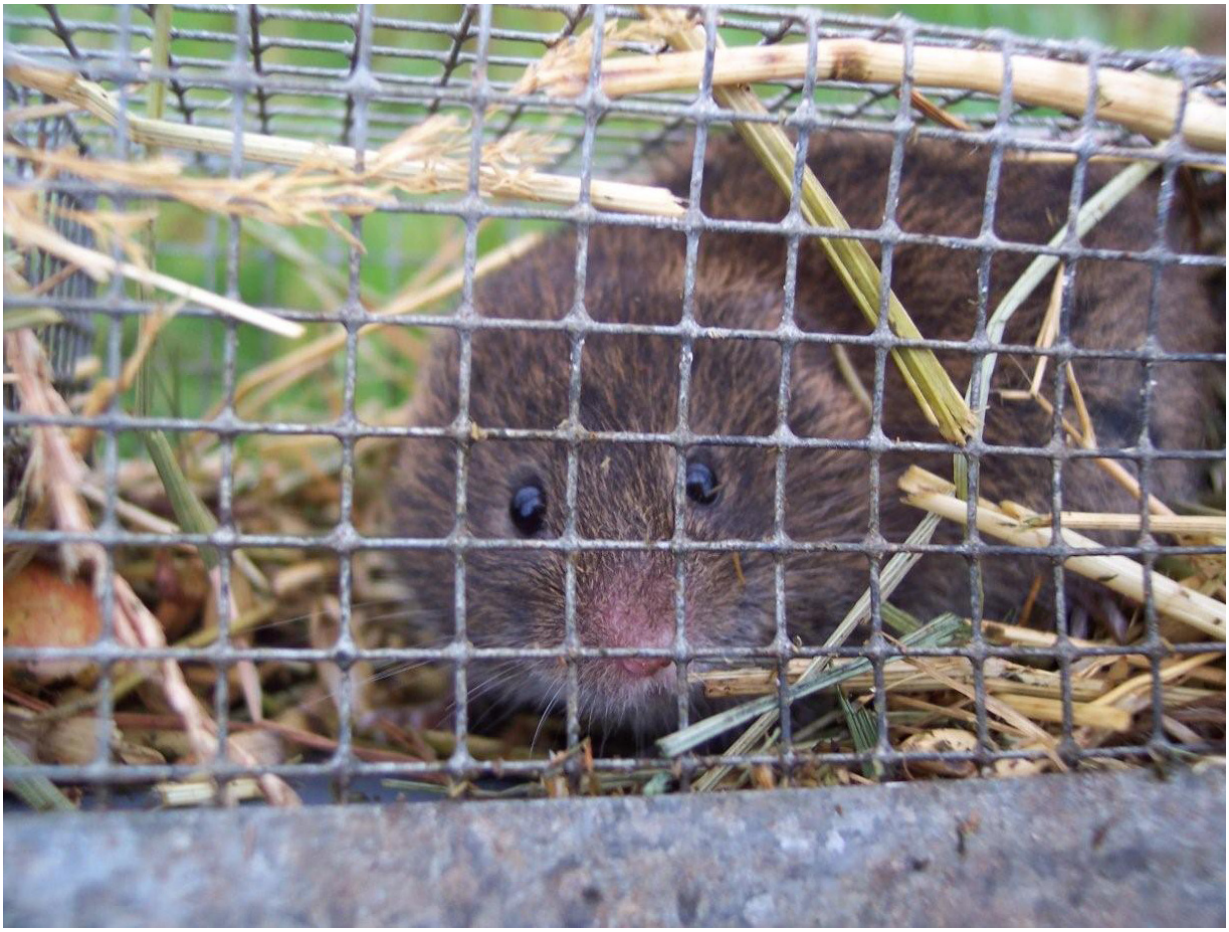
International Centre for Research in Organic Food Systems

Organic farming and biodiversity

REFUGIA 2007-2010

ICROFS



Field vole (Microtus agrestis) Photo: Tine Sussi Hansen

Organic farming and biodiversity
- the impact of organic farming on nature

Organic farming is generally acknowledged for its positive effects on biodiversity and other landscape services. However, the intensity of farming has changed significantly through the last decade as ranks of traditional holistic organic farmers have been joined by much more economically-driven new organic farmers. At the same time there have also been steady improvements in farming methodology and crop types resulting in efficiency in organic farming which can often rival its conventional counterparts. Therefore, large variations occur between organic farms.

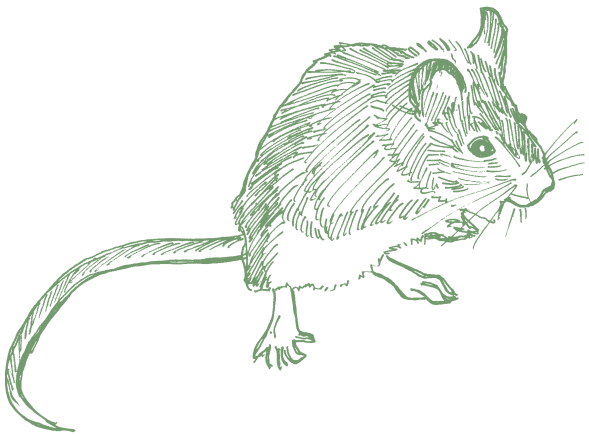
The present project aims at increasing society's and consumers' knowledge about the impact of organic farming on nature by investigating the role of different types of organic farms as refugia for biodiversity.

What is biodiversity?

The Rio Convention defines biodiversity as consisting of three components: genes, species and ecosystems, which are often regarded as the biological resources in society. So far focus has primarily been directed towards conservation of selected nature areas containing rare and/or threatened species. However, conservation of biodiversity does not only encompass conservation of rare nature, but may as well cover conservation of ordinary nature as a special characteristic of the arable landscape and hence represented on organic and conventional farms.

A need for new studies in Denmark

It is generally accepted that organic farming gives rise to higher species richness than conventional farming. Several papers describe the beneficial impact of organic farming on biodiversity. Arable flora, invertebrates, birds and mammals all benefit from organic farming in terms of improved species richness and /or increased abundance. However, very few Danish studies have been undertaken in the last century. As organic farming has developed quickly in Denmark since the onset of the organic boom in the mid nineties, the conclusions of the older studies may no longer be valid. Therefore, there is a need for new comparative studies in Denmark. The present project aims at increasing society's and consumers' knowledge about the impact of organic farming on nature by investigating the role of different types of organic farms as refugia for biodiversity



Objectives of the project

Visionary objectives:
To increase society's, decision-makers' and consumers' knowledge about the multifunctional role of organic farming - especially focusing on the impact of organic farming on nature.

Immediate objectives:
To investigate food chains, species diversity, genetic diversity and interaction between flora and fauna in organic farming compared to conventional farming, and to test the following refugia hypotheses:

Hypotheses

1. Species diversity is higher in organic fields compared to conventional fields. Population sizes of many species are higher in organic fields compared to conventional farming – even on intensive organic farms.
2. Extensively cultivated organic fields have higher species numbers and higher densities of weeds and arthropods than intensively cultivated organic fields
3. Organic farms possess a higher number of functioning weed–herbivore food chains than conventional farms, which gives the foundation for more insect life in organic fields.
4. The documented differences in floral species richness and composition between organic and conventional borders and hedges result in higher availability of plant-produced food, e.g. nectar, pollen and seeds.
5. Organic farms have a role as refuges (food chains, species- and gene bank) for the species in the arable land that are declining in the conventional farmland.
6. Local extinction of plants, invertebrates and smaller mammals happens more frequently within conventional farmland due to the use of pesticides, structural differences (fewer suitable habitats) and different ways of production that reduce the biodiversity at the species and gene level.

These hypotheses are addressed within six work packages (WP 2-7):

Structure, diversity and intensity
This work package will investigate the structure, diversity and intensity of organic farming, and its role for multifunctionality in Denmark (WP 2).

Species diversity and food chains
This work package will investigate weed-insect food chains for two crops within intensively and extensively cultivated organic fields in order to compare with existing data for conventional farms.
This will give information about the amount of non-crop food available for birds and small mammals feeding in the fields and about whether organic fields sustain more food chains than conventional fields. (WP 3)

Field margins and hedges
This work package will investigate the plant-produced food resources in terms of flowers (nectar and pollen) and seeds available for insects, birds and small mammals in hedges and field margins at organic and conventional farms. The data will show whether the documented differences in species composition between hedge vegetation at organic and conventional farms are mirrored in the resource availability (WP 4).

Species diversity and mammals
This work package aims at comparing biodiversity at the community and species level of small mammals in conventional farms and intensively and extensively grown organic farms.
At the community level, the project aims at performing extensive trappings of small mammals in many different types of crops within various organic and conventional cropping systems. The results will be used to combine biodiversity of small mammals into one common nature quality index. At the species level, the project aims at describing dispersal of selected species from organic farms into conventional farms. Focus will be attended on the importance of larger set aside areas and small biotopes within the farming systems, and the importance of hedges, ditches etc in the landscape. Data from the dispersal studies will be provided by marking-recapture as well as from providing the animals with radio transmitters. All data will be synthesised in a large model. Collection of data on reproduction and survival of small mammals will also be performed within various farming systems (WP5).

The role of organic farms as genetic sources for species in the arable land
This work package will investigate the role of organic farms as genetic sources for species in the arable land by analysing the genetic diversity and population structure of "wild" species in the arable landscape. This will be performed assuming firstly that the upland habitats in hedgerows and fields/ grassland of organic farms function both as islands and corridors connecting the islands for flora and fauna, and secondly, that the use of pesticides in conventional agriculture causes frequent local extinction and re-colonisation events of weed and invertebrates (WP6).

The role as refugia and biological sources: a synthesis
This work package will investigate the impact that organic farms have on the wildlife content of the landscape by creating a set of landscape configurations using the information from WP2 on the agricultural extensiveness and distribution of organic farms and from WP 2, 3 and 4 on the species ecology, genetic patterns and species diversity. Modeling tools will be used to synthesize this information and to create a set of indices for describing the ability of a landscape configuration of organic farms to support a range of wildlife. The resulting landscape wildlife index (LWI) will have the potential to be used by interest groups to determine which scenarios result in the optimum wildlife potential from their particular viewpoint (WP7).

The role of Organic Farms as refugia for biodiversity
(REFUGIA 2007-2010)

Project leader

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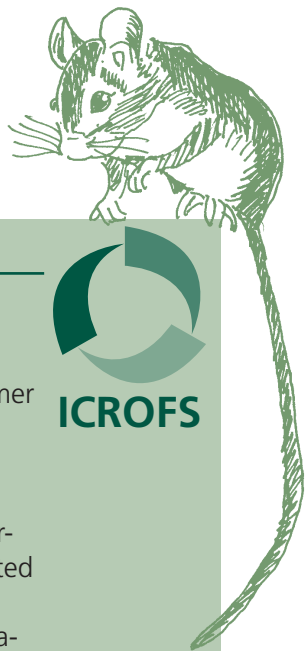
Links:

www.refugia.elr.dk/uk
www.icrofs.org

Wood mouse (Apodemus sylvaticus) Photo: Tine Sussi Hansen

Hedgerow in one of the focus areas of REFUGIA
Photo: Tine Sussi Hansen



About ICROFS

The International Centre for Research in Organic Food Systems (ICROFS) is a "centre without walls" where the research is performed in interdisciplinary collaboration between research groups in different institutions. The centre is an expansion of the former research centre DARCOF, which the Danish Government in 2008 decided to give an international mandate and an international board.

The main purpose of ICROFS is to coordinate and monitor international research in organic food and farming systems in order to achieve optimum benefit from the allocated resources. Further, the aim of ICROFS is to initiate research and create impact of the research results through support and dissemination of high quality research of international standard.

More information at www.icrofs.org