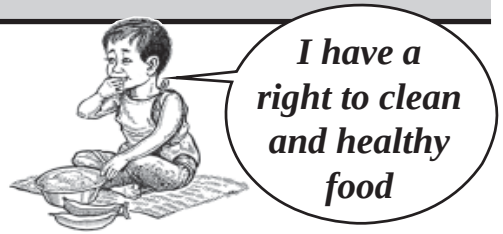
What is Integrated Pest Management ?

The spider and its web helps to control lots of harmful insects

Farmers are always concerned about their crops. After the hard work of farming, it's their worst nightmare to lose them again. There are many creatures which can badly harm crop production. A creature which does this is called a ***pest***. Bacteria, insects, fungi, birds, rats, weeds, etc. can all be harmful. Preventing, reducing or curing the harmful effects of pests can be done by management of the pest or the crop and its environment. To do this in a sustainable way often means using a range of methods together to prevent and control pests. Because these methods are all linked, the term ***Integrated Management*** of the pest is used. So this chapter gives information about ***Integrated Pest Management***.

Why do integrated pest management?



- to get healthy food
- to reduce farm production costs
- to increase production
- to protect the environment
- to reduce the need of harmful chemicals
- to prevent pests becoming resistant to chemicals
- to make sustainable farming systems

Poisonous chemicals for pest control are often banned, but not in poor countries

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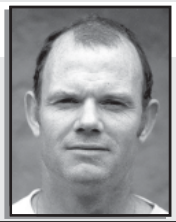
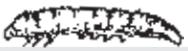


Nowadays there is much use of poisonous chemicals to kill and control agricultural pests. But this has many harmful effects. For example :-

- poisons used can remain in the environment for many years, continuing to harm soil, water, vegetation and animals.
- Poisons used on fruit, vegetables, etc. can be eaten by people. This can cause many diseases, genetic problems, and cause babies to be born handicapped.



- Farmers often don't know how to use the poisons correctly, which results in them being affected by the poisons. This causes over 400,000 people to die each year in the world.
- Poisons are used for protection of crops from harmful pests, but often this also kills beneficial plants and animals which are helpful in controlling pests, building soil or pollinating plants.
- Continuous use of chemical poisons can cause pests to develop **resistance** to the chemicals. These resistant varieties will breed, and to kill them chemicals need to become stronger, or different types need to be used. This will increase the numbers and strength of chemicals used, and encourages dependency. Integrated pest management methods are important as the solution to this problem, and to the other problems mentioned above.

How to do integrated pest management ?

Integrated pest management can be divided into 2 main areas. Firstly, (a) how to **prevent** damage from pests, and secondly, (b) how to **control** or **cure** pest damage once it has already started to occur. In this chapter we start to look at group (a) on this page, while methods for group (b) start on page 16.

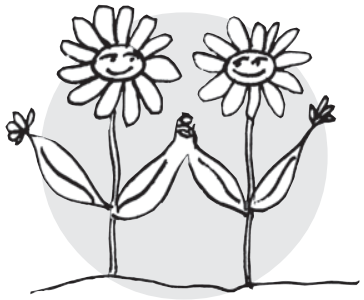
Various techniques are described below. In integrated management one method may not be enough to stop a pest, so it is important to use as many methods as possible.

(a) How to Prevent Pests ?

Need	Methods used
1. Healthy Soil	compost, mulch, irrigation, rotations, green manures, etc.
2. Healthy plants	compost, irrigation, weeding, species selection, green manures, etc.
3. Fencing	living fences
4. Diversity	mixed cropping and rotations
5. Companion Planting	mix aromatic/smelly plants e.g. coriander, fennel, marigold, lemon grass, basil, onion, garlic etc.
6. Decoy planting	providing alternative plants for pests to attack
7. Helping pest predators	providing habitat and food for beneficial pest predators
8. Repelling pests	liquid manure, herbal controls

1. & 2. Healthy Soil and Healthy Plants

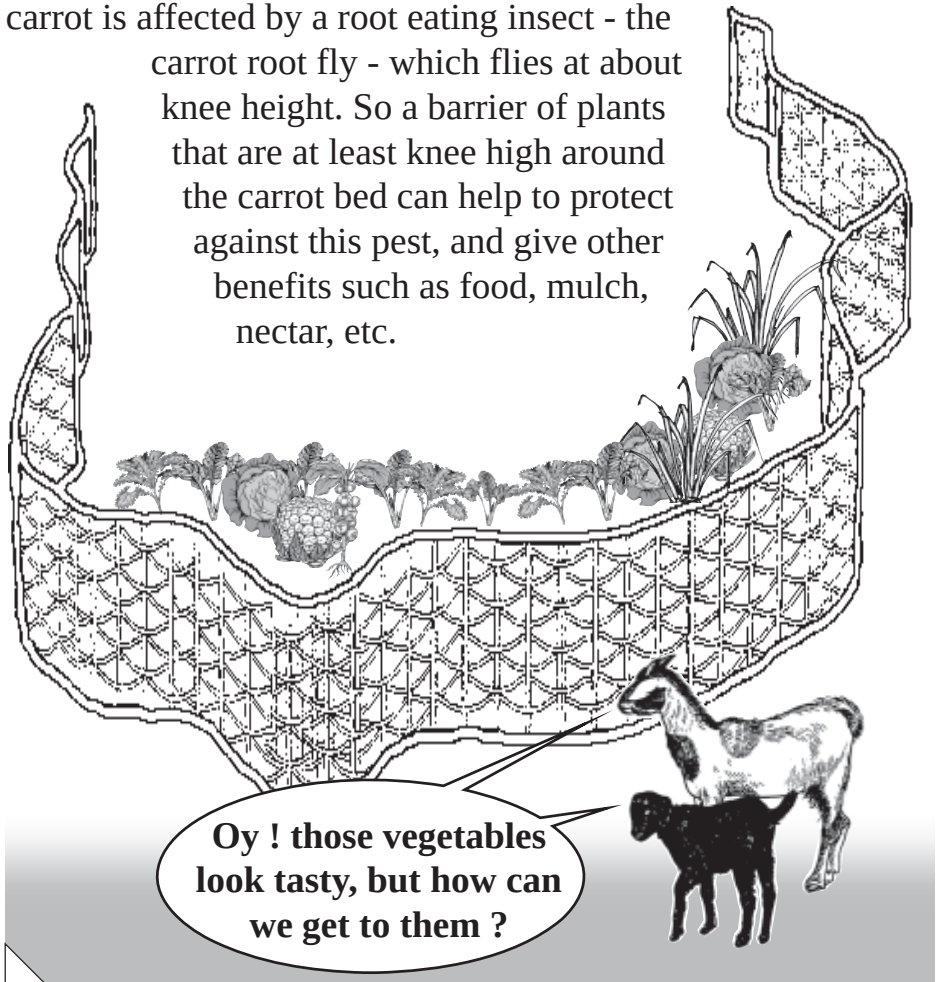
- Just like people are healthy with a nutritious and balanced diet, the soil is also healthy with plenty of organic matter, nutrients, micro-organisms, etc. It then supports healthy plants, which can resist disease.
- Unrotted compost can cause pests and diseases in the soil, so always use well rotted compost.
- Water is essential for the soil and plants. Having the right amount of water at the right time helps plants to grow, stay healthy and resist pests and disease.



- Crops attract certain types of pest and disease. Always planting the same crops in the same place causes those pests to increase and damage the crops. This is why crop rotations are beneficial. For example, potatoes and their relatives - tomato, aubergine, sweet pepper, etc. shouldn't be planted in sequence on the same piece of land for up to 2 years. The rotation helps to break the pest and disease cycle so they will not harm the next crop. After crops that attract many diseases are harvested, such as potatoes and other vegetables, planting onions or garlic for a season helps to clean the soil of the many pests and diseases attracted by the previous crop.

3. Fencing

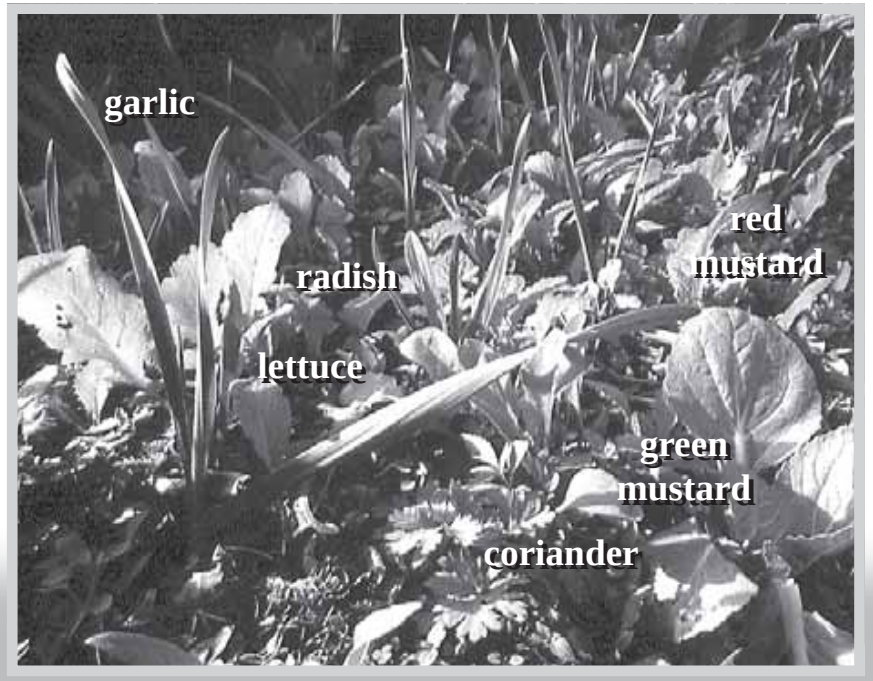
Without a fence, many types of pest can get on to the land and damage crops. So a fence is very important. The most beneficial type of fence is a **living** or **green fence**, or **hedge**. This is not just a barrier, but can give other benefits as well. For example, a barrier of lemon grass around the vegetable bed will help to protect against weeds and other pests, and also can be cut as mulch to put on the bed. Similarly, carrot is affected by a root eating insect - the carrot root fly - which flies at about knee height. So a barrier of plants that are at least knee high around the carrot bed can help to protect against this pest, and give other benefits such as food, mulch, nectar, etc.



4. Diversity

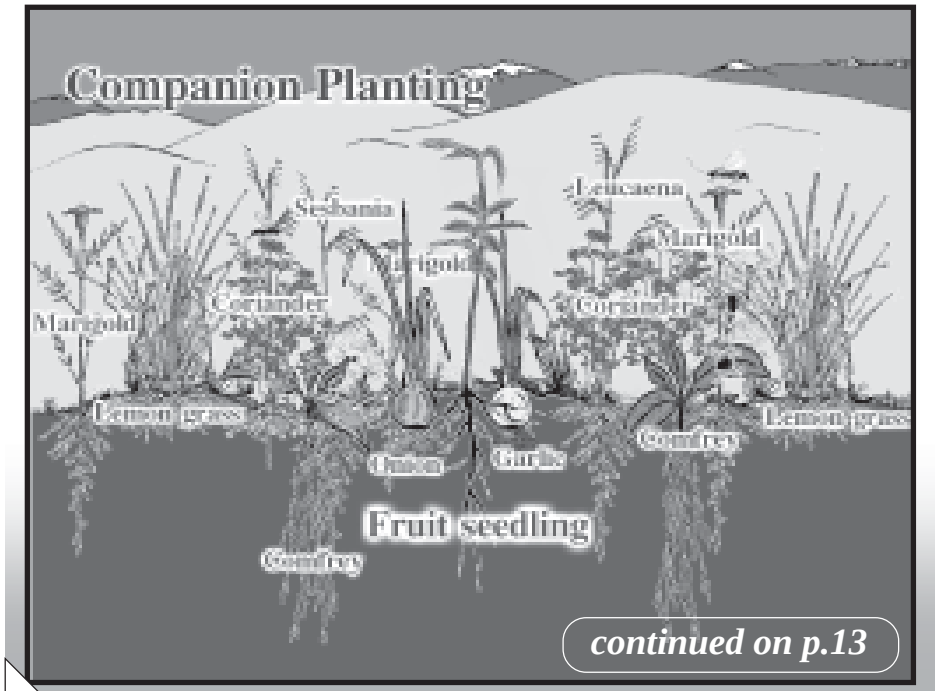
Continuous monoculture planting of the same crop will always suffer more from pest attack. For example, if only cauliflower is planted, a fungus or insect which feeds on cauliflower can destroy the whole crop in a very short time, and is difficult to control. This why it's good to plant a variety of crops together, called **mixed cropping**.

It's possible to plant many types of vegetable in the kitchen garden. For example, cauliflower, Swiss chard, radish, carrot, peas, broad bean, lettuce, turnip, coriander, fennel, dill, kohl rabi, spinach etc. can all be planted together. If any one of these is attacked by a pest, there are all the others that will still give production. The chapter ***Mixed Vegetable Gardening*** gives detailed information on this technique.



5. Companion Planting

Plants give each other various types of support. For example, the scent of garlic helps repel many types of pest. Marigold gives a chemical from its roots which helps to repel soil nematodes which otherwise eat plant roots. The flowers of marigold also give a strong smell which help to repel insect pests. Some insects recognise the smell of the plants they eat, so strong smelling repellent plants help to protect these vegetables. Legumes such as peas and beans help to provide extra nitrogen to other plants. Mixing these plants with grains, vegatables, fruits or any type of crop to help protect them is called **companion planting**. Marigold, mint, basil, lemon grass, wormwood, garlic, onion, coriander, fennel, dill, nasturtium, tansy, etc. are all companion plants and it is beneficial to mix them with and around other crops.



continued on p.13

Let's See How to do Integrated Pest Management

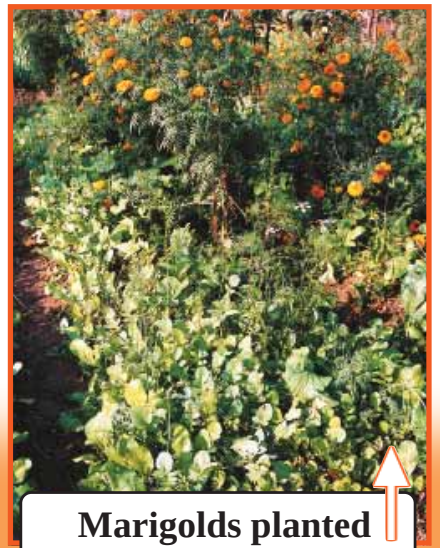
The fence around a kitchen garden can be made of local resources.

Home made pens to keep chickens in the right place. These can be moved around.

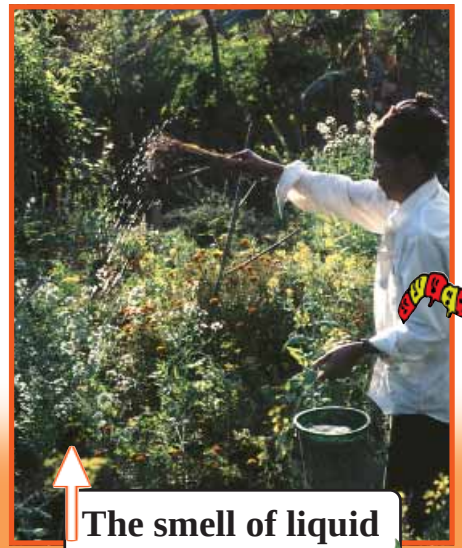
In fertile soil, plants are healthy and can resist many pests and diseases themselves.

Red coloured vegetables have less pests

A variety of colour, leaf texture and scent help to protect vegetables from insect pests

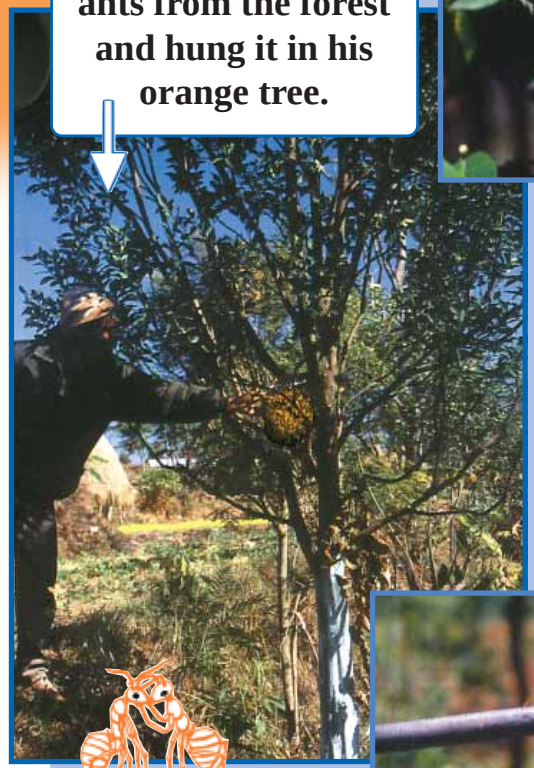


Marigolds planted around the vegetable bed help to protect against some harmful insect pests



The smell of liquid manure on the vegetables helps prevent and repel pests

Surya Adhikari from Begnas, Nepal, brought a nest of red ants from the forest and hung it in his orange tree.



These ants protect the oranges from any type of pest

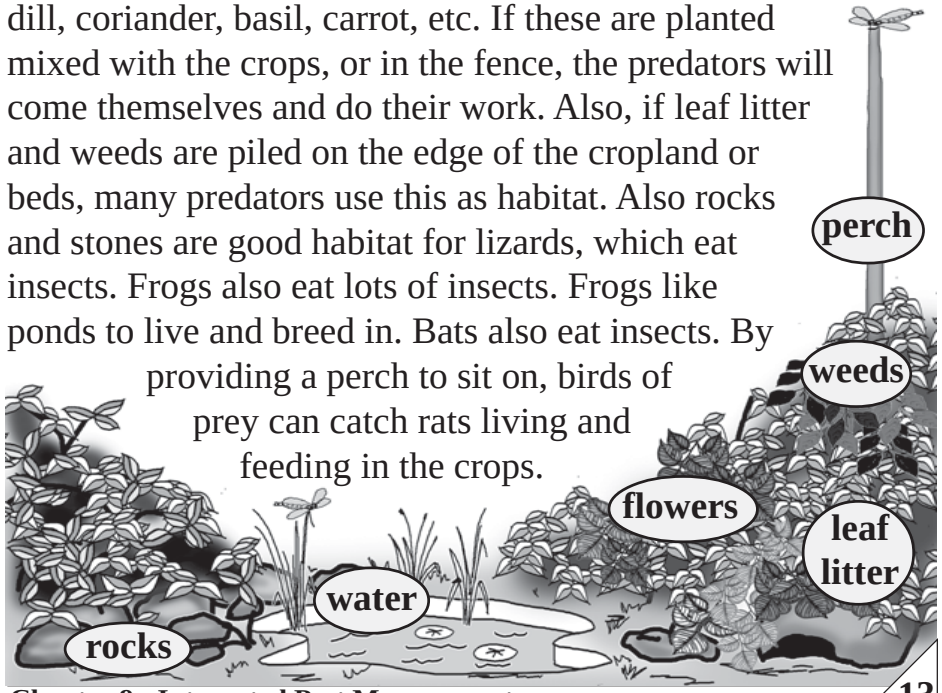
The tree is protected for free, and the ants also get free meals !

This hoverfly visits coriander and similar aromatic plants for nectar, and lays its eggs inside harmful catepillars, which kills them.

6. Attracting Predator Insects and Animals

Ninety five percent of insects are useful, and only five percent cause damage to crops. There are many insects and other animals which will attack harmful pests. These are called **predator insects** or **animals**. ***Predator animals are farmers' friends***. The more they are present on farms, the more they can help controlling pests.

How to help predator animals ? If there is the right habitat, they will arrive and stay themselves. Their food are the pests on the crops. Many types of predator insects feed on nectar from flowers. They like flowers of marigold, fennel, dill, coriander, basil, carrot, etc. If these are planted mixed with the crops, or in the fence, the predators will come themselves and do their work. Also, if leaf litter and weeds are piled on the edge of the cropland or beds, many predators use this as habitat. Also rocks and stones are good habitat for lizards, which eat insects. Frogs also eat lots of insects. Frogs like ponds to live and breed in. Bats also eat insects. By providing a perch to sit on, birds of prey can catch rats living and feeding in the crops.

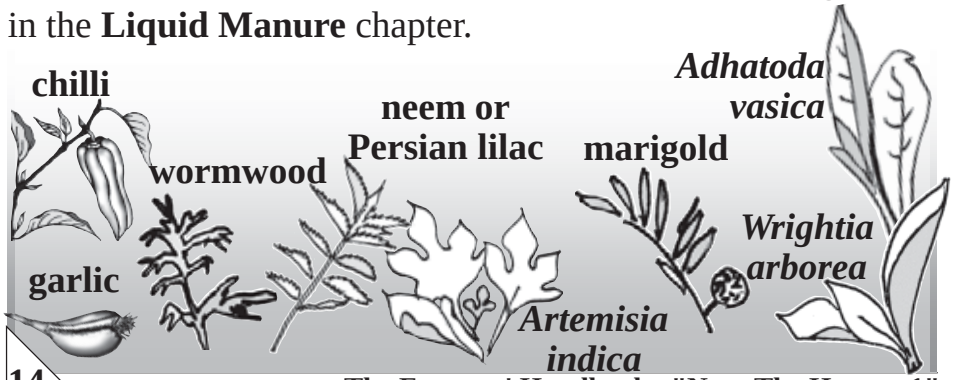


7. Decoy Planting

Harmful insect pests will eat other plants as well as the crops farmers plant. So if these are added to fences around the crops, or even mixed in with the plants, these will be attacked instead of the crops. This is called ***decoy planting***. For example, an insect that attacks cotton plants also eats the castor oil plant. So by planting castor around the cotton plants, the cotton can be saved. Like this, nettles will attract caterpillars, which prevent them eating vegetable crops.

8. Liquid Medicine

Wormwood, neem, persian lilac, chilli, garlic, onion skins, marigold leaves, cow dung, ash, oil seed cake, khirro, *Adhatura vasica* and tobacco are examples of plants which can be used to make a medicine which repels pests and also acts as a fertilizer. Information on how to make this is given in the **Liquid Manure** chapter.



Experience from the Philippines


Sesinando Masajo

Mr Sesinando Masajo farms 28 hectares of rice paddy in the Philippines. Before 1973 he used lots of chemicals on his rice. He would apply chemicals 5-6 times on each crop. But he observed that the rice was suffering from more and more pests. Because the pests were in different stages of their life cycle, it became very difficult to control them with chemicals. He thought that the poisons were also killing the beneficial predator insects, and so the pests were able to increase in numbers.

After 1973, Mr Masajo stopped using poisons, and he saw that his rice production started to increase. At that time he was getting 5.2 tonnes per hectare rice production. In 1993, that had increased to 9.6 tonnes.

Mr Masajo has now taught these methods to his neighbours. Because of this, by 1996 there were 550 local farmers who had stopped using poisons. All these farmers experienced an increase in rice yield, and at the same time they found the quality of the grain had also improved.

Women farmers from Nepal visit farmers in Indonesia to see and learn about integrated pest control in rice

(b) What to do once pests start to attack ?

It may be that even after using all the techniques given above, pests still attack the crops. Below are examples of methods used after problems have started :-

- **Liquid Pest Repellent** (see page 14)

- **Cow's Urine :-** mix one part fresh cow's urine with 3 parts water and spray to control various insect pests.

- **Neem Oil :-** mix one part neem oil with 3 parts water to make a strong pest repellent. Add soap to help the neem to stick to leaves. Kerosene can also be added.

- **Wood Ash :-** adding ash to the soil surface helps to protect against many insects, and also provides fertilizer.

- **Oil Seed Cake :-** mix one part oil seed cake with 3 parts soil to protect against red ants.

- **Tobacco Juice :-** boil a handful of tobacco leaves in 2 litres of water like making tea. Sieve, and spray the tea onto the pest, which will kill them. Only spray when there are not any beneficial insects on the plants, otherwise they will also be killed. Beware: tobacco juice is very poisonous !

Appropriate Agricultural Alternatives (AAA) farm from Bhaktapur District in Nepal have the following experience :

- Make a strong tea from ground mint leaves and spray on brassicas to repel butterflies, which produce harmful catepillars.

- Mix together 1 kg oil seed cake, 5 kg wood ash and 1 kg mint leaves and soak the soil to a 2 inch depth. This helps to control stem cutting insects.

- Grind 250g of wild basil and mix with 1 litre of water and boil to reduce the liquid . Spray this to repel leaf eating pests.

- When stem borers have attacked and made holes in fruit trees, use wire or a needle to push cotton wool soaked with kerosene into the hole to kill them.

Healthy and protected vegetable beds at AAA Farm

From Kavre District in Nepal, INSAN'S Model Farmer Mrs Jipmaya Tamang has this experience :-

- Take equal quantities of wormwood, *Adhatoda vasica* and nettle, soak in cow's urine and spray on plants every other day. For small plants, dilute with 10 parts of water and spray. For large plants, dilute with 6 parts water. This protects plants against sucking and eating insects.

- Mix 1 part chilli pepper, 2 parts kerosene and 10 parts wood ash and apply on the soil. This protects against red ants and other insects which live in the soil.

If you know of other remedies like this, please send us the information.

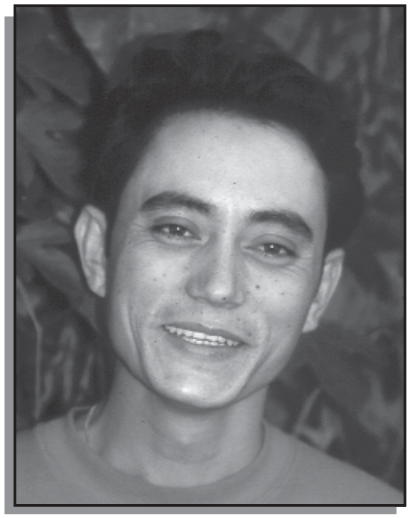
Observation

The most important work in integrated pest management is **observation**. Which pests are harmful, to which crops, at what time ? Where do they come from ? How do they breed ? What can be done to prevent them coming ? By understanding these things, the life cycle of the pest can be understood and so can be interrupted to prevent the pest becoming a pest. In this way pests can be prevented early on from being harmful to our crops.

Farmers' Experience

Mr Ramesh Khadka

From Nepal, Bhaktapur district, Dadhikot VDC, Gamcha, and manager of Appropriate Agriculture Alternatives (AAA) farm, Mr Ramesh Khadka has experience of integrated pest management. Now let's hear his story.



Ramesh Khadka

" On this farm no chemicals or poisons are used at all. Everything used is made from organic material. We use vegetable compost, goat manure, bonemeal, oil seed cake, chicken manure and rabbit manure. We also use liquid manure against pests. For this we use various types of strong smelling plants, like *Wrightia arborea*, wormwood, Persian lilac, etc. squashed into a container to partially decompose, then we use the liquid that comes from this. It helps to repel many pests. Most problems disappear when you have good, fertile soil. We also use mixed vegetable cropping to prevent pests, and teach the local farmers the methods we use. All our vegetables are sold at organic markets in Kathmandu. "

Read On !

Subjects Related to Integrated Pest Management

Living Fence chapter

In this chapter see how to plant not just a fence but also produce fodder, fuelwood, mulch and other benefits

Fruit Tree Planting chapter

Information on how to plant and manage valuable fruit trees for best production is given in this chapter

Kitchen Garden and Mixed Vegetable Growing

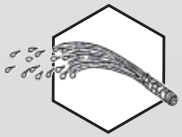
Information on great vegetables produced for less work is given in these 2 chapters

Integrated Fruit Orchard chapter

Fruit trees can be mixed with other types of tree to make an integrated orchard more productive. Find out how in this chapter

Liquid Manure chapter

Use local plants to make a liquid for fertilizer and pest control from information in this chapter



Compost chapter

Information on how to make good compost quickly is given in this chapter