

The role of landscape elements in plant production

(Practical exercise)

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Principally the organic agroecosystem should function as a self-organising organism in good balance with environment.

In natural ecosystem, biodiversity is high and the populations of phytophagous organisms are balanced by their natural enemies. In agroecosystems the number of species is decreased and self-regulation characteristics of natural communities are lost because humans modify such communities by breaking the fragile thread of community interactions. This breakdown can be repaired by restoring the elements of community homeostasis through the addition and enhancement of biodiversity.

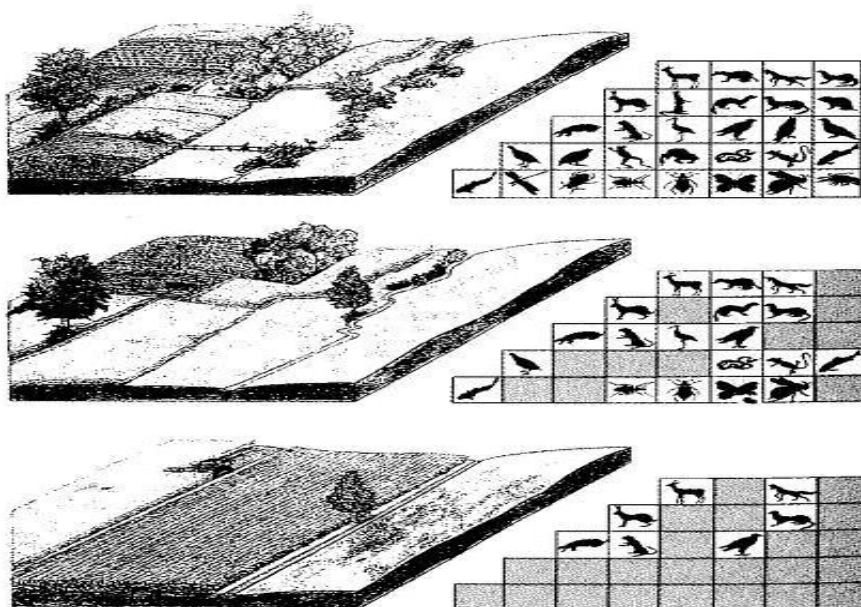


Figure 1. Biodiversity depending on landscape heterogeneity.

The first component, planned biodiversity, includes the crops and livestock included in the system by the farmer, which will vary depending on the management inputs and spatial and temporal arrangements of crops. The second component, associated biodiversity, includes all flora and fauna, herbivores, carnivores, decomposers etc., that colonize the agroecosystem from surrounding environments and that will thrive in the agroecosystem depending on its management and structure. The agroecosystem can be diversified with the use of high crop diversity in time and space, limitation of the size of fields, creating structural mosaic of adjoining crops and uncultivated land (Figure 1) - field boundaries, different natural areas - ponds, coppices etc., which provide

shelter and alternative food for natural enemies of pests – parasitoids, predators and natural antagonists of plant diseases.

Coppices, shrubs, diverse field margins are offering habitat conditions for predators and parasitoids which can kill a significant part of plant pests. Also the diversity of microorganisms controls the development of diseases and pests (Altieri and Nicholls, 2004). In field margins flowering plants of the *Umbellifera* and *Compositae* families are well attracting adults of parasitic wasps and tachinids which later are looking for places for egg laying in the insects in fields. Lady birds and predator bugs are aggregating for hibernation on deciduous trees and shrubs which they leave in spring to look for colonies of aphids. From field boundaries ground beetles – carabids and staphylinids - disperse into fields. Coombes and Sotherton (1986) showed that beetles could be recovered up to 200 m into the fields but there is significant decrease of abundance in the direction to the field centre. Considering the predatory polyphagous nutrition the carabids play a definite role in agroecosystems as natural pest-control agents, they feed on aphids, moth- and sawfly larvae etc. Some ground beetles eat also mollusca and seeds of weeds. All the larvae of ground beetles are voracious predators. (Kromp, 1999). In the Baltic crop fields, depending on crop and management and surroundings, around fifty carabid species are established (Luik et al., 2000; Tamutis, 2000). Carabids have been demonstrated to reduce cereal aphid populations in their early colonization phase (Sopp and Chiverton, 1987). Their abundance is higher in winter crops and especially in the field parts which were bordering on other winter crops. For example in Estonia on the Puki organic farm in winter oilseed rape field in the part with winter wheat margin the carabids' number was 1.4 times higher than in the field centre and 31 times higher than in part bordering with gravel road. On the Tali organic farm in the barley field part bordering on the ditch edge and covered with diverse plant community the total number of carabids was two times bigger than in the field part bordering on cultural hay (Luik et al., 2005). Several surveys prove that the field margin with the width of at least three meters covered with multiple species of plants providing sufficient shelter and hibernation for the natural enemies of pests can fulfil the tasks of plant protection.

Consequently the locations of fields and their surroundings have big impact on plant production – plant health - and have to be taken in account in organic production.

Assessment of biodiversity

- **Pitfall trapping**
- **Sweep netting**
- **Plant cover analyse**