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EPOK – Centre for Organic Food & Farming

# More Biodiversity on Organic Farms?



**EPOK**



**PLANTS BENEFIT FROM ORGANIC FARMING**, particularly plants that are insect pollinated, annuals and rare. Around 20 percent greater diversity has been found on organic farms, when compared to conventional farms. Yet no difference was found between farms that had newly converted to organic farming and those that had been organic for longer. Plant diversity benefited immediately from the change in farming system. This was down to ceasing to use herbicides, growing a wider variety of crops on the farms and that the stands of crops were thinner.

The surrounding landscape contains environments from which species can spread. A large proportion of natural environments, such as grazing land and organically farmed land, in the immediate surroundings are beneficial for biodiversity. The relationship between the quantity of field margin and the size of the field has been shown to be important on organic farms; the greater the proportion of field margin the greater the diversity.

**SOME SPECIES OF BIRDS BENEFIT, PARTICULARLY INSECT EATERS.** A lower intensity of arable farming, thinner crops and less use of pesticides increases access to both seeds and insects. A greater proportion of spring sown cereals is positive for birds. It is also beneficial if there are animals

on the farm, because it leads to traditional grazed pastures, more leys and an increase in insect species.

Many bird species benefit from small scale, varied landscapes which include a high proportion of natural environments and grazing lands where they can maintain territories and search for food. There are exceptions, for example larks, which benefit from large fields and a large scale landscape.

**WILD POLLINATORS BENEFIT BOTH FROM ORGANIC FARMING METHODS AND FROM SMALL SCALE LANDSCAPES.**

The species diversity of butterflies in one study was 20 percent higher, and there were 60 percent more species on the organic farms when compared to conventional farms. The number of butterfly individuals increased with the time since farms converted to organic farming. Another study has shown that both organic farming and the surrounding landscape play a role together, with the species richness of butterflies only being greater on organic farms that were in a large scale landscape. This is because in a small scale landscape, species can more easily spread to different fields, so that the impact was minimized. Even the proportion of organic farms in the surrounding landscape is of importance. In other studies, organic farms were found to have no effect on diversity, which was only influenced by the composition of the surrounding landscape.

Bumblebees have also been shown to be a group that increases in numbers on organic farms, compared to conventional farms, which to an extent is because organic farms have a higher proportion of grassland and more flowering species, which also flower over a longer time period. The species richness of bumblebees was, however, only affected by the composition of the surrounding landscape. The more small scale landscapes were more species rich for bumblebees in both the organic and in the conventional farming systems. Small scale landscapes can provide a variety of different environments that are important for different life stages, such as feeding, overwintering and mating sites within a limited area.

**THE NATURAL ENEMIES OF PEST SPECIES ARE USUALLY MOST AFFECTED BY THE SURROUNDING LANDSCAPE.** There

are a wide range of insect species such as ground beetles, lacewings, ladybirds and parasitoids, as well as spiders, that eat pest species such as aphids (also known as greenfly or blackfly). It has been shown that organic farming often has no direct impact in terms of numbers or species richness of such species, but their condition and their fertility can be better on organic farms. This is because there is more of their food there. The surrounding landscape is often of great importance to these natural enemies, an increase in the proportion of arable fields has a positive effect on carabid beetles and spiders for example, whilst some species benefit from small fields and a diverse crop rotation system.

### **BOTH POLLINATORS AND NATURAL ENEMIES BENEFIT FROM MINIMIZING THE USE OF PESTICIDES.**

Reducing the use of herbicides is of indirect benefit, because it increases the food of both herbivores and pollinators, whilst minimizing the use of insecticides directly reduces both the death from treatments and increases access to prey for predator species. In terms of landscape, it is important for many insect species that there are both resting places and overwintering sites, for example in field margins or natural grazing lands. This can mean everything from warm, open sandy areas to trees or dead wood and straw such as thatched roofs on old fashioned farm buildings.

## **Does organic farming provide more ecosystem services?**

**ECOSYSTEM SERVICES** are the services which are performed by an ecosystem which give a benefit to humans that can be given a financial value, such as pollination, the natural control of pest species, nutrient cycling and decomposition.

**INSECT POLLINATION** benefits over 20 of the crops which are grown in agricultural and horticultural production in Sweden. The value of this ecosystem service in 1998 was calculated to 95 million USD. Organic farming was shown to lead to higher pollination and higher quality in strawberries that were placed out in the field margins of organic cereal fields, when compared to conventional cereal fields. Farms which had been newly converted to organic production had equally good pollination compared to farms that had been organic for a longer period.

**THE PROTECTION OF NATURAL ENEMIES** is also an important ecosystem service that can minimize yield losses and lead to increased barley yields of over 300 kg per hectare. In one study, the percentage increase in yield was highest on organic farms. In another study, it was shown that the potential for biological control was highest on organic farms in small scale landscapes.







## Which other factors are of importance?

**FARM SIZE** – small farms have greater diversity. For example, it was found in one study that more than 50 percent more bird species were found on small organic farms (less than 52 hectares) compared to large organic farms (>135 hectares). Contrary to this, the number of territories was not greater, which was due to larks being very common on large farms.

**FIELD SIZE** – is often linked to farm size and landscape structure. Small fields have a larger proportion of field margin per unit area and therefore more species can disperse into small fields. Small fields often have a greater diversity of birds, bees and butterflies. Even in this case larks are exceptional, in that they prefer larger fields.

**A VARIED CROP ROTATION** – contributes to conditions where more species can flourish, including birds, bumblebees and butterflies. If flowering crops, such as oilseed rape, peas, field beans and clover are included in the crop rotation, they will benefit both pollinators and later in the season seed eating insects and birds. Using leys in the crop rotation often makes a positive contribution to diversity, especially if the mix includes flowering species, particularly those which bloom for long periods.

**RESOURCES OVER THE WHOLE SEASON** – pollen, nectar, suitable plants or insects must be available over the whole season. Flowe-

ring trees and bushes, for example willow, rowan, wild roses, wild cherries and wild apples in field margins and the surrounding area are beneficial for pollinators. The berries and fruit which come later can also provide food for birds and other groups.

**OPEN CROP STANDS** – since a dense, highly competitive crop stand is bad for many other plants (regarded as weeds), both in organic and in conventional agriculture. Open crop stands are also beneficial for some species of ground beetles. The crop stands can be dense due to high nitrogen inputs, high herbicide usage and more intensive mechanical tillage.

### **MECHANICAL WEEDS CONTROL**

– can be equally harmful as chemical weed control for the plants and animals which live in the field. The number of tillage operations is often greater on organic farms, although at the existing levels this is not thought to have a negative impact on the number of species in organic fields. Interestingly, mechanical weed control could have a positive effect on conventional farms, perhaps because it opens up the dense crop stands to some extent.

**FARMER INTEREST** – farmers with an interest in nature have been shown to have a greater biodiversity on their farms, including more ground beetles and wild bees.

### **Report on organic agriculture and ecosystem services in a landscape perspective**

This brochure is based on a larger review written by Camilla Winqvist for EPOK. In the larger review to which we refer, the studies are described in more detail with complete references. The report is published in 2012 and available at [www.slu.se/epok](http://www.slu.se/epok).

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