

## Pesticides:

# A Quick Introduction

Pesticides include:

- Herbicides - control/kill competitive weeds;
- Fungicides - kill fungal diseases;
- Insecticides - control/kill insects.

Herbicides and insecticides are more commonly used than fungicides, which are expensive to apply and mostly used on perennial plant and fruit crops.

The first mention of the use of an insecticide/chemical to control insects is in 1000 BC. Homer writes of using sulfur to keep insects away from crops. Modern synthetic insecticides as we know them today were brought to market in the 1930's. The purpose of insecticides is to keep away pests, which in turn increases yields, makes crops more aesthetically pleasing and lowers prices for consumers. By making crops aesthetically pleasing, consumers are more likely to buy them. Many times fruits and vegetables that "look" the best are the ones that received insecticide treatment. Insecticides are also cost effective; they are easy to apply and relatively inexpensive.

The benefits of pesticide (herbicides, fungicides, and insecticides) are usually quite obvious. Crops can produce higher yields at a lower cost with less manual labor from the farmer. Crops also "look" more inviting. However, the downsides of pesticides are usually not as obvious. Currently, of the pesticides available on the market, 10% are suspected of or known to be carcinogens, cancer-causing agents. Excess run-off can pollute water and land. In addition, the generous application of pesticides weakens their effectiveness. More than 200 insect species are known to be resistant to one or more insecticide. Are there alternatives to pesticides?



# Alternative Practices

## Predatory Insects

Predatory (or “beneficial”) insects are insects that eat pest or “bad” insects. Predatory insects are effective in combating pest insects and can sometimes eliminate the need for insecticides entirely. Predatory insects do no harm to humans or pets/animals, nor do they cause water or soil pollution as some pesticides can. One challenge to using predatory insects in place of insecticides is that release of the beneficial insect at the correct time is critical. If released too early or too late, they can fail to effectively ward off pests. This method also requires more time input from farmers as it is necessary to routinely check the fields to be certain that predatory insects have established themselves. Commonly used predatory insects include:



- Lady Bugs – eat aphids, mealy bugs, mites, and insect eggs;
- Solider Beetles – eat aphids, larvae eat maggots, grasshopper eggs, and small caterpillars;
- Green Lacewings – eat aphids, mites, and other soft-bodied insects;
- Big Eyed Bugs – eat aphids, mites, leafhoppers, and other small insects;
- Various types of Nematodes – eat grubs, maggots, cutworms, weevils, beetles (e.g. Japanese and May), flea larvae, and other soil and boring insects.

## Multi-Cropping

Multi-Cropping involves planting more than one species of crop in a field. There are several benefits to multi-cropping:

- Helps eliminate insects and other parasites. One crop repels the pests that are attracted to the other crop – may reduce the need for insecticides. For example, a field will contain tomatoes, onions and marigolds; the marigolds repel tomato pests. This decreases the possibility of crop failure.
- Promotes healthy soil. The crops are paired such that they can “feed” off each other, a nutrient that one crop uses is replenished by the other crop and vice-versa.
- Increases crop yields.
- When used in conjunction with mulching, it is a useful way of controlling weeds – may reduce the need for herbicides.

The major downside to multi-cropping is that it is very labor intensive. It requires a substantial amount of labor/effort to plant, tend and harvest the crops. In addition it necessitates significant planning coordinating crops.



# Alternative Practices

## Mulching

Mulching involves applying a layer of organic (or inorganic) material on the ground around plants. Mulch can be made up of a variety of materials; organic mulches include everything from grass clippings, compost, straw, shredded leaves, sawdust and pine needles just to name a few. Mulching provides several advantages:-

- Smothers out competitive weeds – may reduce the need for herbicides;
- Conserves soil moisture – promotes healthier soil and heartier plants which can reduce the need for pesticides;
- Keeps the ground cooler in the summer and warmer in the winter – promotes heartier plants which can reduce the need for pesticides;
- Prevents erosion – promotes healthier soil and heartier plants which can reduce the need for pesticides;
- Keeps fruits, vegetables and plants cleaner, in particular decreases fruit/vegetable rot because the products are not directly touching the soil – a more attractive looking product is yielded.

The benefits of mulching are numerous; keep in mind, however, that mulching requires more time and labor from farmers. Timing is key to the application mulch; if it is applied too early it can stunt the growth of plants, if too late, weeds may already have established themselves and won't be detoured by the cover. The amount of mulch is critical as well - over mulching can suffocate plant roots, denying them oxygen, harbor diseases and attract rodents.

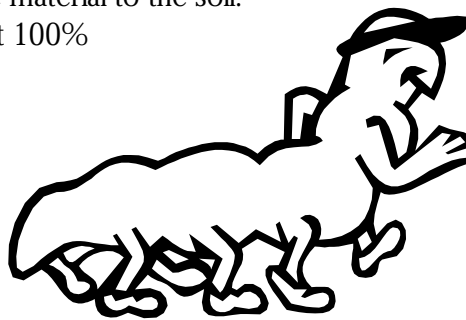


## Cover Crops

A cover crop is a crop grown in the off-season such as clover, winter peas, rye, vetch, rapeseed, and buckwheat. They can be planted at any time of the year depending upon the climate, need, and cash crop being planted. Cover crops have several benefits:

- Weed suppression – may reduce the need for herbicides;
- Can keep away “bad” insects because they do not like the cover crop – may reduce the need for insecticides;
- Provides a habitat for predatory and beneficial insects; these are insects that eat the “bad” insects which hurt crops – may reduce the need for insecticides;
- Provides erosion control – not as much soil is lost, thus sustaining healthier soil;
- Replenishes the soil nutrients – helps restore nitrogen and minerals in soil, also when turned over, they decompose and add more organic material to the soil.

There are many advantages to cover crops, but they are not 100% effective. In some cases, pesticides are still needed.



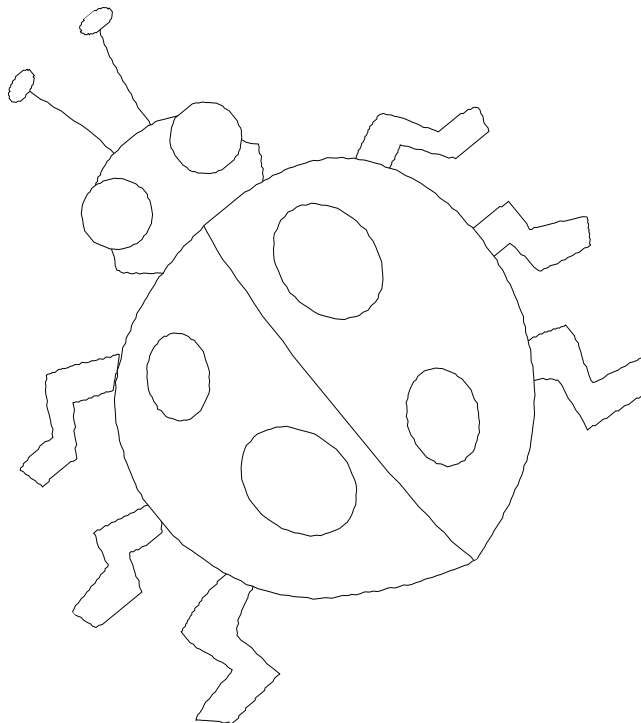
# Alternative Practices

## Crop Rotation

Crop rotation entails changing the crop grown in a field each year. Crops use certain nutrients from the soil, thus by rotating crops, the soil has a chance to replenish the nutrients that a particular crop used. A balanced crop rotation sequence can promote healthier soil. Other benefits of crop rotation include:

- Suppression of weeds, pathogens and insects – planting the same crop in a field allows pests and diseases that live in the soil to infect next year's harvest; since most insects and diseases tend to be plant specific, the insects and diseases will not affect the new crop planted and not accumulate in the soil – may reduce the need for insecticides, herbicides, and fungicides;
- Healthier soils mean heartier plants – which means plants are less susceptible to pests and disease – may reduce need for insecticides;
- Reduces erosion – promotes healthier soil, see above;
- Increases diversity of farm operation – farmer less likely to suffer a loss if a particular crop does not do well, can rely on other crops for profit.

A downside to crop rotation is that it requires significant planning; the sequence must be specific to the soil and climate types. It also must be developed in a way that is profitable for the farmer. In addition, crop rotation sometimes requires more labor input because of different planting and harvesting schedules, however, this can distribute labor demand more evenly and perhaps stabilize employment. Sometimes, herbicide residues applied to previous crops can damage the new crops when first beginning crop rotation.



# Alternative Practices: PROS & CONS

	ADVANTAGES	DISADVANTAGES
Cover Crops		
Crop Rotation		
Predatory Insects		
Mulching		
Multi-Cropping		
Other:		
Other:		
Other:		

# High-Tech Foods

You probably already consume many Genetically Modified (GM) foods and don't realize it. Almost 70% of processed foods sold in the United States contain some sort of Genetically Modified Organism. GMOs are ingredients in all sorts of products ranging from cornflakes to dog food. So what exactly are Genetically Modified Organisms? GMOs are part of agricultural biotechnology, which involves the use of highly developed and complex engineering techniques to manipulate genes or gene sequences at a cellular or sub-cellular level (Thompson). GMOs are organisms that are the products of these manipulations. What is gained by manipulating genes? Scientists found ways to make organisms grow larger, faster, more nutritious, and more resistant to drought, disease, insects and herbicides (to name just a few of the things they can do). The four major GM crops grown include corn, soybean, cotton and canola (rapeseed).

<b>Crop</b>	<b>Products</b>	<b>Products and Derivatives can be found in:</b>
Corn	Corn flour, corn starch, corn oil, corn sweeteners and syrups	Breads, cereals, chips, cookies, ice cream, alcohol, tomato sauces, margarine, enriched flours and pastas
Soybean	Soy flour, soy oil, lecithin, soy isolates and concentrates	Breads, candies, chocolates, crackers, fried foods infant formula, veggie burgers and sausages, shampoo and bubble bath, cosmetics
Canola	Oil	Chips, cookies, fried foods, margarine, salad dressings soaps, detergents
Cotton	Oil, fabric	Clothes, linens, chips, cookies, crackers, peanut butter

<b>Country</b>	<b>% of crop area occupied by GM Crops</b>
United States	16.9%
Argentina	36.8%
Canada	6.6%
China	0.4%

GM crops are grown on six continents, but the majority of the crops are concentrated in four countries: Argentina, Canada, China and the United States. Between 1996 and 2000 the global crop area occupied by GM crops grew from .1% to 2.9%. As a three billion dollar a year industry, GM crops are growing each year.

Advocates of agricultural biotechnology claim that GMOs are a means to achieve important and necessary goals. GMOs can help fight disease and alleviate hunger and malnutrition, benefiting humans. Benefits to the environment include reducing the need for fertilizers and pesticides. Farmers will be able to grow crops using less water and reduce soil erosion and runoff. They also create more useful consumer products.

Opponents of agricultural biotechnology claim that there are too many risks associated with GMOs. GMOs can be harmful to people, causing allergies and other unknown human health issues because long-term testing has not been conducted. GMOs may hurt the environment. They can create "superweeds" increase pest resistance, affect "non-target organisms and reduce biodiversity. In essence, GMOs can change an eco-system.

