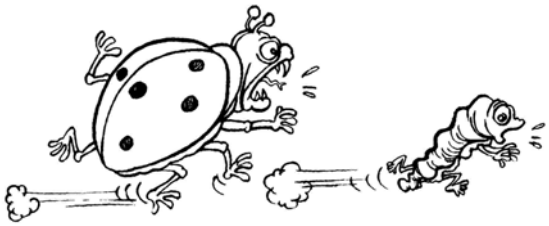
Farmers Make Friends with Natural Enemies

Many small-scale vegetable farmers in sub-Saharan Africa rely on pesticides to control pests on their crops. However, there are many concerns about this practice. Often, farmers do not wear appropriate protective clothing; and sprayers are inadequately maintained; too much or too little pesticide may be applied, which can lead to the development of resistance by pests, if pesticides are applied too close to harvest; consumer safety is threatened as crops can contain unsafe levels of residues; and excessive use of pesticides can damage the environment.

Since 1997, the CPP has been funding work in Zimbabwe and Kenya to develop more sustainable approaches to pest management. These integrate cultural practices, e.g. crop rotation, practices which encourage and conserve natural enemies (predators, parasitoids and pathogens) of arthropod pests, and the careful use of selective pesticides which do not harm natural enemies. Surveys of vegetable farms in 1997 suggested that most smallholder vegetable farmers were unable to recognise important natural enemies of crop pests on their farms, limiting the contribution of natural enemies to pest management strategies. 'Farmers' friends' were frequently being misidentified as pests and sprayed, costing the farmers money. The baseline studies also revealed a lack of information on best practices at both extension and farm levels.



The ladybird beetle is an important natural enemy, feeding on a range of crop pests

Two CPP projects are addressing this lack of information. Working closely with local research collaborators, the government extension agency and NGOs, the natural enemies project (R7266) has produced a full colour field guide for trainers and extension workers, in three languages (English, Shona and Ndebele). Posters and flip cards are also available to enable farmers to identify natural enemies on the farm. Project R6764 drew on findings from the CPP cluster of vegetable projects and other research to produce a handbook of vegetable IPM strategies in Zimbabwe. This was tested at a series of dissemination workshops for extension staff and NGO trainers (held jointly with the natural enemies project) in three different regions of Zimbabwe.

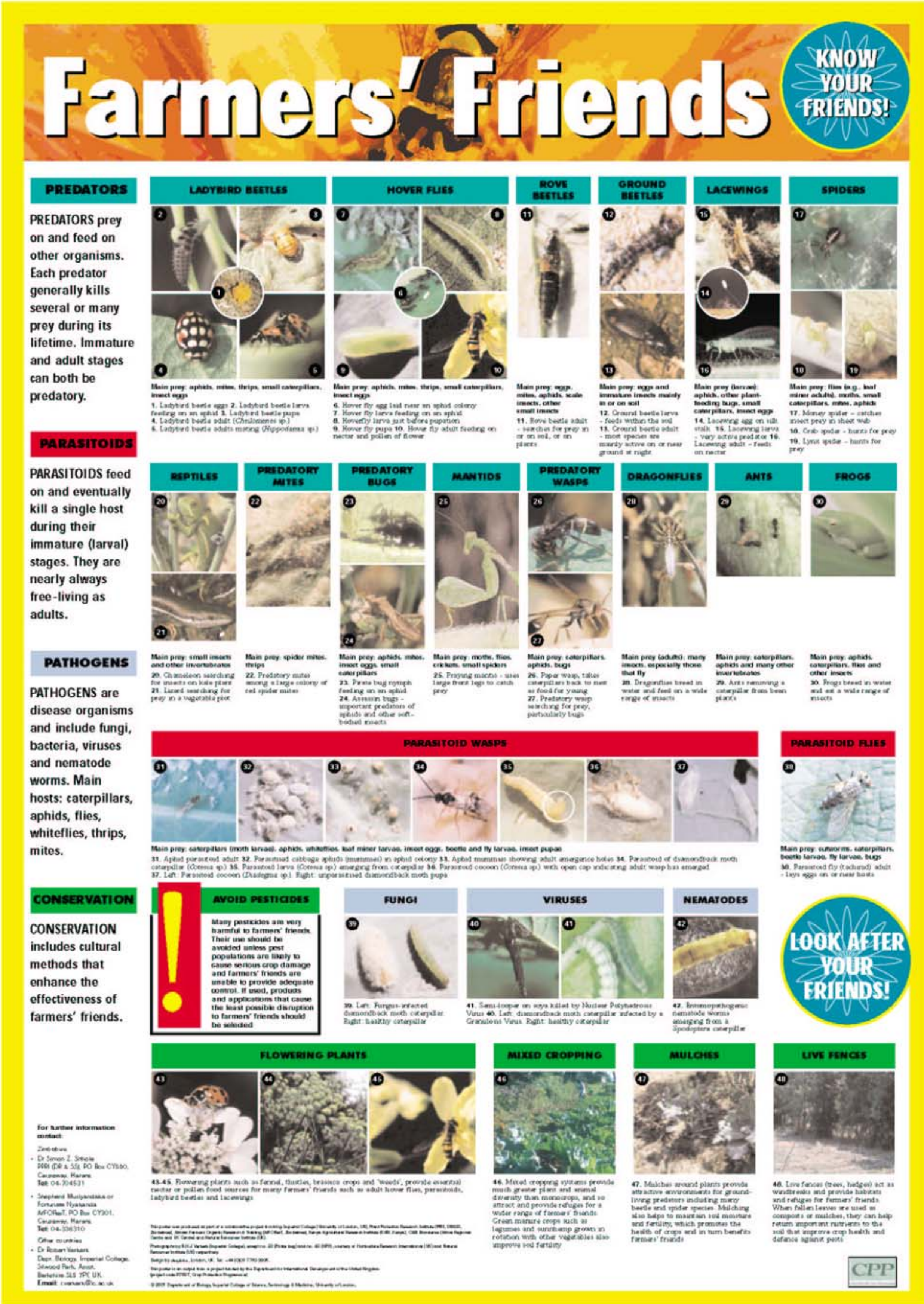
A small farmer training programme initiated at the workshops will be used to evaluate the effectiveness of the training materials in raising awareness and farmer recognition of natural enemies. There has already been good uptake of the materials by NGOs. Further uptake is expected through Food and Agriculture Organization (FAO)-funded farmer field schools and a training of trainers programme being developed by Agritex, the government extension agency, and this will ensure that the information is widely disseminated in Zimbabwe.

Validating the IPM manual with extension workers in Zimbabwe

There is also interest beyond Zimbabwe. The FAO Global IPM Project has ordered copies of the field guide. Strong interest has also been shown by International Institute for Tropical Agriculture (IITA) and other Consultative Group for International Agricultural Research (CGIAR) centres in adapting the materials for use in West Africa, including the production of a French language version, and the launching of a 'Farmers' Friends' website. The materials could also be adapted for use in East Africa, linking with work carried out by a CPP-funded vegetable IPM project in Kenya (R6616).

***R7266**: Development and evaluation of a pilot field handbook on natural enemies of vegetable pest, R. Verkerk and D. Wright, Imperial College*
***R6764**: Environmentally acceptable crop protection strategies based on the improved use of pesticides and adoption of IPM strategies by smallholders in Zimbabwe, H. Dobson, NRI*
***R6616**: Pest management in horticultural crops: integrating sustainable pesticide use into biocontrol-based peri-urban production systems, J. Cooper, NRI*

Overleaf: the Farmers' Friends poster


Farmers' Friends
KNOW YOUR FRIENDS!
PREDATORS
PREDATORS prey on and feed on other organisms. Each predator generally kills several or many prey during its lifetime. Immature and adult stages can both be predatory.
PARASITOIDS
PARASITOIDS feed on and eventually kill a single host during their immature (larval) stages. They are nearly always free-living as adults.
PATHOGENS
PATHOGENS are disease organisms and include fungi, bacteria, viruses and nematode worms. Main hosts: caterpillars, aphids, flies, whiteflies, thrips, mites.
CONSERVATION
CONSERVATION includes cultural methods that enhance the effectiveness of farmers' friends.
LADYBIRD BEETLES
Main prey: aphids, mites, thrips, small caterpillars, insect eggs
1. Ladybird beetle eggs 2. Ladybird beetle larva feeding on an aphid 3. Ladybird beetle pupa
4. Ladybird beetle adult (Cheilomenes sp.)
5. Ladybird beetle adults mating (Hippodamia sp.)
HOVER FLIES
Main prey: aphids, mites, thrips, small caterpillars, insect eggs
6. Hover fly egg laid near an aphid colony
7. Hover fly larva feeding on an aphid
8. Hoverfly larva just before pupation
9. Hover fly pupa 10. Hover fly adult feeding on nectar and pollen of flower
ROVE BEETLES
Main prey: eggs, mites, aphids, scale insects, other small insects
11. Rove beetle adult - searches for prey in or on soil, or on plants
GROUND BEETLES
Main prey: eggs and immature insects mainly in or on soil
12. Ground beetle larva - feeds within the soil
13. Ground beetle adult - most species are mainly active on or near ground at night
LACEWINGS
Main prey (larvae): aphids, other plant-feeding bugs, small caterpillars, insect eggs
14. Lacewing egg on silk stalk 15. Lacewing larva - very active predator 16. Lacewing adult - feeds on nectar
SPIDERS
Main prey: flies (e.g., leaf miner adults), moths, small caterpillars, mites, aphids
17. Money spider - catches insect prey in sheet web
18. Crab spider - hunts for prey
19. Lynx spider - hunts for prey
REPTILES
Main prey: small insects and other invertebrates
20. Chameleon searching for insects on kale plant
21. Lizard searching for prey in a vegetable plot
PREDATORY MITES
Main prey: spider mites, thrips
22. Predatory mites among a large colony of red spider mites
PREDATORY BUGS
Main prey: aphids, mites, insect eggs, small caterpillars
23. Pirate bug nymph feeding on an aphid
24. Assassin bugs - important predators of aphids and other soft-bodied insects
MANTIDS
Main prey: moths, flies, crickets, small spiders
25. Praying mantis - uses large front legs to catch prey
PREDATORY WASPS
Main prey: caterpillars, aphids, bugs
26. Paper wasp, takes caterpillars back to nest as food for young
27. Predatory wasp searching for prey, particularly bugs
DRAGONFLIES
Main prey (adults): many insects, especially those that fly
28. Dragonflies breed in water and feed on a wide range of insects
ANTS
Main prey: caterpillars, aphids and many other invertebrates
29. Ants removing a caterpillar from bean plants
FROGS
Main prey: aphids, caterpillars, flies and other insects
30. Frogs breed in water and eat a wide range of insects
PARASITOID WASPS
Main prey: caterpillars (moth larvae), aphids, whiteflies, leaf miner larvae, insect eggs, beetle and fly larvae, insect pupae
31. Aphid parasitoid adult 32. Parasitised cabbage aphids (mummies) in aphid colony 33. Aphid mummies showing adult emergence holes 34. Parasitoid of diamondback moth caterpillar (Cotesia sp.) 35. Parasitoid larva (Cotesia sp.) emerging from caterpillar 36. Parasitoid cocoon (Cotesia sp.) with open cap indicating adult wasp has emerged
37. Left: Parasitoid cocoon (Diadegma sp.). Right: unparasitised diamondback moth pupa
PARASITOID FLIES
Main prey: cutworms, caterpillars, beetle larvae, fly larvae, bugs
38. Parasitoid fly (tachinid) adult - lays eggs on or near hosts
AVOID PESTICIDES
Many pesticides are very harmful to farmers' friends. Their use should be avoided unless pest populations are likely to cause serious crop damage and farmers' friends are unable to provide adequate control. If used, products and applications that cause the least possible disruption to farmers' friends should be selected
FUNGI
39. Left: Fungus-infected diamondback moth caterpillar. Right: healthy caterpillar
VIRUSES
41. Semi-looper on soya killed by Nuclear Polyhedrosis Virus 40. Left: diamondback moth caterpillar infected by a Granulosis Virus. Right: healthy caterpillar
NEMATODES
42. Entomopathogenic nematode worms emerging from a Spodoptera caterpillar
LOOK AFTER YOUR FRIENDS!
FLOWERING PLANTS
43-45. Flowering plants such as fennel, thistles, brassica crops and 'weeds', provide essential nectar or pollen food sources for many farmers' friends such as adult hover flies, parasitoids, ladybird beetles and lacewings
MIXED CROPPING
46. Mixed cropping systems provide much greater plant and animal diversity than monocrops, and so attract and provide refuges for a wider range of farmers' friends. Green manure crops such as legumes and sunnhemp grown in rotation with other vegetables also improve soil fertility
MULCHES
47. Mulches around plants provide attractive environments for ground-living predators including many beetle and spider species. Mulching also helps to maintain soil moisture and fertility, which promotes the health of crops and in turn benefits farmers' friends
LIVE FENCES
48. Live fences (trees, hedges) act as windbreaks and provide habitats and refuges for farmers' friends. When fallen leaves are used as composts or mulches, they can help return important nutrients to the soil that improve crop health and defence against pests
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