is after rainy season to winter. But teacher can take a challenge with children to make school garden as though- a- year activity by choosing suitable plants & vegetables and also practicing some advanced gardening skills.



Feedback Summary

ENRE Partner Organisation (District)	Swanirvar (North 24 Pgns)	Swanirvar (North 24 Pgns)	Swanirvar (North 24 Pgns)	Kajla Janakalyan Samity (East Midnapur)	Home based group (Hooghly)
Village	Beliakhali	Chandalatty	Kolsur	Parulia & Hinch	Chandan-nagar
School / Group	Magur Kali Janakalyan Samitee	Najul & Titumeer / KKB	Kolsur Secondary School	Parulia Mahasin KKB	Green Sprout
Students	Total 32 (15 girls & 16 boys) into 4 groups	Total 32 (27 girls & 5 boys) into 2 groups	4 boy students	Total 13 (6 girls & 7 boys)	2 children
Class	Class 4-10	Class 5-9	Class 4-6	Class 5	Class 2-5
Teacher's Name	Abul Kalam	Fajlur Rahman, Adhal Manik		Najnina Khatun	Satoko Chatterjee (mother)
Activity duration (Class periods)	Reported Apr, 2002 (2 periods + project work)	Last week of Jul - 20 Aug, 2002 (3 periods, 2 hrs. / p)	ENRE staff visited the village in Dec. 2004	1 Sep - 18 Nov, 2002 (5 periods)	1999-2003



Results

Information from Local farmers

- Children of groups affiliated to Kajla (Parulia & Hinch) interview to five local farmers to find the general situation of vegetable cultivation.

Farmer	Amar Maiti	Durga Sankar Pal	Sek Jalim	Bau-ud-Din	Jalau-ud-Din
Vegetable cultivated	Bitter gourd Brinjal - Ceylon spinach Chili Cucumber - - - Okra - Potato - - - - - Yam	- Brinjal - Chili - - - - Onion Potato - - - - - -	Bitter gourd Brinjal Cabbage Ceylon spinach - - French bean - (Marish sak) - Potato Pumpkin Ridged gourd Roselle Snake gourd - - Yam Yard long bean	Bitter gourd Brinjal - - Chili Cucumber - Hyacinth bean (Marish sak) - - Potato - - - Tomato Turmeric Yam -	Bitter gourd Brinjal Cabbage - - - - Hyacinth bean - - - Potato Pumpkin Ridged gourd Roselle Snake gourd - - Yam Yard long bean
How long	15 yrs	10 yrs	5-6 yrs	2 yrs	3-4 yrs
Insect Problem	Yes	Yes	Yes	Yes	Yes
Insects	Leda, Dosh	Dosha, Leda Doga chidrakari	Jonaki, Leda, Dosh,	Dosha, Leda, Unknown	Leda, Dosh, Jonaki etc.
Protection for insect problem	Metacid	<ul style="list-style-type: none"> Neem leaf Extract Neem bark in Boiling water 	Neem water Dimecron Burning tire mix with ash & kerosene & apply	Liquid manure (Taral saar) Neem solution	<ul style="list-style-type: none"> Dimecron Burn tire Liquid manure with Kerosene Liquid manure
Effect	Yes	Yes	Yes	Yes	Yes
Vegetables which has less insect problem	Yam, Turmeric	Chili, Brinjal	Yam, Turmeric, chili	Turmeric, Yam	Bottle gourd, Roselle, Yam

Season & Vegetable	[Rainy] Okra, Bittergourd [Winter] Potato, Brinjal	[Rainy] Okra, Bittergourd [Winter] Potato, Brinjal	Do	[Pre rainy] Yam Turmeric [Rainy] Spinach [Winter] Potato, Brinjal Tomato	[Winter] Potato, Brinjal Yardlong bean Pumpkin, Cabbage, Hyacinth bean Other vegetable can be grown all season
Seed	Self & Market	Self & Market	Do	Buy from Market	Most of the seeds from home, other buy from market if necessary

- Same children group of Kajla collected several other information from farmers during Sep-Oct 2002

► **List of Vegetables made by Children**

- Brinjal : 3 type (1. white, 2. Thorny, 3. long)
 Potato & Yam : 5 types (1. Round, 2. Sweet, 3. Susni Potato, 4. Khamalu aloo, 5. China Aloo)
 Banana : 1. Green banana, 2. Chapa kola, 3. Chini kola, 4. Patia kola, 5. Shingapuri kola
 Arums : 1. Oul kochu, 2. Mankochu
 Palong saak : 1. Tock palong, 2. Mishiti palong, 3. Panjabi palong
 Note saak : Sada note, Lal note, Kanta note
 Sheem : 1. Farash Sheem, 2. Makon sheem, 3. Torukala sheem
 Chilli : 1. Sada lonka, 2. Choto lonka, 3. Boro lonka

► **Water Required**

Vegetable	lot	Middle	less
Potato	+		
Brinjal	+		
Okra	+		
Pumpkin		+	
Bitter gourd		+	
Pointed gourd			+
Sweet potato		+	
Radish	+		
Carrot		+	
Tomato			+
Yam			+
Snake gourd		+	
Cucumber		+	
Cauliflower	+		
Chill	+		
Cabbage	+		
(Kundri)			+
Ridged gourd		+	
Green banana			+

Home Gardens by Children

■ Mind Map

Vege garden situation – check the soil type – suitable vegetable – water require

Vegetable bed :

Farming – what vege grow – soil preparation – compost making- watering – liquid manure – selection seed – seed collection – difficulties and benefit – know method /process – field map

Vegetable Usage : – as food – as medicine

Insect attack and disease : identify insects, know disease, protection method

Other usage:

Food: vege curry, achar, Jam & jelly, fodder for birds and animals

■ Examples of growing vegetables

▶ Groups in Chandal Atty Village

Children made total 19 home gardens. Among them 7 gardens are well done. Children made sketch map of own vegetable garden and kept growing record. Some children could sell extra harvest vegetables and kept the balance record.

▶ Kolsur village

Children in Kolsur village affiliated to Swanirvar have been working Home garden activity successfully. During visiting Kolsur village in December 2004, we ENRE staff could visit several home gardens managed by children (see Photos p.70). Later we collected the information from those children for sharing their experience in this feedback. The following information was collected in January 2006 with cooperation from teachers of Swanirvar. All children are students of Kolsur Secondary School.

Name of children	Probas Sardar	Tapas Sardar	Tufan Munda	Rita Munda
Class	6	6	8	not attending school at present
The garden started	Early 2004	Early 2003	Early 2003	Early 2003
Is the garden still there?	Yes	Yes	Yes	Yes
Size of garden	Two gardens 1) 39' x 20' 2) 15' x 12'	55' x 15'	20' x 20'	25' x 20'
Water source	Tube well	Pond	Pond	Pond
Vegetables Grown	Bitter gourd, Brinjal, Chili, Elephant foot, Hyacinth bean, Onion, Papaya, Potato, Red amaranth, Ridged gourd, Spinach, Tomato	Ash gourd, Beet, Bitter gourd, Bottle gourd, Brinjal, Cabbage, Cauliflower, Chili, Cucumber, Hyacinth bean, Peas, Potato, Red amaranth, Spinach, Yard long bean	Ash gourd, Beet, Bitter gourd, Brinjal, Cabbage, Carrot, Cauliflower, Chili, French bean, Kohlrabi, Onion, Peas, Radish, Red amaranth, Ridged gourd, Spinach, Yard long bean, Tomato	Ash gourd, Brinjal, Cabbage, Carrot, Cauliflower, Ceylon Spinach, Chili, Elephant apple, French bean, Hyacinth bean, Kohlrabi, Radish, Red amaranth, Ridged gourd, Spinach, Tomato
Any Difficulties ?	No	No	No	No
Family members' feedback	Now we do not need to buy vegetables from market. Expenditure became less also small incomes from extra harvest	(Same as Probas family)	(Same as Probas family) also we are happy to help gardening because we can get 'poison free' vegetables.	(Same as Tufan family)
Children's self feedback	I can do gardening by myself and I'm happy to get some income which helps my study cost.	I am proud of doing home garden, because income by selling extra harvest from my garden can help my study cost.	(Same as Tapas)	I like gardening. By selling extra harvest, we can get income.



Probas Sardar



Tapas Sardar



Tufan Munda



Rita Munda

▶ **Rooftop Garden**

Home based group 'Green Sprout' has Roof top gardening experience. Shantonu and Manosi has started home garden in 1999 with help from their mother, their garden activity continued for 3 years. They identified suitable vegetables for home garden such as Sword bean, Winged bean, Ceylon spinach, Rice bean, Greater yam, Basil and Sweet Potato(vine) etc. (see also their seed exchange activity, page 72). They enjoyed several after harvest activity.



Green Sprout's Rooftop Garden (Yam & winged bean were planted on the ground they climbed up to the roof)



Good harvest of Winged Bean from Roof Garden

Their 'after harvest' activity



Making dry chilli crown



Vegetable Puppet Show



Making pictures from seeds, flowers, leaves



Trying Natural Dye with Anatto Seeds

► **Seed Package Project**

'We started this project during our summer vacation (May - June, 2000). We had many bean seeds in our garden. We decided to sell them because we could not plant all the seeds. we could also earn some pocket money.

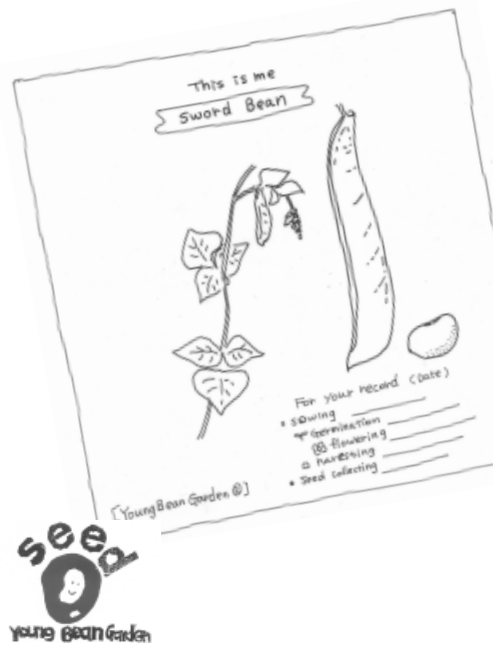
First we decided our project's name Young Bean Garden. We choose this name because we are young, and we use fresh, young beans for packing. Beans can be grown very easily and produce a big harvest. We also learned from our father that beans are good fo^e the soil. We grew two kinds of beans this season, winged beans and sword beans.

We designed the seed packets with help from our mom. But we make the by ourselves. Sometimes it is very hard to make them. We made some mistakes in the beginning, but we still work everyday on Young Bean Garden. So far we've sold out 20 packets. We hope many people will buy our seeds.'

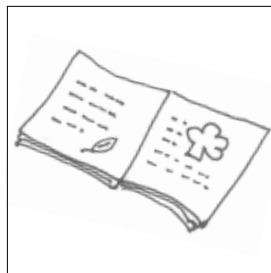
(by Shantonu Chatterjee, 9 and Manosi Chatterjee, 7)



[each seed packet has instruction note on seed]



Resources



to strenghten your guiding role

Growing Vegetables & Fruits can be Enjoyable & Educational

Ardhendu S. Chatterjee



In India a large number of children suffer from malnutrition, some of them do not get enough to eat; though Balwadi scheme, ICDS and recent midday meal scheme are trying to address this problem. Some children eat enough but their diet is often deficient in protein. Vitamin A, vitamin C and iron deficiency is also common among children as they do not eat sufficient fruits & vegetables, especially during the hot & dry season.

What are some of the reasons of a poor diet ?

a) There is a common belief that only expensive foods are good food. So everybody wants to eat cauliflower, cabbage, tomatoes, brinjal, pointed gourd etc and most of these are deep fried or overcooked. Poor families cannot afford these except during short period, so potatoes have become 'vegetable' for them alongwith some green chillies and onion.

b) Many weeds growing in rice fields or gardens or on degraded lands are tasty and nutritious, but they are identified as 'scarcity period food' or 'poor peoples food' as a result many people do not like to be seen collecting or eating them.

c) Many families, particularly in rural areas even today, have no access to clean water. The vegetables washed in dirty water (often after peeling or cutting) get contaminated and those who eat often suffer from waterborne diseases and become weak.

d) Too much oil / fat and spices are used to cook food causing acidity and indigestion. Now a days people like to save time by using powdered spices, which are often adulterated with sawdust, colour powder etc.

e) Readily eatable snacks have become popular both in cities and villages. Most of these foods and drinks taste nice but have little nutritional value and often have too much fat, salt, sugar etc.



f) Most of our surface water sources are polluted with pesticides, agro-chemical residues, chemical detergents etc. As a result many types of edible frogs, mud fish, crabs, shrimps, molluscs etc have disappeared. These used to provide valuable protein to village children in the past.

Shrinking forest and grassland area means hunting of rabbits, partridge, wildfowl etc is not a viable option any more and many kinds of roots & tubers, mushrooms etc have also disappeared from the diet of the rural poor.

g) Lack of crop diversity is another major factor, many millets, legumes, oilseeds are not cultivated any longer and processing at local level has also stopped. Most milling and oil extraction now happens in industrial scale and the husks, brans, oilcakes etc which were used as food or fodder do not return to village anymore. Earlier milk used to be converted to curd and only clarified

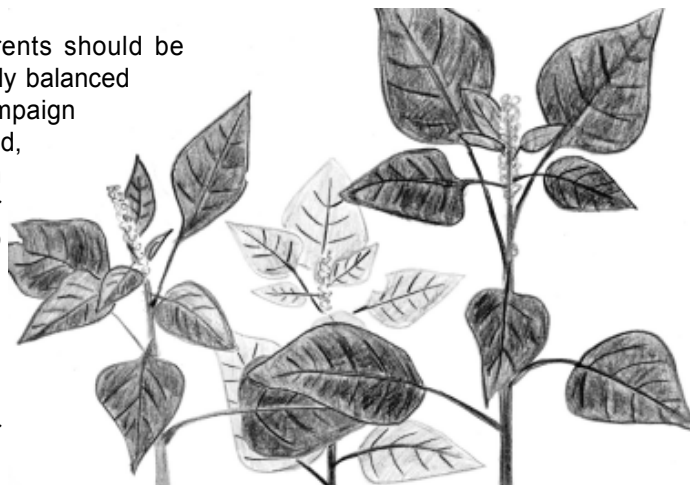
butter was sold, the byproduct butter milk was consumed by children; now all milk goes straight to consumers, and the enhanced income is seldom spent to feed children better.

h) Despite many 'wonderful' schemes and cooked up data showing their successful implementation, many children from resource poor families spend their day herding goats & cattles; usually for the families from whom their parents had borrowed money or foodgrain to tide cover the lean period or a disaster. These children seldom get enough nutrition.

As a result of these and other factors, the number of children in rural areas suffering from malnutrition is increasing; especially among families who are agricultural labourers or artisans with little land and no reliable sources of income. The situation becomes worse if they live in a drought or disaster prone area and their are no healthy forests, grasslands or wetlands nearby; that can be accessed. In the urban areas obesity, diabetes and even heart attack are becoming common among children addicted to junk foods and fizzy drinks.

What are Some of the Initiatives that We can Take

i) Children and their parents should be made aware of nutritionally balanced diet. There should be campaign in favour of locally produced, seasonal food, both grown and collected. The danger of eating food with too much salt, sugar or fat and with chemical colours and pesticide residues should be highlighted and the myth that packaged food & drinks are always safer should be challenged.





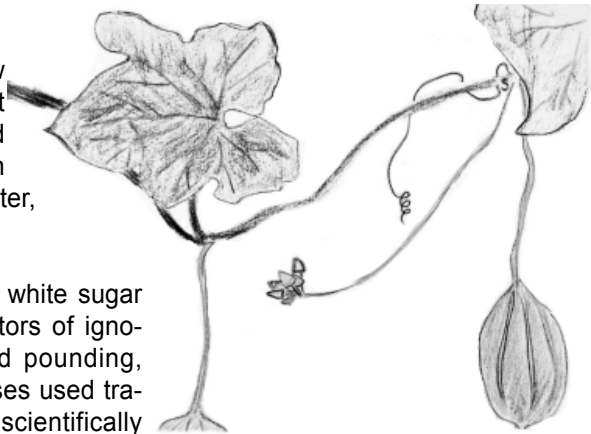
ii) Children should be encouraged to know more about the trees, birds, fish etc present in their environment. Diversity in nature, and in culture should be celebrated and children made aware of need for conservation of water, energy and natural resources.

iii) The fact that polished rice, white flour, white sugar etc are not symbols of richness but indicators of ignorance should be stressed. Malting, hand pounding, steaming, roasting and fermenting processes used traditionally by rural households should be scientifically studied and ways of improving keeping quality through the use of natural spices & colours, solar driers, sterilised packaging etc which can be done at village level.

iv) Every primary & secondary school and every pre-school centre should try to use nearby land to grow vegetables, which may not be expensive, but which have a lots of minerals & vitamins. Cylon spinach, sweet potato leafs & young shoots, winged bean leaf & beans, roselle leaf and fruits, Ivy gourd leaf & fruit etc. are some examples. Drumstick, curry leaf, neem, tamarind trees etc can be grown around the schools to provide edible leaves, especially during dry season. Children can also learn to take care of chicken, ducks, pigs etc at home or learn to take care of chicken, ducks, pigs etc at home or learn to raise earthworms, frogs, fish etc in small containers or ditches.

v) Groups of older children can raise seedling of nutritious fruit trees such as star gooseberry, small guava, zizyphus, wood apple etc. to plant around homes, school building etc OR they could even adopt a stretch along a road or canal and plant it with small fruits, with some support from teachers and elders.

vi) Their should eventually be skill training centres where 14-15 year old children can learn about food production and processing technology etc through scholarship or apprenticeship scheme.



Gardens can help to improve diets of children but they can also be a way to educate both in school and out of school children. We have found 9-12 year old children, can already start some gardening activity and enjoy looking after their own plants. They can learn counting, measuring, calculating percentage etc through gardening and make experiment with vegetable dyeing, vegetable design patterns etc. The mystery of how seeds travel long distances in the air, float on water, are carried by squirrels, rats & birds; and stick to human and animals to enjoy a free ride are interesting facts for children. They can make planting, harvesting, seed saving calendars etc.



Children out of school who are 14-15 year old could attend part time training centres where they may learn to make compost; raise vegetable & fruit trees seedlings; learn to raise ducklings, chicks or fish spawn or fingerlings etc and earn some income as well. They too can learn to measure weights & volumes, understand the chemistry of soil testing, biology of pollination, technology of water harvesting & storage as well as food processing etc.

Teachers & Facilitators, who are concerned about such life based and life centred education will find this booklet useful and may get in touch with us if they need further guidance assistance or Happy Gardening.



Ardhendu S. Chatterjee is the Director of DRCS and has a wide range of working experience and knowledge on Sustainable Agriculture related issues as an expert. He is one of the committee member of "All India Organic Farmers Association" and is involved in other network / groups of Sustainable Agriculture in India and neighbouring countries.

Case Studies of School Gardens

A Special kind of 'School' for Learning Farming — Activities Conducted by NISTHA, a Baruipur NGO Working Women's Empowerment —



Every Sunday morning, children from Baruipur make time to attend a special kind of 'school'. About 20 girls, class 7-9, learn the techniques of ecological farming as their career option...

(The following is an extract from article appear in Hindutan Times on 17.03.2005)

Nishtha, a Baruipur NGO working in 62 villages of South 24 Parganas, is running this programme for farmer's children, who attend normal school as well, to teach them the techniques of Sustainable agriculture. About 90 children are being given the training, of whom 20 have been selected for a pilot project.

These 20 children have been given the training from a specialist from DRCS. The aim of this course is to make children look at farming as a career option and help them understand the theories they learn in school through practical work. Students are being taught how to test soil, measure rainfall, record temperature, select the right crop, and make organic manure and pesticides.

"We select the plants for cultivation keeping in mind the soil characteristics, water availability and the temperature profile. We also make our own manure from cow dung and fallen leaves and pesticides with mixture of Neem extracts and soap," says Rkhi Dhara, a student of Nauliberia Girls' School near Baruipur.

Parents feel their children are finally learning the right thing. Even a few months back they would have forced them to drop out of school, dragged them into family chores and married the girls off as quickly as possible. That attitude had now changed. "My daughter and I are trying out the new farming techniques and helping my husband adopt them," says a woman, whose daughter is a regular at the farming classes and attends school, too.

► If you need further detail, please contact :

Ms. Meena Das

(Secretary, Nishtha, Subuddhipur, De Para, Baruipur, 24 Parganas (S) -74330)

Phone : 033-2433-9865, E-mail: minadas@vsnl.net, Website: www.nishtha.org

**Syllabus on Sustainable agriculture for children
(by Training team of NRM / DRCSC)**

Content & sub content	Methods
<p>◆ Environment</p> <ul style="list-style-type: none"> • Concept of Nutrient cycle • Basic concept of Environment, Ecology & Ecosystem • Different type of rainfall • Measuring rainfall • Measuring max.-min. temperature • Concept of natural vegetation • Study on natural vegetation • Role of Environment in agriculture • Ill effect of modern agriculture 	<p>Chart presentation Lecture / Chart Lecture Practical Practical Lecture Practical / Observation Group Discussion</p> 
<p>◆ Soil</p> <ul style="list-style-type: none"> • Structure component of soil • Importance of top soil • Soil texture & its advantages, disadvantages • Concept of living soil • Soil testing by Kit box 	<p>Lecture / Practical Lecture Participatory discuss Video show Practical</p>
<p>◆ Bio - manure</p> <ul style="list-style-type: none"> • Basic concept of Bio-manure • Different type of Bio-manure • Making compost, vermicompost, liquid compost 	<p>Lecture Participatory discuss Practical</p>
<p>◆ Seeds</p> <ul style="list-style-type: none"> • Concept of seed • Classification of seeds • Dormancy of seed • Seed collection, preservation and treatment 	<p>Lecture Chart presentation Lecture Practical</p>
<p>◆ Nursery</p> <ul style="list-style-type: none"> • Concept of nursery • Raising vegetable, multipurposes trees, and fruit tree nursery 	<p>Participatory discuss Practical</p>
<p>◆ Organic cultivation practices</p> <ul style="list-style-type: none"> • Local vegetables • Mushroom • (Rice) • Collection, identification and preservation of different pest and friend insects 	<p>Practical Practical Practical Practical</p>
<p>◆ Herbs</p> <ul style="list-style-type: none"> • Importance of herb • Identification of local herbs and their usage • Producing herbal products (Skin ointment, Cough syrup etc.) 	<p>Lecture Survey & Discussion Practical</p>

The duration of the course is 1½ year. Every sunday morning children get gathered and once a month a trainer from DRCSC guides them. The children completed this course are divided into 5 groups (4 children each group) and give mothers and other school children handy guide of Ecological Agriculture. To increase their capacity as 'young instructor', communication and presentation skills are also added into the curriculum.

Example of Urban School Garden — Loreto School, Sealdaha, Kolkata —

Some students' group of Class 5-8 of Loreto School were trying to find some space in their household for growing vegetables. Their interest for gardening had been increasing gradually, when one of the teachers got some information about DRCSC and contacted the centre for seeking gardening guidance.

In June 2005, Sustainable Agriculture Training Staff of DRCSC visited Loreto school and gave students the introductory training for beginning a school garden. The students were given basic idea of a School garden, soil management, soil testing, and garden map making and in turn showed their eagerness to start their school garden.



'Food Producers of our School' (September 2005)

Students started working on their school garden by making vegetable beds, growing



'School Garden after 3 months' (September 2005)

living fences, etc their work gradually expanded to Compost making and Tree nursery. They enjoyed all garden skills they learnt, and their school garden is still continued by the students. They grow various kind of legumes crops, beans, spinach, water convolvus, sweet potato, egg plant, lady's fingers, ridged gourd etc. Recently the students produced Vermicompost using their kitchen waste and even made a water tank for fish such as Climbing Perch (Koi maach) along with aquatic plant called Azora. When their gardening activities were introduced on a newspaper article, the students must have been proud of themselves.

- For further information, please contact Ms. Chandana, Loreto School
OR ENRE team / DRCSC

Preprimary school gardens in dryland area for improving children's nutrition status — Examples from Birbhum and Bankura district —

Village nursery schools were started in Santhal (one of tribal in West Bengal) village started 4-5 years ago as part of one of DRCSC's projects called Multi Purpose Education Centre (MPEC) project. The centres are located in dryland areas and especially in tribal villages to improve the villagers' means of livelihood and food security. Each centre provides for early childhood education, adolescent class, and mothers' class. Also several efforts have been made to increase villagers' involvement in managing the centre. Nursery school garden activity is one of such efforts. With guidance from project field workers, parents and other community members are encouraged to establish a nutrition garden in the compound of each centre. Since the soil is very poor and water is scarce in these areas, it takes



MPEC Centre in Madhavpur village, Bankura district. The beginning of the centre garden in 2003. The soil is rather poor and dry. Children wash their hands and reusing the water for garden with help from the teacher.

a few years to improve the gardens alongwith suitable gardening techniques.



MPEC Centre in Sarbanandapur village, Birbhum district. The garden was in the second year in 2003.

Regular watering is done by mothers in turn and nursery children learn to use their waste water for gardening. Once a garden is established, green vegetables harvested from the garden can make children's midday meals more nutritious. These meals are also cooked by mothers in turn. Through this nursery school garden, the mothers can learn about the preparation of nutritious food and also to start their own home garden. Year by year, the nursery school gardens increase

their crop variety and various fruit trees / herbs are planted to expand the harvest period whole year round. At present in 2006, these gardens are quite green and well managed.

- ▶ For further information, please contact Education Team in DRCSC.



Lunch time ! Balanced diet can help improving children's growth. (MPEC centre ~ Madhavpur)

Summary Information on Vegetables Appeared in this Booklet

⊙ suitable for school / home garden

* not suitable for school / home garden

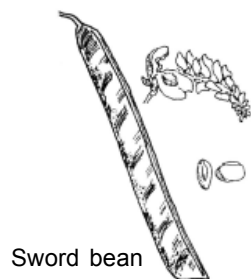
	English Name	Bengali Name	Sowing season						Days to harvest from Sowing	Remarks
			Dry			Wet				
			early	mid	end	early	mid	end		
Roots & Tubers (Kohl)	Beetroot	Beet								
	* Cabbage	Bandha kopi								
	Carrot	Gajor							70-120 days	
	* Cauliflower	Phulkopi								
	⊙ Elephant foot yam	OI or OI kochu							5-6 months	
	Ginger	Ada								As herb & spices
	Kohlrabi	Aul kopi								
	* Onion	Peanj								
	* Potato	Aloo								
	Radish	Mula or Mulo								
	⊙ Sweet potato	Rangaalu or Mishti alu							3-6 months	Leaves also edible & planted throughout the year
	⊙ Taro	Mukhi Kochu							8-10 months	
	⊙ Turmeric	Halud							7-8 months	As herb & spices
⊙ Yam	Khamalu/ Chupri Alu							7-8 months		
Leafy Vegetables	⊙ Amaranth small	Note sak		▷	▷				30-45 days	Sada note Kanta note
	Amaranth, Red	Laal sak							30-40 days	Harvest can continue for a long time if planted in succession
	Black Colocasia leaves	Kachu sak		▷	▷				45-65 days	
	⊙ Bottle gourd Leaves	Lau sak								(see Bottle gourd)
	⊙ Ceylon spinach	Pui sak							60-70 days	Propagated also through stem cuttings

List of Vegetables

⊙ Coriander leaves	Dhane pata							24-45 days	
Drumstick leaves	Shojne pata							Throughout the year	Perennial plant (Tree)
⊙ Fenugreek leaves	Methi sak							25-30 days	
Garden sorrel	Tak palang							30-40 days	
Indian Pennywort	Thankuni							45-60 days	
Ivy gourd leaves	Telakucha sak			▷				30-40 days	grows naturally
Jute leaves	Paat sak							30-60 days	
Leaf onion	Peyanj sak								
Pig weed	Betho sak							30-40 days	Grows naturally in weed fields
⊙ Pumpkin leaf	Kumro sak								
Radish leaves	Mulo sak					▷	▷	15-20 days	
Spinach	Palang sak							30 days	Mishti palang
⊙ Water convolvulus	Kalmi sak					▷		60-90 days	
⊙ Water leaf / Talinum	Panjabi palang or Dopati palang			▷				35-40 days	Once grown spreads quickly, also propagated through stem cuttings
B. 'Gima sak'	Gime sak							25-30 days	Mollugo sp. Grows naturally
B. 'Kulekhara sak'	Kulekhara							always	Grows naturally
B. 'Punarnava sak'	Punarnava, Sant sak							25-35 days	Grows naturally
Ash gourd	Chal Kumro								
⊙ Bitter gourd	Ucche / Karala							60 days	
⊙ Bottle gourd	Lau							70-85 days	
⊙ Chilli	Lanka			▷		▷		70-90 days	Sada lanka, choto lanka, bolo lanka
Cucumber	Sasha								
Drumstick	Sojne / Najne								
Egg plant / Brinjal	Begun								White, thorny, long varieties

Fruit Vegetables

	Elephant apple	Chalta							
	Plantain	Kanchkala							
	⊙ Green papaya	Kancha penpe							
	Hog plum	Amra							
	⊙ Lady's finger / Okra	Dheronsh or Bhindi					60-90 days	Soak seeds 24 hrs in water before sowing	
	Pointed gourd	Potal							
	⊙ Pumpkin	Kumro					100-110 days	Sweet pumpkin, rainy season pumpkin	
	⊙ Radish	Mula, Mulo						White radish, round radish	
	Ridged gourd	Jhinge					70 days		
	Snake gourd	Chichinge							
	Sponge gourd	Dhudhul							
	⊙ Tomato	Tometo					70-100 days		
	Melon	Kankur							
Beans & Peas	⊙ Cluster bean	Guchhabin					60-90 days		
	French bean	Faras bin					30-45 days		
	⊙ Hyacinth bean	Shim					5-6 months		
	Peas	Motorshuti					45-90 days		
	⊙ Sword bean	Makhon sim					3-5 months		
	Yardlong bean	Barbati					45-50 days		
	⊙ Winged bean	Kamranga sim					4-5 months	2 months harvesting period	
Others	Banana flower	Kolar mocha							
	⊙ Roselle	Tak dhanrosh or Chukur					35-45 days	Both leaves & fruits edible	



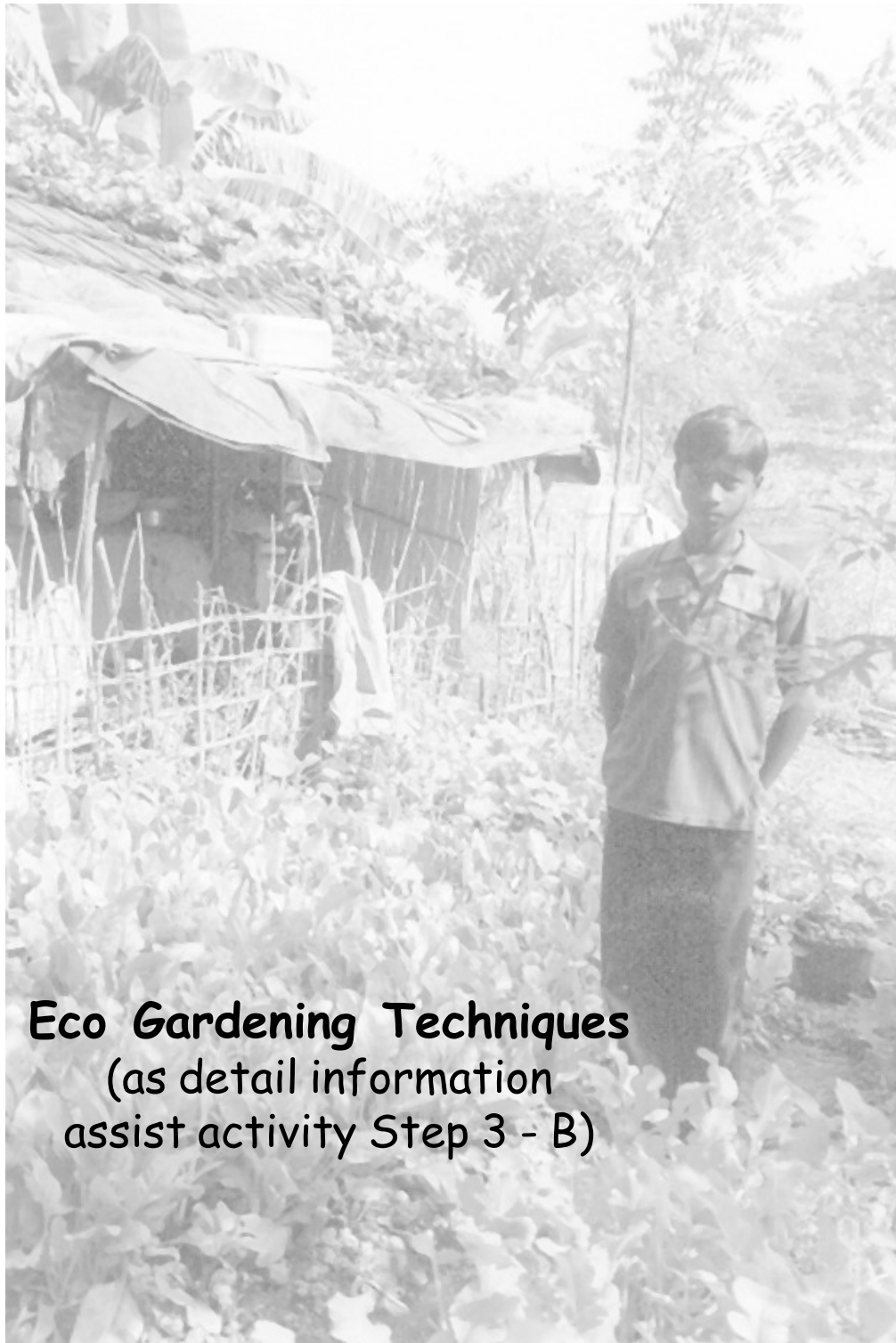
Sword bean



Winged bean



Roselle



Eco Gardening Techniques
(as detail information
assist activity Step 3 - B)

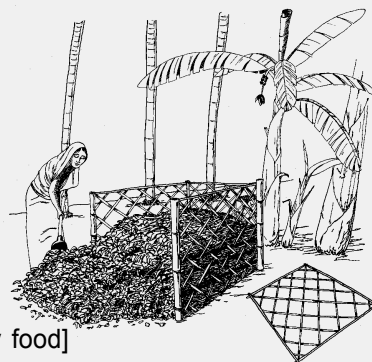
Compost

Compost is natural fertilizer made from rotten organic waste such as garden waste (leaves, weeds, branches etc) and kitchen waste (vegetable / fruit peels etc). The process of making compost is simple, children can also easily prepare compost. Compost activates the power of microorganisms that help make soil fertile.

What you need:



You need two types of organic wastes for preparing compost.

- (1) Dry organic matters such as rice straw, dry tree leaves, post-harvest residues, cotton or jute waste, saw dust etc. These materials contain Carbon element, good food for microorganisms that decompose organic waste. [similar to energy food]
- (2) Raw organic matters such as cow dung, droppings of small birds & animals, fresh leaves (specially leguminous plants leaves are good), aquatic weeds, fruit & vegetable skins etc. These materials contain more Nitrogen, that is also an important food for microorganisms. [similar to protein food]



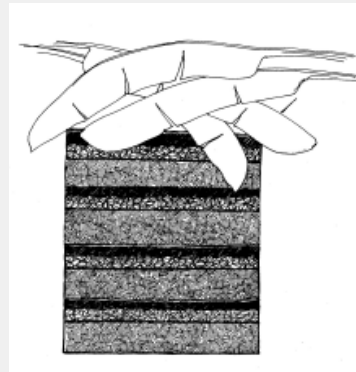
Steps of making compost:

- (1) Site selection
Choose the location where get half shade and well drainage. The site should be protected from direct sun, heavy rain, and water logging.
- (2) Different design
There are two types of composting.

Type	Pit compost	Heap compost
Description	The depth of pit should be less than 1m (3 ft) and the size is 1.5m-1.8m (5-6ft) square.	About 1.5m-1.8m (5-6ft) square and 1.5m (5ft) height. Often bamboo frames are used for keeping work easier.
How it looks		
Condition	Good for dry land area and dry season. Require more labor than the heap type, if we turn the material.	Good for wet land and rainy season. Suitable to try out with children.

- (3) **Better drainage**
Place bricks or pieces of bamboo in the bottom of the base for better water drainage. (for both type)

- (4) **Ratio of materials**
The ratio of volume for each material -
Dry material : Raw material : Soil = 3 : 2 : 1
If you have only limited amount of cow dung, make cow dung solution with water and spread it over the dry material.



- (5) **Making layers**
Make a layer of dry material first, and make wet with cow dung solution. On top of that, make the second layer with raw material, then spread soil on top of that. Repeat this process till the required height.
- (6) **Setting a 'bamboo pipe'** (cut half about 2 m long bamboo, remove the partitions and make small holes using nail. Reattach each half binding with rope / wire) middle of the compost heap. This pipe helps releasing excess heat and methane gas.
- (7) **Protect the compost pit/heap from drying up/ heavy rain by covering the top with Banana leaves / jute bags.**
- (8) **After one month, turn over your compost and add moisture by spreading water, cover it with soil. It takes 2.5-3 months for compost to be ready for use.**

How do you know your compost is ready to use:

- (1) You do not feel any heat when you enter your hand in the compost pit
- (2) The compost does not have any rotten/bad smell
- (3) You can not see original form of materials
- (4) The color of compost is dark brownish black and not sticky.

How to use compost:

Mix the compost with soil before sowing/ transplanting.

When you stock compost, it should be kept at one corner of the garden and covered with jute sack. It is recommended that you should apply atleast a small quantity of compost during rainy season's cultivation.

Tips for good compost making:

- Don't expose your compost pit in strong sun / rain
- Keep compost pit away from water logging, but maintain 70-60% moisture always
- Make compost materials into small pieces before layering them
- Rock phosphate or ash can be mixed with compost

(Translated from SAN training note 'Compost' in Bengali, DRCSC)

Vermicompost

Small Scale Household based Production

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.

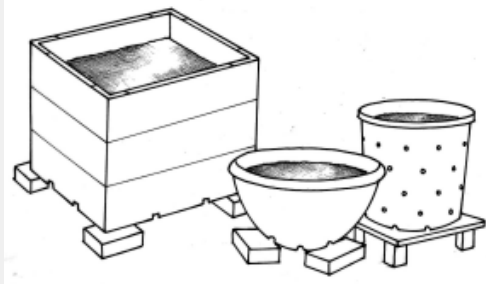
Earthworms can be sold as fish food, chicken food, vermicompost starter etc and can be used at home garden or farm to feed fish, chicken, duck etc.

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.

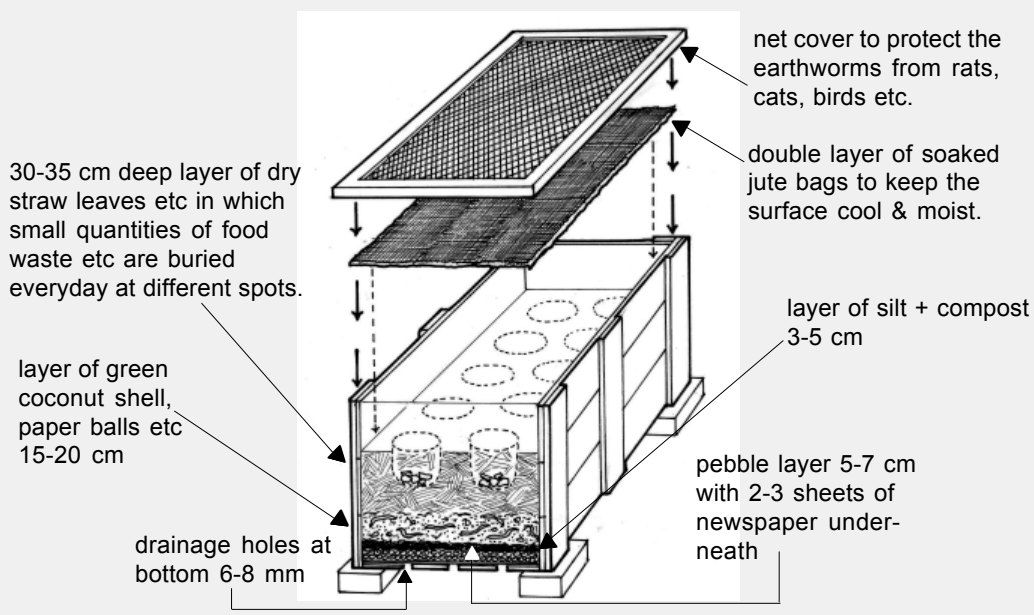
Maintenance : Sprinkle some water to keep the jute bag wet & bury the kitchen waste in the straw layer use a different spot everyday, this takes only 5-10 minutes per box.

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,



Sheet Mulching Garden as No - dig Garden

Sheet mulching is very interesting method to create vegetable / flower garden by using organic waste. This can also be good school activity to grow awareness of waste management. Most importantly, this method does not need 'hard-work' like turning or digging soil to make garden. You just need to create layers of organic waste and all the layers need to be thoroughly wet. However, in the long term, a sheet mulched garden will require less water than a normal 'hard work' garden. And you can do plantation almost immediately in sheet mulched garden immediately.

In general, Mulching is to cover the soil surface with 15cm or more of organic materials such as dry and green grass, tree leaves etc. The benefits of mulching are, to add plant nutrients, to buffer soil temperatures, to prevent erosion, to promote soil life, to control weeds, to restore soil structures so on.

To create 'Sheet Mulch Garden', you need 35-45cm depth of layer of mulching. The steps are as follows.

[source : 'Earth User's Guide to Permaculture' / Rosemary Morrow, Kangaroo Press, 1993]

WHAT TO DO

- Slash long grass and weeds
- Wet whole area thoroughly
- Add some agricultural lime (if necessary)
- Do the following layers
Soak paper, cardboard, underfelt or even old carpet.
Lay overlapping sheets over whole area.
- Mark out border with bricks or timber
- Throw any organic waste such as grass clippings, garden scraps or weeds on garden bed.

WHY DO IT

- Clippings decompose and add organic matter to the soil
- Rain won't reach the soil through the layers
- Helps bind any heavy metals so they can not be taken up by plants
- Stops weeds and adds more organic matter to the soil.
- Shapes garden space
- It will also decompose and turn into humus.

WHAT IT LOOKS LIKE



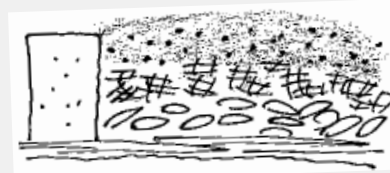
- Add old hay or grass to 15 cm deep

- More compost to turn into humus



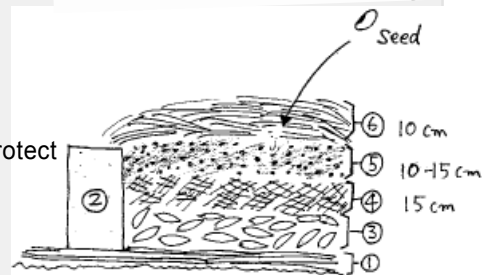
- Add 10-15 cm of rotted manure, compost or mushroom compost

- Immediate source of plant nutrients



- Add layer of clean weed free mulch (10 cm) such as straw, rice hulls

- Hold water in retain volatile nutrients, protect seedlings, soil temperature control



Garden is not necessary to be always square shape. Especially in small-scale garden, wavy edges are used to increase the area available for planting. Also, children can have more fun.



Easy for children to prepare



Easy for children to grow

Circle Garden

Circle bed is good for saving space and water, also absorbs extra water in rainy season.

The diameter of a circle bed is usually 1 m, and 2 m distance of each center of circle bed.

How to make circle bed

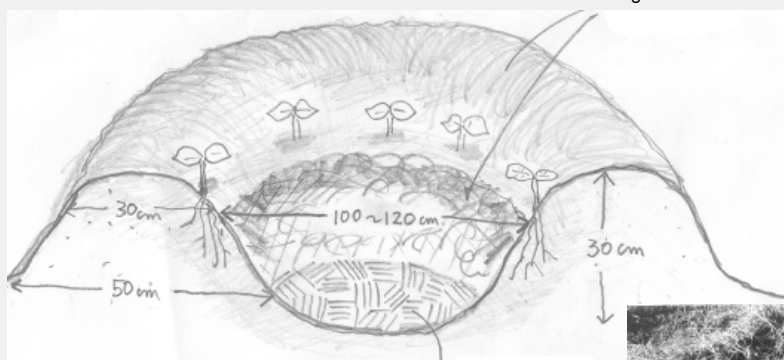
You need 1 spade, 2 sticks and 1 rope (about 0.8 m)

- 1) Remove weeds of the place where you want to make circle bed
- 2) Put the circle mark by going round with 0.5 m radius
- 3) Make soil soft out side the circle line
- 4) Dig the center part and put soil surrounding the circle
- 5) Keep the bed shape properly. (mountain shaped with 30 cm wide bottom & 20 - 25cm height)
- 6) Put compost & organic matter in center part
- 7) Sowing the seeds on the slope of bed (Be careful !! Not on the top)
- 8) Do mulching
- 9) Watering



Later you can plant Creeper vegetable like pumpkin on outer slope of the circle bed. You can put kitchen waste time to time in the center part of circle bed.

Mulching

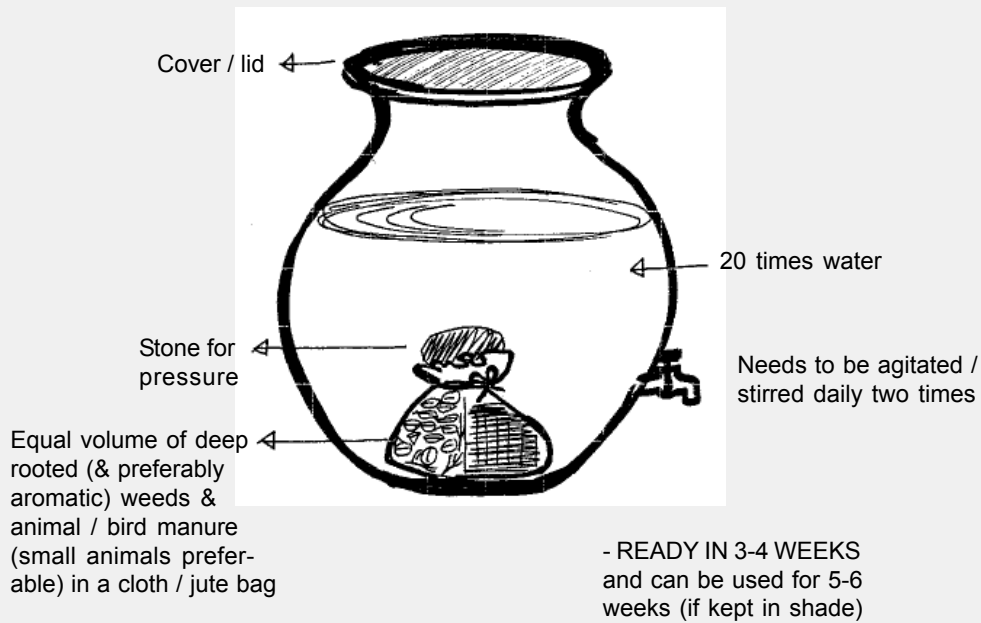


Compost



Compost Tea (Microbial Fertiliser)

Compost tea is liquid manure, specially suitable for home gardens (specially in households where cows, pigs etc not available but there are few ducks, chicken, sheep, rabbit etc).



About 1 litre of compost tea for every 1m² of planted area every week is usually adequate for most vegetables. This can be added directly to soil or mixed with water 1:1 and sprinkled on the leaves. Seedling beds and plants showing deficiency symptoms may need more frequent application (2/3 times a week)

Companion Plants

These are plants which are recognized as helping other plants in one or more of the following ways:

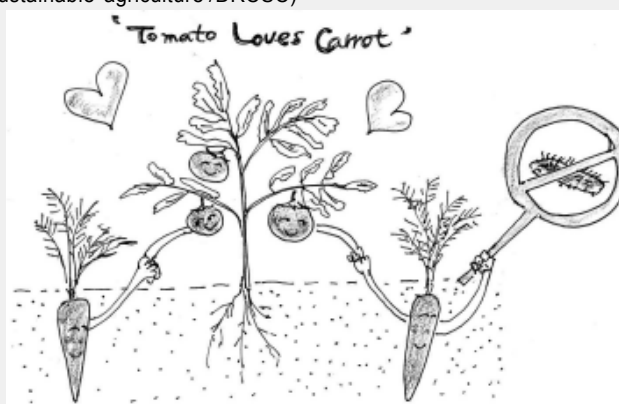
- The smell of the volatile oils discourages certain pests.
- Nitrogen-fixing plants of the legume family supply nitrogen to other plants.
- Some plants have shapes which confuses the pests' recognition ability.

You should try to grow herbs and flowers throughout your garden; in many cases they will interact to assist each other. It is also a good idea not to plant in straight rows because pests can move easily from one plant to the next in the row.

(Extract from "Earth User's Guide to Permaculture" p.80)

Vegetables	Combination	Vegetables
Beans family such as Yard-long bean, peas, hyacinth bean, soya bean	Like ☺	Most other vegetables
	Dislike ☹	Onion, Garlic
Cabbage, cauliflower, Khlkor etc	Like ☺	Legume family, crops, Beet, Onion, Radish, Peas
Tomato, Brinjal, Chilies	Like ☺	Basil, Onion, Legume family crops, Carrot, Coriander, Marigold flower
	Dislike ☹	Mustard family crops
Pumpkin, Mustard etc	Like ☺	Yard long bean, Radish
	Dislike ☹	Coriander, Basil
Potato	Like ☺	Legume family crops, Onion, Marigold flower
	Dislike ☹	Pumpkin, Mustard etc

(Translated from 'Training note on sustainable agriculture'/DRCSC)





References

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

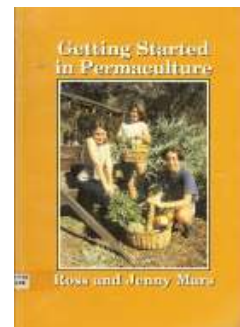
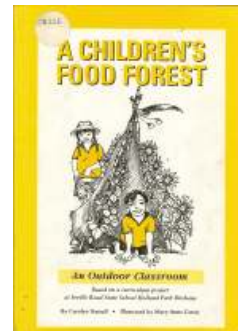
Books and Booklets on VEGETABLES

For your convenience we have put some categories.

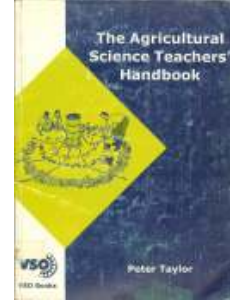
Category (A) - useful for producing materials, (B) - useful teachers & field workers, (C) – materials for children

- Recommended materials for Environmental Education
- Recommended for school library

- People's Farming Workbook /David Philip, Environmental and Development Agency Trust, 1995, 250p. / (A)
- How To Grow More Vegetables / John Jeavons, Ten Speed Press, 1974, 113p. / (A)
- Lessons From Nature / Shimpei Murakami, PROSHIKA, 1991, 102p. / (A) (B)
- My Big Book of Vegetable / Dreamland / (A) (B) (C)
- Know Your Vegetable / Aroka Book /(A) (B) (C)
- Nutrition Almanac / Nutrition Search Inc. 1973 /(A)
- Getting Started In Permaculture / Ross and Jenny Mars, Condleight Trust, 1994. 60p./ (A)
- Earth User's Guide To Paermaculture / Rosemary Morrow, Kangaroo Press, 1993, 152p./ (A) (B)
- A Children's Food Forest: An Outdoor Classroom / Carolyn Nuttall, FeFL Book, 1996, 72p. / (A) (B)
- Nutrition Garden In Cambodia / Ardhendu S. Chatterjee, JVC -Cambodia, 32p./ (A) (B)
- On –Farm Conservation Of Seed Diversity / Green Foundation , 1998, 50p. / (A)
- OUTREACH- Biodiversity Series Issue Pack : Genetic Diversity and Food Crops / Outreach/ (A) (B)
- OUTREACH- Biodiversity Series Solution Pack: Breeding Your Own Crops / Outreach / (A) (B)
- OUTREACH- Biodiversity Series Solution Pack: Preserving Genetic diversity Of Crop Plants/ Outreach / (A) (B)
- Home Garden In South Asia / Helen Keller, 1993, 109p. / (A)
- Improving Nutrition Through Home Garden / FAO, 1995. 171p. /(A) (B)
- 'Growing Vegetables'(p.p39-44, Child – to Child, A Resource Book Part 2) / Talc, 1992, / (A) (B)
- Grow Lab: A Complete Guide To Gardening In The Classroom / NGA, 1999, 127p./ (A) (B)



- Grow Lab: Activities For Growing Minds/ NGA, 1990, 305p./ (A) (B) □
- Growing Ideas: A Journal of Garden Based Learning /NGA / (A) (B) □
- Digging Deeper/ Joseph Kiefer, Food Works, 1998, 141p./ (A) (B) □
- The Agricultural Science Teacher's Handbook / Peter Taylor, VSO, 142p../ (A) (B) □
- Bio-intensive Approach To Small-scale Household Food Production / IIRR/ (A)
- How to Grow a Balanced Diet : A Handbook For Community Workers/Ann Burgess, Grace Maina et. Al., VSO, 1998 / (A) (B) □
- School Gardens Concept Note: Improving Child Nutrition and Education through the Promotion of School Garden Programmes / SPFS-FAO, 2004, 14p./ (A) (B)
- Festivals of Biodiversity: 13 Celebrations in 12 Months / Kusum Misra Panigrahi, NAVADANYA, 1999, 82p./ (A) (B) (C) □ □
- The Food Forest Resource Sheets: Multiple Learning Outcomes in School Gardens / Carolyn Nuttall, FeFL Books, 2000./ (A) (B) (C) □
- On Composting: Recycling of Organic Wastes / Venkat, Manchi Pustakam, 2004, 31p./ (A) (B)
- A new generation of farmers ('LEISA', June 2004, VI.20. No.2) / LEISA Magazine/ (A) (B)



Bengali Books (বাংলা বই)

- প্রকৃতি থেকে শেখা : উষ্ণমন্ডলীয় দেশে পরিবেশসম্মত কৃষির নির্দেশিকা / সিমপেই মুরাকামী, প্রশিকা মানবিক উন্নয়ন কেন্দ্র
- বাংলার শাক : খাদ্য ও ওষুধ হিসেবে শাকের ব্যবহার / সার্ভিস সেন্টার, ডি.আর.সি.এস.সি
- ঘরোয়া বাগানের সবজি : পারিবারিক পুষ্টির আধার / সার্ভিস সেন্টার, ডি.আর.সি.এস.সি



Interesting Lesson Plans on Waste

- The followings are the examples of lesson plans from websites & journals. You can directly access to each site or contact us, ENRE lesson plan bank, for the detail.

Lesson plans	Level	Website
Sowing Seeds of Inquiry Gardening	Primary	www.wompkee.com
Food gardening in School	Upper primary	www.panasia.org.sg
Seeds Germination	Primary	http://cityfarmer.org
Vegetative propagation	Teachers' guide	www.anet.com
Flower variations	Upper primary +	http://dia.payson.tulane.edu
Delicious Diversity	Primary	www.earthfoot.org
Seeds	Primary	do
Biodiversity : Student Activity	Primary	do
The world's Largest Vegetable	Secondary	www.wri.org
The Gourd Explored	Upper primary +	http://pa.lww.org
Food Plant Life Stories	Primary	www.wowpages.com
Gardens providing Learning Opportunities for Students	Primary	do
Pumpkin Investigation	Primary	www.villagelife.org
From Thinking to Doing	Primary	http://teachers.net
The Noosa remi-Kids Experience	Teachers' guide	'foxfire Journal'
Permaculture in Primary Schools	Primary	Note by Fiona Ball
Environmental Exploration	Primary	do
Curriculum Draft	Primary	do
What are the Parts of a Flower	Primary	http://ericir.syr.edu
Gardening for Kids	Upper Primary +	http://geocities.com
Crafts and Gardening Sites for Children	Primary	www.lionshouse.org
Gems form the Garden:		www.education-world.com
Digging up Activities for all Ages		
Planting – Maintenance	Primary	www.amprior.com
Gardens for Growing People	Primary	www.svm.net
Cultivating Connection	Primary	www.wompkee.com
Nutrition Lesson	Primary	do
From the Ground up	Secondary	www.gatwest.net
Step by Step Guide to Starting a	Primary	http://aggie-horticulture.tamu.edu
The "Growing Science Centre"	Primary	do
Schools Garden That didn't Work	Primary	http://forums.gardenweb.com
Using your Imagination Garden	Primary	http://4garden.msu.edu
A Parmaculture School Garden	Primary	'Green Teacher-78'

- We also recommend free e-bulletin "Kids Garden News" by National Garden Association (www.garden.org). This monthly e-bulletin contains useful information such as 'Resource for Educators', 'School Garden Research', 'Funding Opportunities' etc.

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) _
- 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) _
- 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 – volume 1, Grades 7-9 – Unit 4 " Haura O'connor, 1985, Schilits Audubon Center / p 76-98 (A) (B)
- Book 'Curriculum Planning' ("A Children's Food Forest" Carolyn Nuttall, 1996, FeFI Books / p 53-72 (A) (B) _
- Booklet "Toward a Green Future : A Trainer's Manual on Education for Sustainable Development " CEE, 1999 / 111p. (A) (B) _
- Book "The FoxFire Book" / Eliot Wigginton & his students / Anchor Books / 1969 / 384p. (A) (B) (C) _ P
- Internet paper "Classroom as Learning Laboratories" & "Core Practices" / foxfire.org / 3p.
- Book "Science is ..." / Susan V. Bosak / Scholastic, 1991 / 515p. (A) (B) _
- Magazine "Green Teacher - Education for Planet Earth" (Tim, Grant & Gailcittlejohn, (ed), Green Teacher, Canada, www.greenteacher.com)

ENRE Partner Organisations' Contact Addresses in West Bengal

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- **Seba Kendra Kolkata**
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- **Kenduadihi Bikash Society**
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