A Rocha Kenya

Conservation Agriculture for Schools

(or, how to have fun growing healthy food and look after the natural world at the same time.)

Conservation Agriculture for Schools

Introduction

This programme has been developed for primary schools, by A Rocha Kenya, a Christian conservation organization, from a conservation agriculture programme for small-scale farmers, 'Farming God's Way'. We had the following specific aims, though there have been many other benefits to us all from healthy exercise to relationship building!

- To engage children with the natural world through hands on experience of growing food. To enthuse them and help them develop a desire to care for and protect the environment.
- To teach about the life cycle of plants and the importance of soil, water and nutrients for growth, as well as the practical aspects of growing food.
- To teach about other environmental and sustainable development topics using the conservation agriculture programme as core material.

The overarching aim of this programme has been to enable city children to reconnect with the land and be able to grow food in a sustainable and environmentally friendly way (i.e. using organic methods). However, we discovered that the programme gives many opportunities for teaching across the whole spectrum of environmental education, including for sustainable development. Each unit therefore includes not only material for the practical farming session itself, but also further material on related topics, for classroom use and beyond. In this way we have been able to include material (and much more could be included!) for education on climate change, water, biodiversity, recycling, energy efficiency and healthy eating. We love this unified approach to environmental education and the sense of wonder at and appreciation of the natural world as children engage in the practical task of growing food and the activities and games which accompany this. The programme also, of course, has the added benefit of developing and enhancing school grounds.

The school with which we have piloted this programme has seen much enthusiasm for it from pupils and parents alike; indeed parents were delighted with the eagerness of their children to attend to the vegetable plot and the connection that this provided back to the shamba/farm, a connection with the land which can so easily be lost as people migrate from countryside to cities. We are also running the programme with a local secondary school and we hope that others too will find the material easily adaptable for use at different levels.

The programme was run here in Nairobi in a slightly different form under the title 'Farming God's Way for Schools'; this is a companion programme to the adult, 'Farming God's Way', which is aimed at small-scale farmers. Conservation agriculture is a well known concept and practiced widely; the uniqueness of 'Farming God's Way' lies in it's

specifically Christian content and recorded impact for all round well being on individual lives and community prosperity. We retained this element when working with the pilot school and this fuller version is available on request. Both versions will, we hope, serve a purpose in providing a 'ready to use' gardening/environmental course for use either in school or as an after school club.

Finally…Kenyan vegetables were grown and we have left these names in the text. Managu (African Nightshade. *Solanum nigrum*) is a leafy vegetable high in iron, dhania (*Coriandrum sativum*) is also known as coriander or cilantro.

We hope that you will enjoy using this material as much as we have enjoyed developing it!

Gillian Raven and McRae Muthomi. A Rocha Kenya. Nairobi. May 2016.

Preparation, equipment and notes.

The area of ground to be used should be chosen carefully taking account of sun, shade, ground quality (we found rubble from building work in some parts of the ground we were preparing) and ease of access.

The ground will need digging over thoroughly before beginning the project.

The following equipment will be needed:

For the children:

- Old clothes and boots or other strong shoes.

General:

- Garden/farming tools – jembes, spades, forks, hoes.
- Buckets.
- Watering cans or small containers for watering.
- Squirty soap containers for natural pesticide.
- Small bottles with good screw tops for natural fertilizer.
- Gardening gloves, (if wanted).
- Seeds.
- Any available fertilizer and pesticide plant and equipment for making the solutions. (See specific sessions).
- Chart for jobs rota and nature observations.
- Tarpaulins for the children to sit on during teaching and fertilizer/pesticide making.
- Paper bags for packing harvested vegetables.
- Plant and animal identification books.

Notes:

- 11/2 – 2 hours will be needed for each session with the children.
- We were careful to demonstrate safe use of tools before allowing the children to participate and to stress the importance of hand washing after gardening and making fertilizer and pesticides. Tools were always used under supervision.
- We packed and sold the harvested vegetables to parents at an end of term school assembly. During the assembly the children did a presentation on the project.
- There were many opportunities for looking at plants and small invertebrates during these sessions; hand held lenses and paper for recording finds could be useful.
- We incorporated specific teaching on photosynthesis in session 3, using the very basic chemical formula CO_2 (from air taken in through pores in the

leaves) + H2O (from rain taken in at the roots) + sunlight > H2CO2 (a carbohydrate and building block of life) + oxygen. Trees are important for adding oxygen to the atmosphere!

- Teaching on food chains may also be incorporated into session 3. We have made sets of food chain cards featuring local plants and animals; these can be used in a variety of games and different teaching situations.
- We grew leafy vegetables, but sometimes different parts of a plant are eaten.
- Tree planting is a highly valued activity in Kenya. In the course of this programme we planted 6 trees in the school grounds, all with different uses.
- A Rocha Kenya has made it's own fireless cookers and these were used, on a separate occasion, in combination with an energy efficient jiko (small charcoal/briquette burning heater) to cook rice, which the children then ate.
- The follow on activities are endless…this is not an exhaustive list…!

Children deciding which part of the plant a particular vegetable is.

Session 1. Preparing the Plot

Beginning the project. A brief introduction.

Why garden/farm? Healthy food, cheaper, no nasty chemicals, satisfying, fun!
How shall we garden/farm? Using as little intervention as possible. We shall only dig once, then allow the soil to take care of itself. No digging means that the soil maintains the natural ingredients and microorganisms, which keep it healthy and also guards against drying out.
Look at the plot. What resources do we already have? List: soil, air, water (from rain), sun (warmth and light), our own bodies to work on the soil! Note that these (excluding the latter) are the needs of plant for growth.
Demonstrate safe use of tools. Jembes, spades etc.
Prepare the ground. Digging over, removing weeds, rocks and stones until the soils is fairly fine. Pupils participate using jembes or other tools.
Add compost and plant seeds with method appropriate to seed. (We planted small pinches of seed on a grid pattern at 1 foot intervals and with 1 foot between the rows. We chose crops such as managu and dhania because of their relatively quick growth, so that the pupils were able to harvest within the school term). Rake soil thinly over the top and water gently.
Mulch. Use dead plant material collected on site by the children. Mulching reduces the need for watering and weeding and protects the soil from strong sunlight.
Begin to make list of jobs in the vegetable garden and assign duties. Jobs will include checking the plot for damage or interference from animals, watering and weeding.

Equipment: Garden tools, compost or manure, seeds, watering cans/bottles for watering.

During the week: Make chart of gardening tasks with rota of names. Include space to record observations. Decide when during the day the jobs will be done. When is the best time of day for watering? Where will the water be collected?

Preparation for next week: Make sure composting materials to hand.

Preparing the planting holes using string for guidance

Learning to use jembes to prepare more holes for planting seeds

Filling the seed holes with compost prior to sewing the seed

Marking the position of seeds with sticks

Supplementary material for session 1.
A brief introduction to climate change.

Weather patterns throughout the world are changing. Some parts of the globe are experiencing higher than usual rainfall, some lower than usual rainfall and normal patterns (such as the two rainy seasons here in Kenya) are being disrupted. There also seems to be an increase in extremes of weather – hurricanes, tornados and electric storms. These changing weather patterns are causing difficulty and trouble across the world as more areas begin to experience extreme flooding and drought conditions and suffer the effects of violent storms.

Weather patterns have been changing throughout history, (the world has experienced five great ice ages and at least one great flood), but it does seem that since the Industrial Revolution in 18th and 19th Century Europe, average world temperatures have increased and scientists tell us that these increases in temperature are largely responsible for the current changes in the weather. This increase in average world temperatures is referred to as Global Warming.
So, what causes Global Warming and what has the Industrial Revolution got to do with it?

During the Industrial Revolution, new methods of manufacturing were started which used fossil fuels such as coal, gas and oil to produce energy, as electricity or in steam engines to produce movement which would power machines. As these fossil fuels were burnt, gases - carbon dioxide in particular – were given off and formed a thickening layer around the earth. This layer of gases, which continues to thicken today as industries develop all over the world, acts like a blanket and is warming the world up. Of course we need some of the sun's warmth to be retained on the earth, so that conditions are good for plant growth and animal and human life, but a very thick layer stops many of the sun's rays bouncing back into space and the temperatures rise more and more quickly. One effect of this rise in global temperatures is the melting of land ice, leading to rising sea levels, which combined with more extreme weather patterns, is causing problems in many parts of the world.

We all have a responsibility to care for the earth. So, here are some ways in which you might investigate global warming and climate change further:

1. Find out how electricity is made. There are several methods in use in Kenya. Some are better than others - why?
2. How are our industries fuelled? Can you find out about ways of reducing gas emissions from industry?
3. Transport. Many people have cars now and food; materials for building and many other things are transported by road. Many people also use aeroplanes to get around within Kenya and to make international journeys. Do all

vehicles need to burn fossil fuels? How can we reduce the fossil fuels being burnt through car and other vehicle use?

4. What effect is climate change having on different areas of Kenya? Sometimes climate change combined with other activities, such as cutting down trees, has disastrous effects.
5. How does climate change effect plants and animals? Why is this a problem for humans too?
6. How is waste management connected to climate change?

And here are some suggestions for practical things you could begin to do to reduce the problems of Global Warming and Climate Change.
Maybe you could try some of these things at home or in class and encourage other people to try them too.

1. Are there ways in which we can reduce the use of cars and other vehicles? (Walking where possible, buying local food – no air miles).
2. Fuel for cooking - are there alternatives to burning charcoal?
3. Find out where the energy in your school and home come from? How could you reduce you electricity use?
4. Trees absorb carbon dioxide and release oxygen into the atmosphere. How could you help look after the trees near your home or school? Could you plant some more?

Here is one website that may be useful – and some background reading for interested adults!

http://www.eschooltoday.com/climate-change/Introduction-to-climate-change-for-children.html

http://www.wunderground.com/resources/education/gore.asp

Session 2. What is soil? What is compost?

- **Welcome back. Check the plot and list of jobs and do any necessary weeding and watering.** Are these jobs being done regularly? Are there any problems with the plot or with the jobs? Check that there is easy access to water and the right opportunity to visit the plot.

- **Recap on what plants need for growth.** Warmth, light, water, air, soil. For young children - mime the growth of a plant from seed to flowering and seed production. This can be done in small groups using a circle of rope for the plot, in which a child crouches as a seed and is covered with brown material for soil. The children are asked what is necessary for plant growth and the teacher calls these out in the correct order – warmth first. The appropriate mime is done (by the whole group, or by individuals), next to the 'seed' who responds' by growing, little by little until fully grown and bearing leaves and flowers. Leaves and flowers may be made from coloured paper to be added to the 'seed' during growth.

- **What is soil?** * A brief talk explaining the basic constituents of soil.

- **What is compost?** Similar to soil, but has extra organic (plant) material. We can make it by layering the following ingredients:
Dry/brown plant material
Green plant material
Food waste
Water

Air is also important and will be naturally incorporated as the layers are formed. At A Rocha we turn our compost with a garden fork only once, after 2 months. Cover compost with black plastic sheeting and secure. Insert a wooden pole (broom handle or similar) to monitor decomposition. This should be checked regularly to make sure that the compost is decomposing well – heat means that micro-organisms are at work breaking the ingredients down.
Making compost is a great activity for children. * Choose a suitable site (not full sun), put the children into groups, get each group to collect a different material and add to the compost heap under supervision. The compost will be ready in a few weeks and can be used to improve the soil on a new plot or for the next planting.

Equipment: water containers, buckets for food waste, tools, mime equipment.

During the week: Tasks and recording as before.

Preparation for next week: Assemble materials for making natural fertilizer.

** The following websites, among many available, may be helpful. There are various methods of compost making for a variety of situations.*

http://www.soils4kids.org

http://www.gardeningknowhow.com/special/children/composting-ideas-for-kids.htm

http://www.ecofriendlykids.co.uk/composting.html

Gathering dry plant material for compost or mulch.

Supplementary material for session 2. Composting and recycling man made waste

What is **compost**?

Plant and animal material eventually breaks down into a crumbly substance, rich in nutrients, which is very good for the soil and helps new plants to grow. This process is called decomposition and happens naturally anywhere where there is dead plant and animal material, for example in our forests. We can make a similar material for ourselves for use on the farm or garden by layering dry plant material (leaves, twigs etc.) with fresh green plant material and kitchen waste. The compost heap will need to be kept moist, though not too wet and within a few weeks, the compost should be ready to use. Inside the heap many small invertebrates, including very tiny animals and certain types of bacteria (micro-organisms) and fungi, will break down the plants to make a nitrogen rich mixture which has all the goodness to feed plants as they grow and produce a healthy crop.

Here's how you can investigate composting further:

1. Can you name any of the small creatures living in your compost heap? How are they breaking the plant material down?

2. What is fungus? Is it a plant? Find out as much as you can about this very important, but rather mysterious part of the natural world.

3. Compare some soil taken from the field with some compost from your mature compost heap. Is there a difference? If so, what and why is this?

Now… what about the **man made materials** that we throw away every day? Do they break down on their own as natural materials do?
Here are some questions to help you to investigate what happens to our rubbish after we have put it in the bin.

1. Where does the rubbish from your home or school go when it is collected by the waste disposal services? How is it disposed of?

2. Some of this rubbish may be **recycled**. What does recycling mean? Can you find out which items are recycled and what they are recycled into? Where does this happen and how?

3. List the materials in the waste from your home and school over one week. Is it possible to make sure that some of these are recycled? How could you do this?

4. Some things can be **reused.** Can you list any items that could be reused from your home or school, instead of being thrown away?

5. Can you **reduce** your use of anything that cannot easily be recycled once disposed of? (E.g. supermarket plastic bags?).

6. Looking at the bigger picture… what is the effect on people's lives of large amounts of man made materials not being recycled or reused?

How about a practical project…?

Could you plan to set up a recycling centre for your school? Which items would you be able to collect? How would you collect them? Where would you take them for recycling?

Is there anything else you could do to reduce the problem of waste in your area? (E.g. encourage people to reuse bags, encourage people not to buy items with lots of packaging, make posters to help people understand the problem … and much more!)

Enjoy becoming expert recyclers … of natural and man made materials!

Session 3. Germination and Growth

Welcome back. Check plot. Weed and water as before.

Recap on the cycle of plant growth and reproduction. Brief introduction to photosynthesis. We have often taught about photosynthesis as part of an exploratory walk in the natural world in which children chose one leaf to look at closely. Note down as much about the leaf as you can. What do you see? *Colour, stalk, veins*. Note the difference between the two sides of the leaf.

- What is it that makes a leaf green? *Chlorophyll, chloroplasts.*

- How does a plant make food? *Photosynthesis.*

- What happens during photosynthesis? (Molecule cards and tree diagram - see notes). Food is stored in the plant and converted to energy for growth, fruit and seed production. How do animals get their food? What about humans? (Food chains – see notes).

Giving plants extra goodness for healthy growth. Making natural fertilizer.

Making natural fertilizer is a good activity for young people and the tasks can easily be spread over a large number of children. (See instructions below). Where will this be stored? A schedule for stirring every 3 days needs to be added to the list of tasks. This takes 3 weeks to mature – new fertilizer may need to be made 3 weeks before any end of term presentation, to be fresh when sold. We used Mexican Sunflower (*Tithonia diversifolia*), but there are many other plants that may be used. Children could research this beforehand; an easily obtainable plant must be chosen!

<u>HOW TO PREPARE PLANT TEA</u>

REQUIREMENTS

1. <u>Fertilizer plant</u>
2. <u>Panga (Chopping tool/machine)</u>
3. <u>Water drum/container</u>
4. <u>Permeable bag/ sack</u>
5. <u>Rope</u>
6. <u>Stick</u>
7. <u>Water</u>

STEPS:

1. Chop the plant into pieces. We got the children to break the plants up by hand.
2. Put the chopped leaves and branches into the bag and tie the neck.
3. Fill three-quarters of your drum with water and put chopped leaves in the water at a ratio of 1:3.
4. Put the sack into the drum and suspend it. (See picture).
5. Cover the container and store under a thick shade or in a dark room.
6. Stir the mixture every 3-5 days by lifting the bag in and out of the water several times.
7. Repeat this for 2-3 weeks until the water has turned dark.
8. Remove the bag. The fertilizer is now ready to be bottled for use.

Equipment: as above.

During the week: Tasks and recording as before, but also check and stir fertilizer mixture.

Preparation for next week: Assemble materials for making natural pesticides. Prepare tree seedlings for planting and decide on locations.

A set of food chain cards for Karara Forest, Nairobi

Supplementary material for session 3.
Water.

Water is one of the most basic needs for life on earth. All plants and animals (including of course humans!) need water. No person can survive for more than 3 days without water and our bodies are 2/3 water! There is never any new water on earth and the water that the dinosaurs drank is the same water that we drink today. It has been going round the water cycle for thousands of years – and of course, for our use, has been cleaned up! There are two main considerations when we think about water on the earth – conservation and preventing pollution.

Conservation Water is needed for all plants including trees and crops planted by farmers. It is important to conserve this water in the soil by having plenty of tree and vegetation cover. Clean water for human use must be conserved so that there is enough for everyone.

Here are some things for you to consider:

1. What is deforestation and how does it affect water on the earth?
2. How can you conserve water at school and at home?

Pollution Water for human use can become polluted from industrial waste, man made waste in landfill sites, pesticides and fertilisers. We all need clean water, so how can this be prevented?

Here are some questions for you:

1. How is the water you use at school and home cleaned?
2. What can we do to help prevent pollution of water for human use or our clean water supplies?

Here are some statistics about water on the earth:

Oceans	97.2% of total	
	All icecaps/glaciers	2%
	Groundwater	0.62%
	Freshwater lakes	0.009%
	Inland seas/salt lakes	0.008%
	Atmosphere	0.001%
	All rivers	0.0001%

All the water available for human use:

Groundwater	0.62%
Freshwater lakes	0.009%
Rivers	0.0001%
	0.6291%

So, if only about 6% of the total water on earth is available for human use, we can see how important it is to make sure this is conserved and not polluted.

Here is a quiz for you. Could you try it out on friends and family?

Name of the closest ocean to your school? INDIAN OCEAN
Water can either be freshwater or this type of water? SALTWATER
Name one form of precipitation? RAIN / SNOW / HAIL / FOG etc.
Number of days a human can go without water? THREE
Name 3 ways way in which we use water? WASHING / DRINKING / BATHING / IRRIGATION/HYDOELECTRIC
Water vapour condensed in the sky is called? CLOUDS
Answer True or False. Plants release water gas or vapour into the air? TRUE
Which direction does water flow - downhill or uphill? DOWNHILL
Percentage of water in the human body? 7
Water can be in 3 forms: vapour/gas, water, and _____? ICE

Session 4. The importance of trees for the garden/farm and keeping a crop healthy.

Welcome back. Check plot and weed and water as before.

Tree talk and tree planting session. Trees and other plants can be of great benefit for the garden/farm, encouraging a greater range of beneficial insects, providing shade and improving the soil. The list of beneficial plants and insects will vary from place to place. We planted trees in the vicinity of the vegetable plot, to increase shade and soil quality, choosing 6 different types with different characteristics, (ranging from decorative trees to those which provide good cattle fodder) which were explained to the children. We chose Meru Oak (*Vitex keniensis*), Nandi Flame (*Spathodea companulata*), Mukarara (*Margaritaria discodea*), Cape Chestnut (*Calodendrum capense*), Albizia (*Albizia coriaria*) and Apple Ring Acacia (*Faidherbia albida*). which was planted within the vegetable plot because of its particular soil enriching qualities. Tree monitors may be appointed to care for the young trees, as after care is an essential (and often overlooked) part of the process.

- Brief talk on beneficial insects and pests, followed by making natural pesticide. The method is very similar to that used for making natural fertilizer, but soap is added to the solution to make it stick to the plants. We used Fish Bean Plant (*Tephrosia vogelii*) but there are many different plants that do this job. Gloves may be worn (depending on the plant) when making and applying the pesticide.

STEPS FOR MAKING EFFECTIVE TEPHROSIA PESTICIDE

1. Pick fresh Tephrosia leaves.
2. Weigh out 1kg of leaves. (see also 5. below).
3. Pound the leaves using a pestle and mortar.
4. Add the pounded leaves to 1 litre of water (or if making less, dilute in a ratio of 1 part leaves to 1 part water) and store it in a dark room overnight. Exposing the pesticide to sun reduces its effectiveness.
5. After 12 hours, sieve out the pounded leaves and dilute the mixture with 4 parts water
6. Take 100ml of water and rub soap on it until it turns cloudy. Then add these to the pesticide. Soap acts as a sticker. Soap as a sticker is safe as soap biodegrades in 10 hours.
7. Put the mixture in a pump and spray.

NB: This is effective on over 400 different pests, including termites, citrus, black ants, aphids, red spider mites, snails and slugs.

This can also be used to control pests on animals. Add ¼ kg of fresh or dried leaves to 1 litre of water and dilute with five times that volume of water before applying to the animals to control ticks, lice and fleas.

POINTS TO REMEMBER

1. Always watch out for early signs of pest invasion. Most natural pesticides will not work effectively if the invasion has occurred on over 70% of the affected crops, it is best to remove the affected crop from the farm if over 70% has been affected by pest.

2. Always add a few hot chillies to your natural pesticides to increase their effectiveness.

Equipment: Spade or jembe for digging holes for trees, tree seedlings, compost/manure, equipment as for making natural fertilizer.

During the week: Tasks and recording as before, but add in use of natural pesticides where necessary.

Preparation for next week: Get packaging papers and storage boxes ready for the harvested vegetables.

Tephrosia vogelii

Supplementary Material for session 4. Biodiversity

There are many different plants and animals living on the earth. This variety, which is different for different parts of the world is called **biodiversity.** Within a **habitat,** (or home), each plant and animal will have it's own particular place or role and each will be dependent on the others for survival. This is called **interdependence**. Plants and animals co-existing within a particular habitat form an **ecosystem.**

There are many different roles for plants and animals to fulfill within a habitat. Plants are **food producers** (green plants are the only living thing that can produce food directly from the sun by **photosynthesis**), some animals are plant eaters (**herbivores**) and in their turn provide food for the meat eaters (**carnivores**). Some insects are **pollinators,** transferring pollen from one plant to another as they feed on nectar and some eat dead plants and animals (they are the **decomposers** – the rubbish collectors and cleaners of the natural world!).

As trees are cut down for firewood and charcoal and to make space for agriculture and building, some animals lose their habitat and can no longer survive. As some areas become arid due to global warming and overuse of the soil, habitats are lost and the animals that live there can no longer survive. This means that biodiversity decreases. Look at Qu. 2 below and think about the effect of this on food chains within a habitat.

Here are some practical investigations for you to make and some questions for you to consider:

1. Could you list some of the plants and animals in your school grounds, or if you have one, in your garden at home? What different roles do they have to play in the ecosystem in which they exist? Use the biodiversity survey sheets provided to help you do this.
2. What happens when an animal or plant no longer exists, (or becomes extinct)? What is the effect on the other plants and animals in the ecosystem?
3. Why is biodiversity in Kenya and across the world decreasing? (Loss of habitats, increasing human population, poaching etc.)
4. What can we do to maintain and improve biodiversity in the environments in which we live? (Find ways of encouraging invertebrates into the school grounds – making special habitats for them, campaigning against poaching etc.).
5. Are there other ways in which you could become champions of the animals and plants with which we share the earth and it's resources?

Biodiversity sheet for plants. Add drawings and notes

	PLANT Name the plant if possible.	LEAVES Simple or compound? (How many on a stalk?)	LEAVES How are they attached – opposite or alternately?	LEAF MARGINS? Are they smooth or serrated?	LEAF VEINS What kind of pattern is there?	FLOWERS (if present).	Any other observations.
1							
2							
3							
4							
5							
6							
7							

Biodiversity sheet for animals. Add drawings and notes.

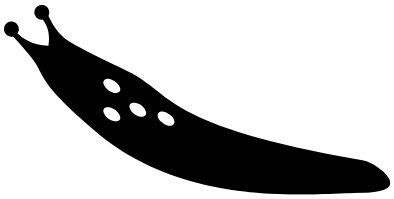
	ANIMAL (Name if possible)	DRAWING	NUMBER OF LEGS	NUMBER OF WINGS	NUMBER OF BODY PARTS	EYES - compound or simple?
1						
2						
3						
4						
5						
6						
7						

Making a Minibeast City

Ways of making homes for minibeasts when you have not got much space.

Grassy garden
A small patch of grass left to grow long will make a home for grasshoppers, beetles, caterpillars and other creatures.

Slug rug
A small square of carpet left on the ground will attract slugs, snails, ground beetles, ants and even voles hiding under it. Always make sure that the slug rug is replaced in exactly the same spot each time.



Tile flats
Roof tiles, pieces of slate and even pieces of roofing felt will attract the same sorts of creatures as the slug rugs.

Bee bank
Fill a tin can, cut off lemonade bottle or short piece of drainpipe with hollow stems, reeds or bamboo. Partly bury it in a bank of soil. Solitary bees will lay eggs in the tubes. Don't worry. They do not sting!

Log cabins
Make a neat pile of logs with one end in the shade of a bush or hedge and the other end of the logs in the sun. Creatures will find homes between the logs and wood-boring insects will make homes inside the logs. Some will choose the dry sunny ends of the logs and others in the cooler damper ends.

Lacewing Lodgings
Cut a flap in the side of a lemonade bottle. Fill the bottle with drinking straws, lengths of reed, straw, hollow stems (such as cow parsley) etc. Tape the flap up and hang the bottle horizontally from a fence or bush. Lacewings and ladybirds will enter through the mouth of the bottle and hibernate in the hollow tubes.
A rolled up piece of corrugated cardboard (the type use for packaging) inside the lemonade bottle also works well.

Bee log

Drill holes of different diameters in the ends of logs and offcuts of softwood.
Conifer logs are easier for children to drill holes in. Attach the logs to fences, bushes or walls in sunny places to attract solitary bees.

Vegetable villages

Hollow out half a potato using a teaspoon. Make a hole in each end. Then lay the potato flat on the ground and see which creatures come to live inside it. Try different kinds of vegetables.

Grapefruit grotto

Lay a hollowed out half grapefruit on the ground. See what creatures come to live under it. Also try oranges.

Brick balconies

Obtain some engineering bricks. These are the ones with holes going through them. Fill the holes with mud or clay and make holes in the mud with pencils. Build a low wall with the bricks, leaving spaces in between. Solitary bees may nest in the holes. Other creatures might make homes in the spaces between bricks. You can also use thermalite blocks, which are often used for inner walls of buildings. These are light and quite soft so you can easily make holes in them using a drill or even a screwdriver.

Penthouse suite

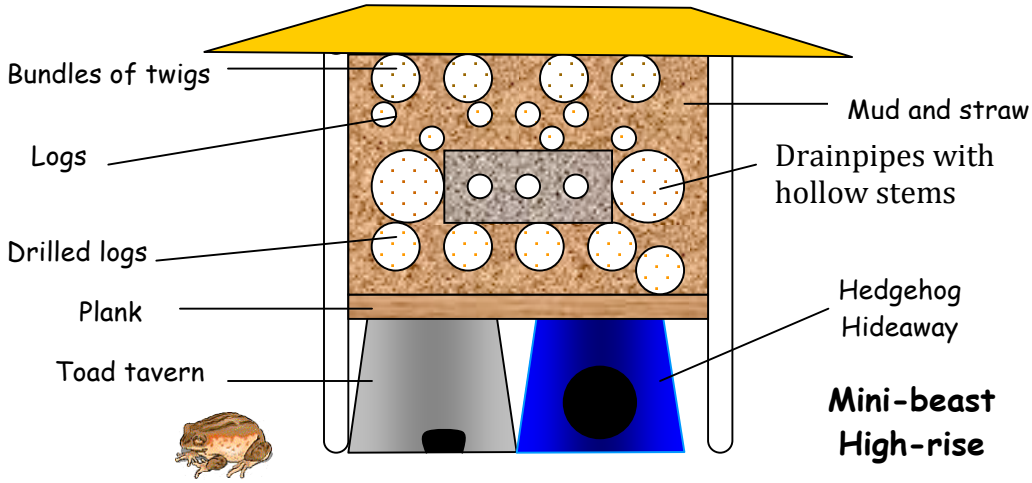
Cut a cross in the lid of a camera film canister. Put the lid on the canister and push a short bamboo stick (45-90 cm. long) through the slit. The canister will ensure that the end of the bamboo does not stick in small people's eyes when they bend down. Stick the other end of the bamboo cane firmly into the ground. Now fill a flowerpot with straw and place it on the end of the bamboo cane. Earwigs will climb up the bamboo and hide in the straw.

Minibeast High-rise

Place four stakes in the ground. Between them place two old plastic buckets upside down. In one of the buckets there should be a semi-circular hole cut in the rim about 5 cm in diameter. This will make a hiding place for frogs and toads.
In the other bucket cut a hole 15cm. Diameter. Fill this bucket with dry leaves through the hole. Then insert a short piece of 15cm. diameter drainpipe a short way into the hole. This home may attract hedgehogs to hibernate and the pipe will make it harder for predators such as cats and badgers to reach in.

Bishops Wood Centre, Worcestershire, England.

Place a short plank on top of the buckets. On the plank place small logs with holes drilled in their ends, pieces of drainpipe filled with hollow stems, small bundles of twigs etc. “Cement” between the layers with mud mixed with chopped straw. Then on top of the stakes attach a sloping roof to keep rain off your mud wall.



(Developed at Bishop’s Wood Centre, Worcestershire, England)

Session 5. Harvesting, storage and good gardening practices.

This session was run when the crops were ready for harvesting, a few weeks after session 4. Intervening weeks may be used on tree planting and care, making fireless cookers and cooking with them, biodiversity surveys, making homes for small invertebrates etc. The list is endless!

- **Welcome back! We can pick some of our veg to eat!** Demonstration of how to harvest managu and dhania. Pupils pick the vegetables.

- **Storage.** How long will these vegetables keep? Compare with other vegetables that we may grow in the future and brief discussion of storage methods. We shall take the managu and dhania home to eat straight away! Demonstrate packing in sugar paper wrappings, pupils pack and store carefully for taking up to the school. (This kind of leafy vegetable does not keep long; we were taking it to the end of term assembly to sell the next day!).

- **What next?** Continue with tasks rota and recording – gardening and farming is an ongoing process! Begin planning what to plant next – brief explanation of crop rotation and crop diversity.

Equipment: Sugar paper, paper bags or other containers for packing vegetables.

During weeks until the end of term: Continue tasks and recording. Harvest any vegetables that are ready and pack for sale to parents. Prepare and bottle concentrated natural fertilizer for sale to parents. Continue to plan for future crops. Prepare presentation for end of term.

A good harvest!

Supplementary material for session 5. Healthy eating, local food and energy efficient cooking.

What do you enjoy eating and what is your favourite food? Is what you like to eat healthy for you? In many parts of Kenya, fresh fruit and vegetables are easy to buy, easy to grow and good for our bodies! Health experts tell us that we should eat 5 – 7 portions of fruit and vegetables each day to stay healthy. Maybe you could do a survey of everything you eat for one week and find out how you are doing? Many other foods are good for us as well of course – can you find out what these are?

Our Conservation Agriculture project has enabled us to learn how to grow our own vegetables. What are the advantages of growing our own food? List as many as you can. (Food can be really fresh, natural fertilizers and pesticides can be used, food does not have to be brought long distances using fuel for transport, healthy outdoor exercise, learning about the wonders of the natural world, knowing how one of the most vital things for physical life – food! – is produced etc.)

The kitchen cupboard survey. What is in your kitchen cupboard and where does it come from? Food from foreign countries has what we call 'air miles' attached to it. Can you find out what this means and why it is important from a climate change point of view to try to buy more local food?

How we cook our food can have a major impact on the environment. Many people in Kenya use charcoal and jikos for cooking, but charcoal production is a problem because it involves cutting down trees. Maybe you could find out about the following cooking methods and environmentally friendly fuels:

- Briquettes to replace charcoal. They may be made from a variety of materials, including paper and leaves.
- Use of solar heated water for boiling food.
- Solar ovens.
- Fireless cookers.
- It is even possible to heat water by putting a clean container into the centre of a compost heat to take advantage of the heat generated as the heap decomposes! (Do you remember how hot the pole in the compost heap was at first? Check it out again now to see whether the heap is still active).

What makes these methods environmentally friendly?

Could you have a go at making any of these in school? Here are a few websites that may help you. Perhaps you could find some more!

http://www.solarcooker-at-cantinawest.com/buildingasolarcooker.html#box_cooker_plans_links

http://www.wikihow.com/Make-and-Use-a-Solar-Oven

http://www.rootsimple.com/2011/12/hay-boxes-or-fireless-cookers/

http://www.foodsresourcebank.org/blog/kenya-paper-briquettes-recycle-waste-and-create-income

Acknowledgements

We should like to thank…

…those who have developed Farming God's Way as a systematic way of teaching organic farming on a Christian basis. And especially the Zimbabwean farmer with whom the idea originated as he struggled, and by the grace of God succeeded, to switch from tobacco to more wholesome crops.

…the teachers, pupils and parents at Logos Christian School, Nairobi for being so enthusiastically engaged in the project.

… Bishops Wood Environmental Centre, Worcestershire, England, for inspiration on games, activities and the importance of connecting children with the natural world.

…all staff at A Rocha Kenya, Nairobi, for hot, hard work in preparing the ground, organizing compost making and many other activities, and for giving essential information and advice over the weeks.

Further reading

Farming that brings glory to God and hope to the hungry.
By Craig Sorley. ISBN 9966-776-13-3

.

Have Fun!